Scheme of Examination for B.Tech. (Civil Engineering) Degree Course - Semester - III

Course No.	Course Title	Teaching Schedule per week				Credits
		L	T	P/D	Total	
CSIC	Machine Learning and Data Analytics	3	0	2	5	4
CEPC201	Fluid Mechanics - I	3	0	0	3	3
CEPC202	Building Construction and Materials	3	0	0	3	3
CEPC203	Structural Analysis - I	3	0	0	3	3
CEPC204	Surveying - I	3	0	0	3	3
CEPC205	Design of Steel Structures - I	3	0	2	5	4
CEPC206	Fluid Mechanics - I (P)	0	0	2	2	1
CEPC207	Surveying - I (P)	0	0	3	3	1
SWAU	NCC/NSS/Yoga	0	0	2	2	1*
SWAU	Sports/Clubs/Technical Societies	0	0	2	2	1*
	Total	**18**	**0**	**13**	**31**	**22**

*Continuous evaluation model as per guidelines and the credit to be awarded at the end of 6th semester based on cumulative performance up to 6th semester

Scheme of Examination for B.Tech. (Civil Engineering) Degree Course - Semester - IV

Course No.	Course Title	Teaching Schedule per week				Credits
		L	T	P/D	Total	
MAIC	Applied Numerical and Statistical Methods	3	0	0	3	3
CEPC208	Soil Mechanics	3	0	0	3	3
CEPC209	Fluid Mechanics - II	3	0	0	3	3
CEPC210	Surveying - II	3	0	0	3	3
CEPC211	Structural Analysis - II	3	0	0	3	3
CEPC212	Soil Mechanics (P)	0	0	2	2	1
CEPC213	Fluid Mechanics - II (P)	0	0	2	2	1
CEPC214	Surveying - II (P)	0	0	3	3	1
CEPC215	Structural Analysis (P)	0	0	2	2	1
CEPE201	Programme Elective - I (Computational Practical)	0	0	2	2	1
SWAU	NCC/NSS/Yoga	0	0	2	2	1*
SWAU	Sports/Clubs/Technical Societies	0	0	2	2	1*
	Total	**15**	**0**	**15**	**30**	**20**

*Continuous evaluation model as per guidelines and the credit to be awarded at the end of 6th semester based on cumulative performance up to 6th semester

Course Code	:	CSIC 221
Course Title	:	Machine Learning & Data Analytics
Number of Credits and L/T/P scheme	:	4 & 3/0/2
Prerequisites (Course code)	:	Problem solving & Programming using C
Course Category	:	IC (CE, EE, ECE, ME, PIE, IIOT, M & C)

Course Learning Objectives:

1. The major goal of the course is to allow computers to learn (potentially complex) patterns from data, and then make decisions based on these patterns.
2. To provide strong foundation for data science and application area related to it.
3. To provide the underlying core concepts and emerging technologies in data science.
4. A data scientist requires an integrated skill set spanning mathematics, probability and statistics, optimization, and branches of computer science like databases, machine learning etc.

Course Content

1. **Introduction to Data Science:** What is Data Science? Linear algebra for datascience:- algebraic and geometric view, Data Representation & Statistical Inference:- Data objects and attribute types, Types of Data, descriptive statistics, notion of probability, distributions, mean, variance, covariance, Understanding univariate and multivariate normal distributions.
2. **Data Analysis:** Probability and Random Variables, Correlation, Regression, Attribute Transformation, Sampling, Feature subset selection, Similarity measures, High-dimensional Data: - Curse of Dimensionality, Dimensionality reduction: PCA, SVD, etc.
3. **Data Visualization, Bayesian Learning& Evaluating Hypotheses:** Basic principles, Scalar, Vector, & Tensor Visualization, Multivariate Data Visualization, Text Data Visualization, Network Data Visualization, Visualization Techniques, Bayesian Approach, Bayes' Theorem, Evaluating Hypotheses- Z-test, T-test, Chi-square Test.
4. **Machine Learning (Supervised & Unsupervised Learning):** Basic concepts of Classification, k-Nearest Neighbor, Decision Tree classification, Naïve Bayes' Classifier, Linear Regression Models, Logistics Regression, Basic concepts of Clustering, K-means, Hierarchical Clustering, DBSCAN.

Text Books:

1. U Dinesh Kumar and Manaranjan Pradhan, Machine Learning using Python, John Wiley & Sons,2020.
2. Cathy O 'Neil and Rachel Schutt., Doing Data Science, Straight Talk From The Frontline, O 'Reilly. 2014.
3. Ethem Alpaydin, Introduction to Machine Learning, Second Edition, PHI, 2010.

Reference Books:

1. T. Hastie, R. Tibshirani and J. Friedman., The Elements of Statistical Learning, Second Edition, Springer, 2009.
2. Christopher M. Bishop F.R.Eng., Pattern Recognition and Machine Learning, Springer, 2006.
3. J. Grus., Data Science from Scratch, Second Edition,O'Reilly. 2019.
4. Douglas C. Montgomery, George C. Runger., Applied Statistics and Probability for Engineers, Third Edition, John Wiley & Sons, Inc., 2003.
5. Tom M.Mitchell, Machine Learning, McGraw-Hill International Edition, 1997.

Course Outcomes

1. Explore the fundamental concepts of data science and machine learning.
2. Understand the processes of data science - identifying the problem to be solved, data collection, preparation, evaluation and visualization.
3. Understand data analysis techniques for applications handling large data.
4. Visualize and present the inference using various tools.
5. Understand various machine learning algorithms used in data science process.

CEPC201 Fluid Mechanics - I

Pre-requisite: Engineering Mechanics

L	T	P/D	Credits	Total contact hours
3	0	0	3	3

Brief description of the course: Fluid Mechanics is a basic engineering subject and helps in solving fluid flow problems in the field of Civil Engineering. The subject deals with basic concepts and principles in hydrostatics, hydro kinematics and hydrodynamics and their application in solving fluid-mechanics problems.

Course Content:

UNIT- I

Introduction

Fluid properties, mass density, specific weight, specific volume and specific gravity, surface tension, capillarity, pressure inside a droplet and bubble due to surface tension, compressibility, viscosity, Newtonian and Non-Newtonian fluids, real and ideal fluids.

(6 hrs)

UNIT- II

Fluid Statics

Pressure-density-height relationship, gauge and absolute pressure, simple differential and sensitive manometers, two liquid manometers, pressure on plane and curved surfaces, center of pressure, Buoyancy, stability of immersed and floating bodies, determination of metacentric height, fluid masses subjected to uniform acceleration, free and forced vortex.

(8 hrs)

UNIT- III

Kinematics of Fluid Flow

Steady & unsteady, uniform and non-uniform, laminar & turbulent flows, one, two & three dimensional. flows, stream lines, streak lines and path lines, continuity equation in differential form, rotation and circulation, elementary explanation of stream function and velocity potential. **(8 hrs)**

UNIT- IV

Dynamic of Fluid Flow

Euler's equation of motion along a streamline and its integration, limitation of Bernoulli's equation, Pitot tubes, venturimeter, Orificemeter, flow through orifices, sharp crested weirs and notches.

(7 hrs)

UNIT- V

Boundary layer and Dimensional Analysis:

Boundary layer thickness, boundary layer over a flat plate, laminar boundary layer, turbulent boundary layer, laminar sub-layer, smooth and rough boundaries, local and average friction coefficient, separation and its control. Dimensional homogeneity, Buckingham's π theorem, dimensionless numbers and their significance, geometric, kinematic and dynamic similarity.

(11 hrs)

Note: The focus of concluding lectures should be to emphasize the value addition of the subject and also on how it impacts the environment. Further, the faculty may suggest possible sustainable solutions/emerging technologies/innovations towards sustainability in the subject domain.

Text Books/Reference:

1. Theory and application of fluid Mechanics including Hydraulic Mechanics by K Subramanya
2. Introduction to Fluid Mechanics by Robert N. Fox & Alan T. Macnold
3. Hydraulic and Fluid Mechanic by P. N. Modi & S. M. Seth
4. Introduction to Fluid Mechanics by Robert W. Fox & Alan T. McDonald
5. Fluid Mechanics Through Problems by R. J. Garde
6. Engineering Fluid Mechanics by R. J. Garde & A. G. Mirajgaoker

Course outcomes: Upon successful completion of the course, the students will be able to:

1. determine the properties of fluid and pressure and their measurement.
2. visualize fluid flow phenomena observed in Civil Engineering systems such as flow in a pipe, flow measurement through orifices, notches and weirs.
3. compute forces on immersed plane and curved plates.
4. apply continuity equation and energy equation in solving problems on flow through conduits.
5. apply dimensional analysis and the concept of CFD

CEPC202 Building Construction and Materials

Pre-requisite: None

L	T	P/D	Credits	Total contact hours
3	0	0	3	3

Brief description of the course:
The course covers the construction in stone and brick masonry along with the requirements of good materials. It also takes into account concrete with properties of various ingredients of concrete and its types.

Course Content:

Unit-I (9)

CONSTRUCTION:
Introduction, various terms used in stone and Brick masonry, Classifications of stone masonry, Brick masonry-bonds in brick work, reinforced brick work, Defects in brick masonry. Doors and Windows Locations, sizes, types of doors and windows, Building items: Plastering & pointing, Painting, Distempering and white washing; Damp proof course (DPC), Anti-termite measures and treatments.

Unit-II (9) Materials:
Stone Classification, requirements of good structural stone, preservation and seasoning of stone. Classification of bricks, constituents of good brick, harmful ingredients, testing of bricks. Timber: Classification of timber, structure of timber, seasoning of timber, defects in timber, fire proofing of timber, important Indian timbers.

Unit-III (12) Concrete materials
Definition, proportions of lime and cement mortars, mortars for masonry and plastering.

Cement, tests on cement (physical tests), various types of cement-ordinary Portland cement, rapid hardening cement, low heat cement, sulphate resistant cement, Portland-pozzolona cement, high strength Portland cement, high alumina cement, waterproof cement, white Portland cement, hydrophobic cement, coloured Portland cement.

Aggregates, classification of aggregates based on petrographic, size, shape & textures, deleterious substances in aggregates, bulking of fine aggregate, sieve analysis, grading of aggregates as per IS-383-1970. Fineness Modulus.

Process of manufacture of concrete, Batching, mixing, transporting, placing, compaction, curing, finishing; Testing of fresh concrete: workability, factors influencing workability, measurement of workability, requirements of workability, and hardened concrete: Introduction, properties of hardened concrete, Non-destructive testing. permeability of concrete, durability of concrete sulphate attack, thermal properties of concrete.

Unit-IV (6) Special Concrete
Sustainable construction through waste material based concrete, Light weight concrete, high strength concrete, mass concrete definitions, its properties and applications, fiber reinforced concrete: Materials. Fibers-types and properties, ferrocement, polymer concrete composites, heavy-weight concrete for radiation shielding.

Note: The focus of concluding lectures should be to emphasize the value addition of the subject and also on how it impacts the environment. Further, the faculty may suggest possible sustainable solutions/emerging technologies/innovations towards sustainability in the subject domain.

Text Books/Reference:

1. Sushil Kumar, Building Construction, Standard Pub., N. Delhi
2. Gurcharan Singh, Building Construction, Standard Pub., N. Delhi
3. M.L.Gambhir, Concrete Technology, McGraw-Hill Education
4. Duggal, S.K., Building Materials, New Age International, 2009.
5. Rangwala, S.C., Engineering Materials, Charotar, 2015.
6. Arora, S.P. and Bindra, S.P., Building Construction, Dhanpat Rai and Sons, 1997
7. Punmia, B.C., Building Construction, Laxmi Publications (P) Ltd., 1993
8. Peurifoy, R.L., Form work for Concrete Structures, McGraw Hill Book Co., 1999.
9. Shetty, M.S., Concrete Technology, S. Chand and Company., 2011.
10. Neville A.M., Properties of Concrete, Fourth edition, Pearson Education Ltd. 2004.

Course Outcomes:

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

CO1: identify the various building materials with symbols.

CO2: identify the properties of building materials.

CO3: distinguish the different construction materials and select appropriate materials for construction.

CO4: aware of Mortar, concrete and its ingredients with their properties.

CEPC203 Structural Analysis - I

Pre-requisite: Engineering Mechanics

L	T	P/D	Credits	Total contact hours
3	0	0	3	3

Brief Description about the course:
This course has been designed for undergraduate (civil) engineering students or those interested in developing a deeper understanding of introductory structural analysis concepts and methods. The course covers various methods and techniques used to analyze the behavior of structures under different loads and stresses. It includes topics like determinate and indeterminate structures, influence lines, and more and provide examples demonstrating their applications. Journey through this course will help students to build the foundation for more advanced courses related to structural engineering. This course is essential for civil engineering students who want to enhance their understanding of structural analysis and design.

Course Content:

Unit-I Energy Methods [07]

Introduction to Castigliano's Theorems, Theorem of Least Work and Theorem of Virtual Work and its applications to beam, frame and trusses.

Unit-II Slope and Deflection of Determinate Beams [07]

Determination of Slopes and Deflections of beams and frames using Macauley's Method, Moment Area Method, Conjugate Beam Method.

Unit-III Indeterminate beams and Frames [12]

Analysis of beams and frames for shear force, bending moment, Slope and deflection using Slope Deflection Method, Moment Distribution Method, Column Analogy Method and Kani's Method

Unit-IV Approximate methods of analysis [02]

Portal method - Cantilever method – Substitute frame method

Unit-V Moving Loads and Influence Lines [08]

Analysis of simply supported spans traversed by single point load - two concentrated loads - Uniformly distributed load, shorter and longer than the span and equivalent uniformly distributed load. Analysis of determinate and indeterminate structures using influence line diagram.

Note: The focus of concluding lectures should be to emphasize the value addition of the subject and also on how it impacts the environment. Further, the faculty may suggest possible sustainable solutions/emerging technologies/innovations towards sustainability in the subject domain.

Textbooks/Reference:

1. Jindal. R.L, Indeterminate Structures, Chan Tea, New Delhi, 2000
2. Punmia B.C., Theory of Structures, Standard Book House, New Delhi, 2000
3. Strength of Materials Part-I, S Timoshenko, Affiliated East-West Press, New Delhi
4. Mechanics of Materials, Popov Nagarjan & Lu, Prentice Hall of India, New Delhi
5. Mechanics of Solids, Prasad, V. S. Galgotia Pub., New Delhi.
6. Elementary Structural Analysis, Jain, A. K., Nem Chand & Bros, Roorkee.
7. Elementary Structural Analysis, Wibur & Nooris, McGraw Hill Book Co., New York.
8. Structural Analysis, Bhavikatti S S Vikas Pub.House,N.Delhi.

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

CO1 Analyze Indeterminate structures using energy methods.
CO2 Formulate Equilibrium and Compatibility equations for structural members.
CO3 Analyze one dimensional indeterminate problem using classical methods.
CO4 Analyze of frames using approximate methods.
CO5 Analyze of structures for gravity loads and moving loads.

CEPC204 Surveying - I

Pre-requisite: None

L	T	P/D	Credits	Total contact hours
3	0	0	3	3

Brief description of the course:
This course will help students to understand the importance of surveying in Civil engineering, to study the basic of linear/angular/direction measurements using, chain/tacheometer/compass and theodolite and their applications. It will help students to determine height of points using various leveling method and Tacheometer to understand the methods of graphical surveying.

Course Content:

Unit-I (9 hrs)

Basics of Surveying: History, Definition, objects, classification, fundamental principles, methods of fixing stations, concept of Geoid and reference spheroids,
Linear measurement: Direct measurement, instruments for measuring distance, instruments for making stations, chaining of line, errors in chaining, tape corrections examples, Chain traversing
Direction Measurement: Bearings and angles; Compass surveying- magnetic bearings, prismatic and surveyors' compass, declination, local attraction errors and adjustments; Methods of compass traversing, checks in traversing, adjustment of closed traverse

Unit-II (9 hrs)

Angle Measurement: Theodolite: Theodolites, temporary adjustment of theodolite, measurement of horizontal and vertical angles, theodolite traverse.
Leveling: Definition of terms used in leveling, types of levels and staff, temporary adjustment of levels, principles of leveling, spirit and trigonometric levelling, reduction of levels, booking of staff readings, plane and geodetic trigonometric levelling, correction due to curvature and refraction, axis signal correction, Contouring, contour, characteristics of contours lines, locating contours, interpolation of contours, use of contours.

Unit-III (9 hrs)

Plane Table Surveying: Plane table accessories, various methods of plane table surveying, two point and three point problems, sources of error, advantages and disadvantages
Tacheometry: Principle of tacheometry, stadia and tangential method of tacheometry

Unit-IV (9 hrs)

Curves: Classification of curves, elements of simple circular curve, location of tangent points-chain and tape methods, instrumental methods, examples of simple curves Transition Curves-Length and types of transition curves, length of combined curve, examples. Vertical Curves: Necessity and types of vertical curves, setting out of a vertical curve by tangent correction, chord gradient and sight distance method.

Note: The focus of concluding lectures should be to emphasize the value addition of the subject and also on how it impacts the environment. Further, the faculty may suggest possible sustainable solutions/emerging technologies/innovations towards sustainability in the subject domain.

Text Books/Reference:

B C Punmia: Surveying volume I and II
W. Schofield: Engineering Surveying (Sixth Edition)
C. Venkataramiah: Text Book of Surveying
Various Online resources including NPTEL

Course Outcomes:

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

CO1: Carry out surveying in the field for various civil engineering projects

CO2: Prepare a contour map and plan of the area, taking accurate measurements with different surveying instruments

CO3: Plotting and adjustment of traverse

CO4: Understand the process of setting of different curves for road and railway designs

CEPC205 Design of Steel Structures - I

Pre-requisite: Structural Analysis - I

L	T	P/D	Credits	Total contact hours
3	0	2	4	5

Brief description of the course: The course is designed to provide the students with the knowledge of basic structural design concepts and their application the field of design of steel structures and detailing. The introduction of steel design code and its application in the design of steel members, i.e. connection, beam, columns and footings.

Course Content:

UNIT-I

1. **Elementary Limit Analysis and Design:**
   Properties of structural steel, I.S.Rolled sections, and I.S. specifications, Working stress and limit state methods, Limit state v/s working stress method, characteristic strength and characteristics loads, design values, Partial safety factors and factored loads, stress-strain relationship for steel. [4]
2. **Connections:**
   Importance, terminology, various types of connections, advantages, and disadvantages of bolted and welded connections, simple and eccentric/moment resistant, bolted, and welded connections. [6]

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UNIT-II

3. **Design of Tension Members:**
   Introduction, shear-lag, types of tension members, net sectional areas, design of tension members, lug angles, and splices. [3]
4. **Design of Compression Members:**
   Introduction, effective length and slenderness ratio, various types of sections used for columns, built-up columns, necessity, design of built-up columns, laced and battened columns including the design of lacing and battens. [6]

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UNIT-III

5. **Column Bases and Footings:**
   Introduction, types of column bases, design of slab base and gusseted base, design of gusseted base subjected to eccentrically loading, introduction to design of grillage foundations. [4]
6. **Design of Beams:**
   Introduction, types of sections, general design criteria for beams, design of laterally supported and unsupported beams, design of built-up beams, web buckling, web crippling, and diagonal buckling. [4]

UNIT-IV

7. **Plate Girder:**
   Introduction, elements of plate girder, design steps of a plate girder, necessity of stiffeners in plate girder, various types of stiffeners, web and flange splices (brief introduction), Curtailment of flange plates, design beam to column connections. [9]

Drawings:

1. Structural drawings of various types of bolted and welded connections (simple and eccentric)
2. Scaled drawings of compression members, Built-Up compression members and beams.
3. Column bases: slab base, gusseted base, and grillage foundation.
4. Plate girder.

Note: The focus of concluding lectures should be to emphasize the value addition of the subject and also on how it impacts the environment. Further, the faculty may suggest possible sustainable solutions/emerging technologies/innovations towards sustainability in the subject domain.

Text Books/Reference:

1. Design of steel structures, A S Arya & J L Ajmani, Nem Chand & Bros., Roorkee.
2. Design of steel structures, M Raghupati, TMH Pub., New Delhi.
3. Design of steel structures, S M A Kazmi & S K Jindal, Prentice Hall, New Delhi.
4. Design of steel structures, S K Duggal, TMH Pub., New Delhi.
5. IS:800-2007, Indian Standard Code of Practice for General Construction in Steel.
6. SP6 (1)-1964, IS handbook for structural Engineers. Bureau of Indian Standards, New Delhi.
7. IS 875 Part (3)-2015, Code of Practice or Design Loads (other than earthquake) for buildings and structures: wind loads, Bureau of Indian Standards, New Delhi.

Course Outcomes: On completion of the course, the students shall be able to

CO1. Design tension members, lug angles, and splices.
CO2. Design compression members, built-up compression members.
CO3. Design welded and bolted connections.
CO4. Design beams.
CO5. Design plate girders.

CEPC206 Fluid Mechanics - I (P)

Pre-requisite: Fluid Mechanics - I

L	T	P/D	Credits	Total contact hours
0	0	2	1	2

Brief description of the course: It helps to understand the basic principles and application of fluid-flow and develops the skills in analyzing fluid flows.

Course Content:

1 To determine metacentric height of the ship model.
2 To verify the Bernoulli's theorem.
3 To determine coefficient of discharge for an Orificemeter.
4 To determine coefficient of discharge of a venturimeter.
5 To determine the various hydraulic coefficients of an Orifice (C_d, C_c, C_v).
6 To determine coefficient of discharge for an Orifice under variable head.
7 To calibrate a given notch.
8 To determine coefficient of discharge for a mouth piece.
9 To study development of boundary layer over a flat plate.
10 To study velocity distribution in a rectangular open channel.
11 Velocity measurements by current meter, float, double float (demonstration only).
12 Experiment on Vortex formation (demonstration only).

Text Books/Reference:

1. Hydraulics and Fluid Mechanics by Modi, PN, and Seth, SM; Delhi Standard Publishers Distributors.
2. Laboratory Manual for Fluid Mechanics by Poonia MP and Jakhar OP; Standard Publishers Distributors, Delhi

Course outcomes: Upon successful completion of the course, the students will be able to:

1. measure discharge in pipes
2. determine the properties of fluid and pressure and their measurement.
3. visualize fluid flow phenomena observed in Civil Engineering systems such as flow in a pipe, flow measurement through orifices, notches and weirs.

CEPC207 Surveying - I (P)

Pre-requisite: Surveying - I

L	T	P/D	Credits	Total contact hours
0	0	3	1	3

Brief description of the course: This course has been designed to impart students the knowledge in field-measuring distances, measuring directions, determining heights of points and to set draw plans and maps.

Course Content:

1. Study of Chain and Compass
2. Leveling: Differential, Fly, Cross Sectioning, Profile and reciprocal
3. Plane Table surveying: Radiation and Intersection
4. Resection- 2 and 3-point problem
5. Working with digital level
6. Working with theodolite for angle measurement
7. Use of Tacheometer for distance and elevation calculation

Text Books/Reference:

B C Punmia: Surveying volume I and II
W. Schofield: Engineering Surveying (Sixth Edition)
C. Venkataramiah: Text Book of Surveying
Various Online resources including NPTEL

Course outcomes:

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

CO1. Use conventional surveying tools such as chain/tape, compass, plane table, levels in the field for various civil engineering applications.
CO2. Adjusting and plotting a traverse.
CO3. Use plane table to prepare map of a small area.
CO4. Use theodolite to measure the angles and tacheometer for distance and elevation measurement.

Evaluation criterion for NCC Cadets

Following criterion is proposed to be adopted for the evaluation of NCC cadets for the practical course of NCC/NSS/Yoga

A: Internal Evaluation (During semester):

(i) Attendance:	20 marks (for 90 % attendance full marks)
(ii) Discipline:	10 Marks
(iii) Drill performance & Body bearing:	10 marks
(iv) Participation in social activities:	10 marks
(v) Domain knowledge:	10 marks (Through oral viva)

B: End sem evaluation: (At the end of the semester)

(i) Discipline:	10 Marks
(ii) Drill performance & Body bearing:	15 marks
(iv) Domain knowledge:	15 marks (Through oral viva)

C: After end of the 6^{th} semester: Bonus marks 10 for each B & C certificate is proposed to be added in final marks subject to total marks does not exceed 100

NATIONAL CADET CORPS

INSTITUTIONAL TRAINING SYLLABUS

INTRODUCTION

1. Institutional Training being conducted in the Colleges and Schools is the principal means of training in the NCC. The aim of the training is to nurture core values, enhance awareness and give exposure to basic military skills and knowledge. Emphasis will be on practical training. Case studies, wherever possible will be used to facilitate active participation and better assimilation. Examples from India's freedom struggle and wars fought by India, post-independence, should supplement relevant subjects to generate secular and patriotic fervor. The instructors and the cadets must grasp the importance of this training and participate actively.

2. **Principles of Training:** In keeping with the changing environment, the principles of NCC Training are:
   (a) Junior Division (JD)/Junior Wing (JW) to be for two years while Senior Division (SD)/Senior Wing (SW) will be for three years.
   (b) Separate syllabi for JD/JW and SD/SW.
   (c) Modified, syllabus for professional educational institutes of repute to encourage enrolment of cadets.
   (d) Revised curriculum for training in a military environment with greater emphasis on soft skill development, awareness of social responsibilities and adventure and sports.
   (e) Uniformity in syllabus for boys and girls.
   (f) Common syllabus for all three wings to be approximately 60 to 70% and Specialised Service Syllabus training will be 30 to 40%.
   (g) Emphasis on practical training.
   (h) Conduct of periodic composite training ensuring continuity for better learning assimilation and its application.

3. Common subjects will comprise about 70% of the periods and Specilalised Service Subjects will be 30%. The breakdown of periods are as under:-

Sr. No.	Subject	No. of Periods			
		First Year	Second Year	Third Year	Total
Senior Division/Wing					
(a)	Common Subject	66	72	72	210
(b)	Specilised Subject	24	33	33	90
	Total	**90**	**105**	**105**	**300**

Junior Division/Wing

(c)	Common Subject	85	85		170
				--NA—	
(d)	Specialised Subject	35	35		70
	Total	**120**	**120**		**240**

4. In addition to this syllabus, **State Directorates** will conduct Social Service Activities in the form of rallies of any nature to carry social messages in the form of posters, street plays, placards etc.

Legend	
Abbreviation	Type
L	Lecture
D	Demonstration
DI	Discussion
P	Practice
V	Video

BLOCK SYLLABUS

COMMON SUBJECTS: SD/SW (ALL WINGS)

Sr. No.	Subject	1st Year	2nd Year	3rd Year	Total Periods
1.	The NCC	03	00	00	03
2.	National Integration and Awareness	06	06	06	18
3.	Drill	16	19	08	43
4.	Weapon Training	12	10	10	32
5.	Personality Development & Leadership	10	15	20	45
6.	Disaster Management	03	03	04	10
7.	Social Awareness & Community Development	05	05	06	16
8.	Health & Hygiene	05	04	07	16
9.	Adventure	02	06	07	15
10.	Environment Awareness and Conservation	02	02	02	06
11.	Obstacle Training	02	02	02	06
Total		**66**	**72**	**72**	**210**

BLOCK SYLLABUS

SPECIALISED SUBJECTS: SD/SW (ARMY)

Sr. No.	Subject	1st Year	2nd Year	3rd Year	Total Periods
1.	Armed Forces	04	04	02	10
2.	Map Reading	07	08	09	24
3.	Field Craft & Battle Craft	05	07	09	21
4.	Introduction to infantry Weapons & Equipment	02	04	05	11
5.	Military History	03	05	05	13
6.	Communication	03	05	03	11
Total		**24**	**33**	**33**	**90**

BLOCK SYLLABUS

SPECIALISED SUBJECTS: SD/SW (AIR)

Sr. No.	Subject	1st Year	2nd Year	3rd Year	Total Periods
1.	General Service Knowledge	02	02	02	06
2.	Air Compaigns	00	02	04	06
3.	Aircraft Recognition	00	04	00	04
4.	Modern Trends	00	00	02	02
5.	Principles of Flight	03	04	03	10
6.	Airmanship	06	02	02	10
7.	Navigation	00	03	02	05
8.	Meteorology	00	01	04	05
9.	Aero-Engines	01	04	01	06
10.	Airframes	02	02	02	06
11.	Instruments	02	03	02	07
12.	Aircraft Particulars	02	00	00	02
13.	Aeromodelling	06	06	09	21
Total		**24**	**33**	**33**	**90**

BLOCK SYLLABUS

SPECIALISED SUBJECTS: SD/SW (NAVY)

Sr. No.	Subject	1st Year	2nd Year	3rd Year	Total Periods
1.	Naval Orientation	08	06	03	17
2.	Naval Warfare and its Components	00	04	03	07
3.	Naval Communication	03	04	01	08
4.	Navigation	00	06	03	09
5.	Searmanship				
	(a) Anchor Work	01	01	00	02
	(b) Rigging	03	00	00	03
	(c) Boat Work	04	05	01	10
6.	Fire Fighting, Flodding and Damage Control	00	02	02	04
7.	Ship and Boat Modelling	02	03	14	19
8.	Search and Rescue	01	00	01	02
9.	Swimming	01	03	05	09
Total		**24**	**33**	**33**	**90**

Syllabus and Evaluation Scheme of Physical Education & Sports Compulsory for up to B.Tech 6th Semester Students

Course Code: SWNC101	L	T/P	C
Course Title: Sports	0	4	2

Course Objective

Physical Education and Sports develop confidence, contributing to academic performance and mental health. Physical activity is a great way to relieve stress, promoting positive physical and mental health and enhanced learning aptitude. The class duration of 90 minutes will be divided into 02 segments comprising of Units 1 and 2.

- First 30 minutes of the class will be an interactive session where the students will be oriented and introduced to the different aspects of Physical Education and Sports.
- In the next 60 minutes of the class every students shall practice different skills and techniques of Athletics comprising of Track and Field events or any other specific games/sports of their choice.

Syllabus

Unit 1

Introduction to Physical Education

- Meaning & definition of Physical Education
- Aims & Objectives of Physical Education

Sports awards and honours

- Awards and Honours in the field of Sports in India (Dronacharya Award, Arjuna Award, Dhayanchand Award, Rajiv Gandhi Khel Ratna Award etc.)

Olympic Movement

- Ancient & Modern Olympics (Summer & Winter)
- Olympic Symbols, Ideals, Objectives & Values

Physical Fitness, Wellness & Lifestyle

- Meaning & Importance of Physical Fitness
- Components of Physical fitness
- Components of Health related fitness Meaning & Importance of Wellness, Components of wellness
- Preventing Health Threats through Lifestyle Change
- Concept of Positive Lifestyle: Importance of Balance Diet etc.

Fundamentals of Anatomy & Physiology in Physical Education and Sports

- Define Anatomy, Physiology & Its Importance
- Effect of exercise on the functioning of Various Body Systems. (Circulatory System, Respiratory System, Neuro-Muscular System etc.)

Kinesiology, Biomechanics & Sports

- Meaning & Importance of Kinesiology & Biomechanics in Physical Edu. & Sports
- Biomechanical principles & its application in sports. (Laws of motion, Friction, Projectile etc.)

Postures

- Meaning and Concept of Postures.
- Causes of Bad Posture.
- Advantages & disadvantages of weight training.

- Concept & advantages of Correct Posture. Common Postural Deformities – Knock Knee; Flat Foot; Round Shoulders; Lordosis, Kyphosis, Bow Legs and Scoliosis, Corrective Measures for Postural Deformities

Training and Planning in Sports

- Meaning of Training
- Warming up and limbering down
- Skill, Technique & Style

Psychology & Sports

- Definition & Importance of Psychology in Physical Edu. & Sports
- Define & Differentiate Between Growth & Development
- Adolescent Problems & Their Management
- Emotion: Concept, Type & Controlling of emotions
- Meaning, Concept & Types of Aggressions in Sports.

Doping

- Meaning and Concept of Doping
- Prohibited Substances & Methods
- Side Effects of Prohibited Substances

Sports Medicine

- First Aid – Definition, Aims & Objectives.
- Sports injuries: Classification, Causes & Prevention and Management of Injuries: Soft Tissue Injuries and Bone & Joint Injuries

Unit-2

(Practical-Sports Specific) Each student has to compulsorily opt for one game/sport so that he/she can be assessed on their performance in the same accordingly for all the 03 years.

Each student will be given practical knowledge about the basic fundamentals of various games and sports and Athletic Events be it Track or Field thereby developing the skill.

Following sub topics related to any one Game/Sport of choice of student out of: Athletics, Badminton, Basketball, Chess, Cricket, Kabaddi, Lawn Tennis, Swimming, Table Tennis, Volleyball etc.

1. History of the Game/Sport.
2. Latest General Rules of the Game/Sport.
3. Specifications of Play Fields and Related Sports Equipment.
4. Important Tournaments and Venues.
5. Sports Personalities.
6. Proper Sports Gear and its Importance

REFERENCE BOOKS:

1. Modern Trends and Physical Education by Prof. Ajmer Singh.
2. Health and Physical Education – NCERT

Distribution of Marks: Total 100 (10+30+20+40)

1. Class Attendance / Punctuality –	10 marks
2. Active Participation Sports Related Activities - (CITIUS, RUN FOR Unity, Prabhat Pheri etc.)	30 marks
3. Viva/Subject Knowledge-	20 marks
4. Practical Exam at the end of 6th Sem (Modified Fitness Test)-	40 marks

Note – PWD Students will be exempted from taking part in physical activities and the Modified Physical Fitness Test.

Syllabus and Evaluation Scheme of Yog
Compulsory for up to B.Tech 6th Semester Students

Course Code: SWNC101	**L**	**T/P**	**C**
Course Title: Yoga	**0**	**4**	**2**

Introduction: Yog education in Institute can immensely contribute to health of children by disseminating knowledge and awareness about the value of health, inculcating and nurturing health promoting habits and life style.

Objectives of the course:

- To enable the student to have good physical and mental health.
- To improve cognitive ability.
- To improve the level of consciousness.

UNIT-I

Introduction to Yog

- Brief introduction to origin of Yog, Psychological aspects leading to origin of Yog, Hindu Mythological concepts about origin of Yog
- History and Development of Yog
- Etymology and Definitions of Yog, Aim and Objectives of Yog, Misconceptions about Yog, True Nature of Yog
- General Introduction to Schools of Yog
- Principles of Yog, Yog Practices for Health and Harmony

UNIT-II

Yog and You

- **Concept of Health-** Aahaar, Nidra, Bharmacharaya, Viyayaam.
- **Aarogya -** Prevention, Cure and Remedies.
- Life Management and Development.

UNIT-III

Yog for Health Promotion –

- Brief introduction to human body
- Role of yog for health promotion
- Yogic attitudes and practices
- Holistic approach of yog towards the health and diseases
- Introduction to yog diet and its relevance and importance in yog Sadhana
- Dincharya and Ritucharya with respect of yogic lifestyle

UNIT-IV

Yog as Preventive measure for Lifestyle Disease

- **Obesity:** Procedure, Benefits & Contraindications for Tadasana, Katichakrasana, Pavanmuktasana, Matsayasana, Halasana, Pachimottansana, Ardha – Matsyendrasana, Dhanurasana, Ushtrasana, Suryabedhan pranayama.
- **Diabetes:** Procedure, Benefits & Contraindications for Katichakrasana, Pavanmuktasana,Bhujangasana, Shalabhasana, Dhanurasana, Supta-vajarasana, Paschimottanasana, Ardha-Mastendrasana, Mandukasana, Gomukasana, Yogmudra, Ushtrasana, Kapalabhati.
- **Asthma:** Procedure, Benefits & Contraindications for Tadasana, Urdhwahastottansana, UttanMandukasana, Bhujangasana, Dhanurasana, Ushtrasana, Vakrasana, Kapalbhati, Gomukhasana Matsyaasana, Anuloma-Viloma.
- **Hypertension:** Procedure, Benefits & Contraindications for Tadasana, Katichakransan, Uttanpadasana, Ardha Halasana, Sarala Matyasana, Gomukhasana, UttanMandukasana, Vakrasana, Bhujangasana, Makarasana, Shavasana, Nadishodhanapranayam, Sitlipranayam.

UNIT-V (Yogic Practice)

1. YOGIC SUKSMA VYAYAMA

Uccharana-sthalatatha Vishudha-chakra-shuddhi (for throat and voice)
Prarthana (Prayer)
Buddhi-tatha-dhritishakti-vikasaka (for developing will power)
Smaranashakti-vikasaka (for improving the memory)
Medhashakti-vikasaka (for improving the intellect and memory)
Netrashakti-vikasaka (for the eyes)
Kapolashakti-vardhaka (for the cheeks)
Karnashakti-vardhaka (for the ears)
Grivashakti-vikasaka (for the Neck)
Grivashakti-vikasaka (for the Neck)
Grivashakti-vikasaka (for the Neck)
Skandha-tatha-bahu-mulashakti-vikasaka (for the shoulders)
Bhuja-bandhashakti-vikasaka
Kohinishakti-vikasaka
Bhuja-vallishakti-vikasaka
Purna-bhujashakti-vikasaka (for the arms)
Mani-bandhashakti-vikasaka
Kara-prsthashakti-vikasaka
Kara-talashakti-vikasaka
Anguli-mulashakti-vikasaka (for the fingers)
Anguli- shakti-vikasaka (for the fingers)
Vaksa-sthalashakti-vikasaka (for the chest)
Vaksa-sthalashakti-vikasaka (for the chest)
Udarashakti-vikasaka (for the abdomen)
Udarashakti-vikasaka (for the abdomen)
Udarasakti-vikasaka (for the abdomen)
Udarashakti-vikasaka (for the abdomen)
Udarashakti-vikasaka (for the abdomen)
Udarashakti-vikasaka (for the abdomen)
Udarashakti-vikasaka (for the abdomen)
Udarashakti-vikasaka (for the abdomen)
Udarashakti-vikasaka (for the abdomen)
Udarashakti-vikasaka (for the abdomen)
Kati shakti-vikasaka (for the waist)
Kati shakti-vikasaka (for the waist)
Kati shakti-vikasaka (for the waist)
Kati shakti-vikasaka (for the waist)
Kati shakti-vikasaka (for the waist)
Muladhara-chakra-suddhi (for the rectum)
Upasthatatha-svadhisthana-chakra-suddhi (for the genital organs)
Kundalinishakti-vikasaka (for the kundalini)
Janghashakti-vikasaka (for the thighs)
Janghashakti-vikasaka (for the thighs)
Janushakti-vikasaka (for the knees)
Pindalishakti-vikasaka (for the calves)
Pada-mulashakti-vikasaka
Gulpha-pada-pristha-pada-tala-shakti-vikasaka (for the ankles and the feet)
Padangulishakti-vikasaka (for the toes)

2. YOGSANA (Sitting Postures)

Dandasana, Swastikasana, Padmasana,Vajrasana, Supta Vajrasana**,** Kagasana, Utkatasana, Gomukhasana,Ushtrasana, Shashankasana, Janusirasana, Paschimottanasana, Bhramacharyasana, Mandukasana, Utthana Mandukasana, Vakrasana, Ardha Matsyendrasana, Marichayasana, Simhasana

3. YOGSANA (Supine lying Postures)

Pavanamuktasan, Utthana-padasana, Ardha Halasana, Halasana, Setubandha Sarvangasana, Sarvangasana, Matsyasana, Chakrasana, Shavasana

4. YOGSANA (Prone lying Postures)

Makarasana, Bhujangasana, Shalabhasana, Dhanurasana, Kapotasana, Raja Kapotasana

5. PRANAYAMA (with Antar & Bahya Kumbhaka)

Surya-bhedi and Chandra-bhedi Pranayama, Ujjayi Pranayama, Sheetali Pranayama, Shitkari Pranayama, Bhastrika Pranayama

6. BANDHA

Jivha Bandha, Jalandhara Bandha, Uddiyana Bandha, Mula Bandha, Maha Bandha, Tri Bandha

7. PRACTICES LEADING TO MEDITATION

Ajapa Dharana, Yog Nidra, Practices leading to Breath Meditation, Practices leading to Om Meditation

8. YOGSANA

Siddhasana, Bhadrasana, Baddha Padmasana, Uttitha Padmasana, Bhunamanasana, Hanumanasana, Bakasana, Kukkutasana, Garbhasana, Matsyendrasana, Marjariasana, Padangusthasana, Hastapadangusthasana, Garudasana, Vatayanasana, Natarajasana, Mayurasana, Padma Mayurasana, Sirshasana and its variations, Ekapada and Dwipada Kandarasana

9. **MUDRAS**

Yog Mudra, Maha Mudra, Shanmukhi Mudra, Shambhavi Mudra, Kaki Mudra, Tadagi Mudra, Vipareet Karni Mudra, Simha Mudra

Distribution of Marks: Total 100 (10+30+20+40)

1. Class Attendance / Punctuality – 10 marks
2. Active Participation in Sports Related Activities - 30 marks
3. Viva/Subject Knowledge- 20 marks
4. End Semester Practical Exam (Yogic Practice)- 40 marks

National Service Scheme (NSS)

Course Title: NCC/NSS/Yoga | Course Code: SWNC102;

LTP: 002 | Credit: 1 (Semester 1 to 6)

Overall Objective:

Development of Student's personality through community service.

Aims & Objective of NSS:

i. To understand the community in which they work.

ii. To understand themselves in relation to their community.

iii. To identify the needs and problems of the community and involve them in a problem-solving process.

iv. To develop among themselves a sense of social and civic responsibility.

v. To utilize their knowledge in finding practical solutions to individual and community problems.

vi. To develop the competence required for group living and sharing responsibilities.

vii. To gain skills in mobilizing community participation.

viii. To acquire leadership qualities and a democratic attitude.

ix. To develop capacity to meet emergencies and natural disasters.

Joining NSS:

Simply by enrolling/registering yourself in the NSS unit through the NSS Programme Coordinator/Officer concerned.

Guidelines for Evaluating NSS Students

Curriculum's 1-credit Course (Semester 1 to 6)

For the curriculum's credit award to students under NSS, the following procedure will be adopted:

Students should engage in various NSS activities (listed in Annexure-1) for at least 240 hours in three years (minimum 40 Hrs/semester).

The attendance records of students will be maintained by their unit's respective Programme Officer.

A student who participates in different activities of NSS during the 1st to 6th semester then he/she will earn certain hours per activity depending upon his/her role and responsibilities carried out by the volunteer as per the following rules:

S.No.	Role	No. of Hours
1	Audience	Upto 5 Hours
2	Active Participation	Upto 7 Hours
3	Organizer	Upto 10 Hours

Distribution of Marks: Total 100 (20+20+20+40)

Class Attendance: 20

Discipline & Punctuality: 20

Event Knowledge: 20

Comprehensive Viva (for all activities held during the entire semester): 40

Annexure-1 (Tentative NSS Activities Planned for an Academic Year)

Activities
Vanmohotsava Week (5-7 days) (Environment Enrichment & Tree Plantation) (Nearby places like public institutions, adopted villages/slum areas, and wasteland and other such activities)
Disaster Management (Workshops, awareness camps for Relief and rescue work inoculation and immunization, distribution of medicines, essential goods)
Adopted village (visiting some nearby villages and deciding 2-3 villages to be adopted for literacy promotion and basic facilities like drinking water, pucca/kutchha road, school shed/buildings, cooperative/self-employment scheme, etc.)
Independence Day (Participation in the college celebration)
Literacy Week (Pledge-taking ceremony, Visit to adopted village/slum to organize dialogue and discussion, Putting up hoardings and banners at prominent places in the local area)
Health Service & Awareness (Integrated Child Development Programme, Health Education, HIV/AIDS Awareness Programme, Motivating parents to send children to school and other such activities)
"**Annual NSS Day Celebrations**" of NSS
Digital Transactions Awareness Programs (“Startup India – Stand up India”)
Blood Donation Camp in collaboration with NITKAA
Autumn Camp (**4-6 days)** in a nearby village (Youth for Sustainable Development with a focus on Watershed Management & Wasteland Development or some other theme)
Gandhi Jayanti (Quiz competition, Speech, Communal Harmony DAY, and other such activities)

Quami Ekta Week (National Integration Day, Welfare of Minorities Day, Cultural Unity Day, Women's Day, Conservation Day)
Swachhta Pakhwada (various activities like cleanliness campaigns in campus, locality, road safety, and other such activities engaging GOI Ministries/Departments initiatives)
Legal Literacy-Social Justice (Lecture by relevant person and other activities
World AIDS Day (creating awareness among school and college-going students, organizing lectures, public discussions, film shows, rallies and street plays)
Energy Conservation Day (awareness programme and other activities
National Youth Week (Lectures/Symposia on the philosophy and teaching of Swami Vivekanand, Mahatma Gandhi; Debate on the role of youth in the contemporary situation; Essay/drawing competitions amongst youth)
Republic Day (Participation in the college celebration)
Nasha Mukti Abhiyan (Awareness on the part of Tobacco Free Society; campaigns, posters, programmes in Hostels)
Women's Week (Special programmes regarding the significant role of women and girl child; Prominent women leaders lectures; awareness programmes and other such activities)
National Safety Day/ Week (Activities based on a theme provided by National Safety Council (GOI))
Life Skills and Vocational Training Programmes (Industry professional for lectures, competitions and other such activities)
Career Guidance (For college students through prominent speakers; NSS volunteers going to schools to provide guidance to 9-12th students and other such activities)
Environment Enrichment & Climate Change (Special programmes like lectures, campaigns, posters and other such activities)
World Bicycle Day Celebration
Other Activities: Activities suggested by Institute, State NSS Unit, MHRD, GOI Ministries etc.

Guidelines for evaluation of student activities under Students Clubs
(1st to 6th Semester: 02 credit)

The Students Clubs provide facilities and the right environment to develop extra-curricular skills in the students, in addition to the academic knowledge imparted by the Institute. Twelve (12) different clubs are working under Students Clubs which organized various events (workshops, guest lecturers etc.) and competitions, to instil the spirit of healthy competition among students, throughout the year. A national level mega cultural festival under the name CONFLUENCE is organized every year. Students can earn course credit by participating in various events organised by the student's club and assisting in coordinating these events as a member of these clubs.

For the credit award to students under students club, following is recommended:

1. Students must engage in club activities for 240 hours in three years (40 hours in one semester).
2. The evaluation criterion and activity hours will be calculated as follows:

SNo	Evaluation Criterion	Number of hours credited	Distribution of Max Marks 100 (Weightage 80%)
1.	Participation as an Audience	0.5 hour* number of event hours	--
2.	Participation as an Performer	(a) 06 hours for full day activity (b) 03 hours for half day activity	10 05
3.	Prize/Award/Recognition (intra - college events)	05 hours	20
4.	Prize/Award/Recognition (inter - college events)	10 hours	30
5.	Organization of event	(a) 12 hours for full day activity (b) 06 hours for half day activity	20 10
6.	Sponsorship Note: Number of hours will be equally divided among students involved where minimum Rs. 25,000/- per students must be ensured.	(a) 15 hours for sponsorship upto 01 Lakh (b) 30 hours for sponsorship upto 05 Lakh (c) 40 hours for sponsorship more than 05 Lakh	(a) 15 (b) 30 (c) 40 Note: Marks will be divided equally in team members, if any

3. The comprehensive viva-voce (**Weightage 20%**) will be conducted at the end of every semester.
4. Documents required as proof:

a. **Participation**: A certificate of participation duly signed by the organizing club's faculty-in-charge. All clubs will maintain a record of certificates issued for verification.
b. **Prize/Reward/Recognition**: A Certificate of Merit/Letter of Appreciation duly signed by Head of the Institute/Dean (SW)/Professor-in-charge of Students Club.
c. **Organization**: A Certificate of Appreciation mentioning event's name and committee's name in which the student contributed.
d. **Sponsorship**: A letter of sponsorship from sponsoring organization mention amount and list of students involved in sponsorship effort. The amount will be equally divided among the students for award of hours and marks as per criterion 6.

Note:

1. Faculty in charges of the individual clubs must ensure at least 40 hours of activities per semester and must keep the record of number of hours for each and every student involved/ registered for clubs.
2. Further, workload of two (02) hours per week should be included as teaching load for faculty in-charges (FIC) and Professor In-charges (PIC) in order to ensure smooth conduct of activities of the clubs.
3. It is recommended to make provision for earned leave for organising events in non-working days.

Guidelines for evaluation of student activities under Technical Societies
(Semester 1st to 6th: 240 hrs.: 1 credit)

There are 12 societies/clubs currently under technical societies which conduct various events (competitions, workshops, guest lectures, meetings etc.) throughout the year and one major event TECHSPARDHA, the annual technical festival is conducted once a year. Each of this society/club is headed by a team of students usually from final year of their programme under the guidance of a faculty-in-charge.

Under new curriculum for B. Tech students, the activities of all technical societies/clubs are to be considered as an audit course. The credit for this course will be awarded at the end of 6th semester.

Students can earn course credit by participating in various events organised by the technical societies and help in coordinating these events as a member of these societies/clubs. The selected heads of societies/clubs under supervision of faculty-in-charge will ensure that each member is engaged in the activities of society/club for at least 40 hours in each semester (240 hours in 6 semesters) to fulfil the requirement of award of credits

At the end of sixth semester the evaluation of student will be carried by a committee of faculty-in-charges of the technical societies. They will be awarded points on following criterion:

Sr. No.	Criterion	Semester I and II (max 20 marks)	Semester III and IV (max 30 marks)	Semester V and VI (max 50 marks)
1.	Participation	1/event	1.5/event	2/event
2.	Prize/Award/ Recognition (intra-college events)	2/event	3/event	4/event
3.	Prize/Award/ Recognition (inter-college events)	4/event	6/event	8/event
4.	Organization	4/event	6/event	8/event
5.	Sponsorship	4/ (Rs10K worth of sponsorship individually)	6/ (Rs20K worth of sponsorship individually)	8/ (Rs40K worth of sponsorship individually)

The committee will duly verify the credentials of each candidate and award marks on above criterion. Student will be awarded a grade as per institute norms.

Documents required as proof:

a. Participation: A certificate of participation duly signed by the organizing club's faculty-in-charge. All societies/clubs to maintain a record of certificates issued for verification.
b. Prize/Reward/Recognition: A Certificate of Merit/Letter of Appreciation duly signed by Head of the Institute/Dean(R&C)/Professor-in-charge of Technical Societies.
c. Organization: A Certificate of Appreciation mentioning event's name and committee's name in which the student contributed, duly signed by the faculty-in-charge of the organizing club.
d. Sponsorship: A letter of sponsorship from sponsoring organization mention amount and list of students involved in sponsorship effort. The amount will be equally divided among the students for award of marks as per criterion 5.

Bearing in mind that the activities of clubs/societies are a part of curriculum now, following recommendation may kindly be considered:

1. Adequate space may be allocated to each society/club for conducting meeting, storing materials and equipment and keeping records.
2. Adequate staff and office space be provided to professor-in-charge (Technical Societies) keep track of purchases, maintain accounts and records and secretarial assistance.
3. An engagement of one hour per week in the load of faculty-in-charge be shown in timetable to compensate for time devoted to the activities of club/societies.

Course Code MAIC 202	Applied Numerical and Statistical Methods (For CE)	L - T - P - C 3 - 0 - 0 - 3

Pre-Requisites: MAIC 102

Course Objectives:

1. To understand the importance of computer oriented numerical methods and statistical concepts for analyzing problems that arise in engineering and sciences.
2. To learn numerical differentiation and integration.
3. To learn to solve ODEs numerically.
4. To learn about Statistical Methods and Testing Hypothesis.
5. To get introduced to the Linear Programming Problems.

Unit 1: 8L

Numerical Solution of Nonlinear Equations: General itera- tive method, Secant method, Newton - Raphson method, Non-linear equations, Solution of system of equations, generalized Newton's method (roots of equation-solution of system of equations), Rateof convergence, Gauss-Seidel method for system of linear equations, convergence criterion, Positive definiteness of a matrix, Spectral ra- dius of a matrix, Tridiagonal system of equations, Thomas algorithm.

Unit 2: 8L

Numerical Differentiation and Integration: Interpolation, Fi- nite Differences- Newton's formulae for interpolation, Lagrange inter-polation, numerical differentiation, Maxima and Minima for tab-ulated values, Numerical integration: Trapezoidal rule, Simpsons 1/3rd and 3/8th rules, Gaussian Quadrature Rule.

Unit 3: 8L

Numerical Solutions of Ordinary Differential Equations: Pi- card method, Euler method, Modified Euler method, Runge-Kutta method of fourth order, Systems of equations and higher order equa- tions, Milne's predictor corrector method, Finite difference method for Boundary value problem.

Unit 4: 8L

Statistical Methods: Distributions: Binomial and Poisson distri- butions, Normal distribution Testing of hypothesis: Large sample tests- Procedure of testing hypothesis, Small sample tests, Student's T-test, Chi-Square test, Independence of attributes and goodness of fit.

Unit 5: 8L

Linear Programming Problems: Linear Programming Problems, Formulation, Graphical Method, Simplex method and Dual Simplexmethod.

Text Books:

1. M.K. Jain, S.R. lyengar and R.K. Jain, Numerical Methods for Scientific and Engineering, New Age International Ltd., 5th Edi-tion, 2010.

2. Paras Ram, Engineering Mathematics through Applications, 2nd Edition, CBS Publishers, 2015.

Reference Books:

1. Erwin Kreyszig, Advanced Engineering Mathematics, 8th Edition, Johan Wiley & Sons, Wiley Student Edison, 2011.
2. Steven C. Chapra and R. P. Canale, Numerical Methods for Engineers with Programming and Software Applications, 3rd Edition, Tata McGraw Hill, 2001.
3. Ronald E. Walpole, Raymond H. Myers, Sharon L. Myers, Key- ing Ye, Probability and Statistics for Engineers and Scientists, Prentice Hall, 9th Edition, 2012.
4. S D. Sharma, Operations Research Theory, Methods and Appli- cations, Publisher Kedar Nath Ram Nath, 18th Edition, 2017.

Course Outcomes:

By the end of the course, students should be able

CO1	To give numerical solution of Non-linear equations.
CO2	To numerically integrate and differentiate functions of one variable.
CO3	To provide numerical solution of Ordinary Differential Equations using one step and multi-step methods.
CO4	To understand the concepts and results in regression models, testing samples using Normal, t and X^2 distributions.

CEPC208 Soil Mechanics

Pre-requisite: Engineering Mechanics

L	T	P/D	Credits	Total contact hours
3	0	0	3	3

Brief description of the course: The course is designed to provide students with the knowledge of various properties of soils that govern engineering design as construction material and as supporting medium.

Course Content:

Unit-I **(10 hrs)**

Soil formation and composition: Introduction, soil and rock, Soil Mechanics and Foundation Engineering, origin of soils, weathering, soil formation, major soil deposits of India, particle size, particle shape, interparticle forces, soil structure, principal clay minerals.

Basic soil properties: Introduction, three phase system, weight-volume relationships, soil grain properties, soil aggregate properties, grain size analysis, grain size distribution curves, consistency limits and their determination, activity of clays, relative density of sands, classification of soils, plasticity chart, Indian Standard Classification System.

Unit-II **(8 hrs)**

Effective stress concept: Principle of effective stress, effective stress under hydrostatic conditions, capillary rise in soils, effective stress in the zone of capillary rise, effective stress under steady state hydro-dynamic conditions.

Permeability of soils: Introduction, Darcy's law and its validity, discharge velocity and seepage velocity, factors affecting permeability, laboratory determination of coefficient of permeability, determination of field permeability, permeability of stratified deposits.

Seepage through soils: Seepage force, quick condition, critical hydraulic gradient, two-dimensional flow, Laplace's equation, properties and utilities of flownet, graphical method of construction of flownets for isotropic soils, piping, protective filter.

Unit-III **(5 hrs)**

Compaction: Introduction, role of moisture and compactive effect in compaction, laboratory determination of compaction parameters, moisture density relationship, compaction in field, compaction of cohesionless soils, moderately cohesive soils and clays, field control of compaction.

Vertical stress below applied loads: Introduction, Boussinesq's equation, vertical stress distribution diagrams, vertical stress beneath loaded areas, Newmark's influence chart, approximate stress distribution methods for loaded areas, Westergaard's analysis, contact pressure.

Unit-IV **(13 hrs)**

Compressibility and Consolidation: Introduction, components of total settlement, consolidation process, one-dimensional consolidation test, typical void ratio-pressure relationships for sands and clays, normally consolidated and over consolidated clays, Casagrande's graphical method of estimating pre-consolidation pressure, Terzaghi's theory of one-dimensional primary consolidation, determination of coefficients of consolidation, consolidation settlement, secondary consolidation.

Shear Strength: Introduction, Mohr stress circle, Mohr-Coulomb failure-criterion, relationship between principal stresses at failure, shear tests, direct shear test, unconfined compression test, triaxial compression tests, drainage conditions and strength parameters, vane shear test, shear strength characteristics of sands, normally consolidated clays, over-consolidated clays and partially saturated soils, sensitivity and thixotropy.

Note: The focus of concluding lectures should be to emphasize the value addition of the subject and also on how it impacts the environment. Further, the faculty may suggest possible

sustainable solutions/emerging technologies/innovations towards sustainability in the subject domain.

Text Books/Reference:

1. Basic and Applied Soil Mechanics by Gopal Ranjan and A S R Rao
2. Soil Engineering in Theory and Practice, Vol. I, Fundamentals and General Principles by Alam Singh
3. Principles of Geotechnical Engineering by B M Das
4. Soil Mechanics and Foundations by Muni Budhu
5. Text Book of Soil Mechanics and Foundation Engineering by V N S Murthy

Course Outcomes:

On completion of the course, the students shall be able to:

CO1 Determine index properties of soil and classify the soils.
CO2 Understand permeability of soils and calculate effective stress in the soil.
CO3 Understand mechanism of compaction and consolidation of soils.
CO4 Estimate soil design parameters for shear strength assessment.

CEPC209 Fluid Mechanics - II

Pre-requisite: Fluid Mechanics - I

L	T	P/D	Credits	Total contact hours
3	0	0	3	3

Brief description of the course: It helps to analyse fluid flow phenomena observed in Civil Engineering systems such as flow in a pipes and open channel hydraulics. The selection of type of turbine required with reference to available head of water and estimated specific speed.

Course Content:

UNIT- I

Laminar Flow:
Navier Stoke's equation, Laminar flow between parallel plates, Couette flow, laminar flow through pipes-Hagen Poiseuille law, laminar flow around a sphere - Stokes' law. **(6 hrs)**

UNIT- II

Flow through pipes:
Types of flows-Reynold's experiment, shear stress on turbulent flow, boundary layer in pipes-Establishment of flow, velocity distribution for turbulent flow in smooth and rough pipes, resistance to flow of fluid in smooth and rough pipes, Stanton and Moody's diagram. Darcy-Weisbach equation, other energy losses in pipes, loss due to sudden expansion, hydraulic gradient and total energy lines, pipes in series and in parallel, equivalent pipe, branched pipe, pipe networks, Hardy Cross method, water hammer. **(8 hrs)**

UNIT- III

Open Channel Flow:
Type of flow in open channels, geometric parameters of channel section, uniform flow, most economical section (rectangular and trapezoidal), specific energy and critical depth, momentum in open channel, specific force, critical flow in rectangular channel, applications of specific energy and discharge diagrams to channel transition, metering flumes, hydraulic jump in rectangular channel, surges in open channels, positive and negative surges, gradually varied flow equation and its integration, surface profiles. **(9 hrs)**

UNIT- IV

Compressible flow:
Basic relationship of thermodynamics continuity, momentum and energy equations, propagation of elastic waves due to compression of fluid, Mach number and its significance, subsonic and supersonic flows, propagation of elastic wave due to disturbance in fluid mach cone, stagnation pressure. **(8 hrs)**

UNIT- V

Pumps and Turbines:
Reciprocating pumps, their types, work done by single and double acting pumps. Centrifugal pumps, components and parts and working, types, heads of a pump-statics and manometric heads, Force executed by fluid jet on stationary and moving flat vanes., Turbines-classifications of turbines based on head and specific speed, component and working of Pelton wheel and Francis turbines, cavitation and setting of turbines. **(9 hrs)**

Note: The focus of concluding lectures should be to emphasize the value addition of the subject and also on how it impacts the environment. Further, the faculty may suggest possible sustainable solutions/emerging technologies/innovations towards sustainability in the subject domain.

Text Books/Reference:

1 Hydraulics & Fluid Mechanics by P. N. Modi and S. M. Seth

2 Flow in Open Channels by S. Subraminayam
3 Ojha, C.S.P., Fluid Machinery and Applied Hydraulics, Oxford University Press, New Delhi.
4 Jagdish Lal, Hydraulics and Fluid Mechanics, Tata McGraw Hill
5 Streeter V.L., Fluid mechanics, Tata McGraw Hill

Course outcomes: Upon successful completion of the course, the students will be able to:

1. Understand the basic principles of fluid mechanics.
2. Visualize fluid flow phenomena observed in Civil Engineering systems such as flow in a pipe and open channel hydraulics.
3. Analyze fluid flows in open channel hydraulics and devices such as weirs and flumes.
4. Develops skills in analyzing fluid flows through the proper use of modeling and the application of the basic fluid-flow principles.
5. Acquire knowledge in the selection of type of turbine required with reference to available head of water and also used for identification of type of turbine with estimated specific speed.

CEPC210 Surveying - II

Pre-requisite: Surveying - I

L	T	P/D	Credits	Total contact hours
3	0	0	3	3

Brief description of the course:
This course will help students to understand the principle of surveying on very large scale by locating precise horizontal controls, to learn about surveying applications in setting out works. Students will also be able to understand the principal of absolute positioning using satellite measurements as well as learn about different types of errors in measurements and their adjustment. Finally, students will understand the principle of photogrammetry, remote sensing, and GIS.

Course Content:

Unit-I **(7 hrs)**

Triangulation and Trilateration: Triangulation systems, classification, strength of figure, selection of triangulation stations, grade of triangulation, field work of triangulation, triangulation computations, Trilateration- Principle, Methods, advantages and disadvantages. Modern Surveying Instruments Introduction, Electromagnetic distance measurement, Total station.
Survey layout/setting out: Introduction, controls for layout, examples of laying out
Numbering System of Indian Topographical Sheets

Unit-II **(5 hrs)**

Survey Adjustment and computations: Definitions, types of error, weight of an observation, law of weights, most probable values, principle of least squares, method of correlates, normal equation, adjustment of triangulation figures by method of least squares.

Unit-III **(12 hrs)**

Elements of Photogrammetry: Introduction, types of photographs, Terrestrial and aerial photographs, aerial, camera, scale and height displacements of vertical photographs, Stereoscopic vision and stereoscopes, height determination from parallax measurement, flight planning, principle of photo interpretation.
GNNS: Global Navigation Satellite System (GNSS): basic concepts, History of GPS, GPS design objectives and details of segments: space, control and user. Brief of different GPS systems, including, NAVSTAR GPS, GLONASS, GALILEO, IRNSS, BeiDou etc, Advantages and limitations of GPS. GPS Signal structure: Carriers frequencies, GPS codes: C/A, P, navigational message, GPS receiver: Types. Principles of GPS position fixing, Pseudo ranging and carrier phase, GPS errors.

Unit-IV **(12 hrs)**

Introduction to remote sensing: Definition of Remote Sensing, types of remote sensing, remote sensing system and components. EMR source and characteristics, active and passive remote sensing, EMR propagation through medium, Role of atmosphere, Atmospheric windows, EMR interaction with objects, Spectral signature, EMR interaction with vegetation, soil and water. Satellite orbits and platforms: Geostationary and sun synchronous satellites, Resolution, Applications of remote sensing in civil engineering.
Basic operations on satellite image including preprocessing (image rectification, enhancement, filtering etc.)
Geographical Information System (GIS): Definition and Objectives, Components of GIS, Spatial data models: Raster and Vector, Data inputting in GIS, Linkage between spatial and non-spatial data, Spatial data analysis: Vector and raster based spatial data analysis, Integration of RS and GIS data, Digital Elevation Model, GIS Software Packages.

Note: The focus of concluding lectures should be to emphasize the value addition of the subject and also on how it impacts the environment. Further, the faculty may suggest possible

sustainable solutions/emerging technologies/innovations towards sustainability in the subject domain.

Text Books/Reference:

Chang T K: Geographic Information Systems, Tata McGraw Hill
Punmia, B C: Surveying II and III, Luxmi Publications
Charles D Ghilani: Adjustment Computations: Spatial Data Analysis (Fifth Edition)
Paul R Wolf, Bon A DeWitt, Benjamin E. Wilkinson: Elements of Photogrammetry with Application in GIS, McGraw-Hill Education
G S Srivastava: An introduction to Geoinformatics
Basudeb Bhatta: Remote Sensing and GIS, OUP India
Ahmed El-Rabbany: Introduction to GPS: The Global Positioning System
Various Online resources including NPTEL

Course Outcomes:

Upon successful completion of the course, the students will be able to
CO1: Advanced methods of locating horizontal and vertical control controls including GPS
CO2: Set out various civil engineering structures
CO3: Learn about various sources of error and correction
CO4: Understand the use of aerial photograph for mapping
CO5: Understand the working of GIS and applications of remote sensing for various civil engineering applications

CEPC211 Structural Analysis - II

Pre-requisites: Engineering Mechanics, Structural Analysis-I

L	T	P/D	Credits	Total contact hours
3	0	0	3	3

Brief Description about the course:
This course has been designed for undergraduate (civil) engineering students or those interested in developing a deeper understanding of structural analysis concepts and methods. The course covers various methods and techniques used to analyze the behavior of structures under different loads. It includes topics like matrix method, Arches and more and provide examples demonstrating their applications. Journey through this course will help students to build the foundation for more advanced courses related to structural engineering. This course is essential for civil engineering students who want to enhance their understanding of structural analysis and design.

Course Content:

Unit-I Matrix Methods **[10]**

Flexibility and stiffness influence coefficients, Order of Indeterminacy – Flexibility and stiffness Matrix.

Flexibility Method: Basic principles - choice of redundants - released structure - application of determinate and indeterminate beams and frames

Unit-II Stiffness Method **[14]**

Concept of stiffness method - restrained structure - applications to determinate and indeterminate beams and frames

Unit-III Arches **[06]**

Three hinged Arches: Determination of horizontal thrust, bending moment, normal thrust and radial shear.

Two Hinged Arches: Determinations of horizontal thrust, bending moment, normal thrust and radial shear for parabolic and segmental shapes, effect of rib shortening - temperature effects - tied arches.

Unit-IV Suspension Cables **[06]**

Force in loaded cable and hanging cables - length of cables for different support conditions - simple suspension bridges with three hinged and two hinged stiffening girders - bending moments and shear force diagrams

Note: The focus of concluding lectures should be to emphasize the value addition of the subject and also on how it impacts the environment. Further, the faculty may suggest possible sustainable solutions/emerging technologies/innovations towards sustainability in the subject domain.

Text Books/Reference:

1. Jindal. R.L, Indeterminate Structures, Chan Tea, New Delhi, 2000
2. Punmia B.C., Theory of Structures, Standard Book House, New Delhi, 2000
3. Strength of Materials Part-I, S Timoshenko, Affiliated East-West Press, New Delhi
4. Mechanics of Materials, Popov Nagarjan & Lu, Prentice Hall of India, New Delhi
5. Mechanics of Solids, Prasad, V. S. Galgotia Pub., New Delhi.
6. Elementary Structural Analysis, Jain, A. K., Nem Chand & Bros, Roorkee.
7. Elementary Structural Analysis, Wibur & Nooris, McGraw Hill Book Co., New York.
8. Structural Analysis, Bhavikatti S S Vikas Pub.House,N.Delhi.
9. Advanced Structural Analysis, Devdas Menon, Narosa Publishers.
10. Structural Analysis: A Matrix Analysis, G S Pandit and S K Gupta, McGraw Hill.

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

CO1 Formulate Equilibrium and compatibility equations for structural members.
CO2 Analyze one dimensional and two-dimensional structures using matrix methods of structural analysis.
CO3 Analyze structures up to three degrees of indeterminacy.
CO4 Analyze cables and suspension bridges.

CEPC212 Soil Mechanics (P)

Pre-requisite: Soil Mechanics

L	T	P/D	Credits	Total contact hours
0	0	2	1	2

Brief description of the course: The course is designed to provide students skills for the determination of properties of soils that govern engineering design.

Course Content:

1. Visual Soil Classification, water content and specific gravity determination.
2. Grain size analysis - sieve analysis and sedimentation analysis.
3. Atterberg limits determination.
4. Relative Density of Granular Soils.
5. Field density by sand replacement method and core cutter method.
6. Proctor compaction test.
7. Coefficient of permeability of soils.
8. Unconfined compressive strength test.
9. Direct shear test on granular soil sample.
10. Unconsolidated undrained (UU) triaxial shear test of fine-grained soil sample.

Text Books/Reference:

1. Soil Testing for Engineers by S Prakash & P K Jain
2. Engineering Soil Testing by Lambe
3. Engineering Properties of Soils and Their Measurement by J E Bowles
4. Compendium of Indian Standards on Soil Engineering, SP: 36 (Part 1) - 1987, BIS

Course Outcomes:

On completion of the course, the students shall be able to:

CO1. Classify soil and can comment on its suitability for construction.
CO2. Estimate soil consistency, permeability and compaction characteristics.
CO3. Estimate soil design parameters for shear strength estimation.

CEPC213 Fluid Mechanics - II (P)

Pre-requisite: Fluid Mechanics - II

L	T	P/D	Credits	Total contact hours
0	0	2	1	2

Brief description of the course: It helps to understand the basic principles and application of fluid-flow and provide skills in visualize fluid flow phenomena observed in Civil Engineering systems such as flow in a pipe and open channel hydraulics.

Course Content:

1 To determine the coefficient of drag by Stoke's law for spherical bodies.
2 To study the phenomenon of cavitation in pipe flow.
3 To determine the critical Reynold's number for flow through commercial pipes.
4 To determine the coefficient of discharge for flow over a broad crested weir.
5 To study the characteristics of a hydraulic jump on a horizontal floor and sloping glacis including friction blocks.
6 To study the scouring phenomenon around a bridge pier model.
7 To study the scouring phenomenon for flow past a spur.
8 To determine the characteristics of a centrifugal pump.
9 To study the momentum characteristics of a given jet.
10 To determine head loss due to various pipe fittings.

Text Books/Reference:

1 Hydraulics & Fluid Mechanics by P. N. Modi and S. M. Seth
2 Singh, S. Experiments in Fluid Mechanics, PHI Learning, New Delhi.
3 Prakash, M.N.S., Experiments in Hydraulics and Hydraulic Machines: Theory and Procedures, PHI Learning, New Delhi.

Course outcomes: Upon successful completion of the course, the students will be able to:

1. Visualize fluid flow phenomena observed in Civil Engineering systems such as flow in a pipe and open channel hydraulics.
2. Develops skills in analyzing scouring phenomenon of fluid flows through the proper use of device such as weir and flumes.
3. Knowledge is useful for the design of open channels for rectangular channels for hydraulic jump phenomena.
4. determine the head loss in various pipe fittings.

CEPC214 Surveying - II (P)

Pre-requisite: Surveying - II

L	T	P/D	Credits	Total contact hours
0	0	3	1	3

Brief description of the course:
This course has been designed to impart students the knowledge in measuring distances and angles with electronic instruments, determining coordinates of a point, drawing contours and Maps and on the working of GIS and remote sensing software.

Course Content:

1. Study of Total Station
2. Measurements of distance, elevation, coordinate with total station
3. Measurement of Coordinates with the help of GPS
4. Plan and contour map with a total station and software (including AutoCAD)
5. Basic use of GIS software with a small digitization exercise (use of QGIS/ArcGIS)
6. Basic operation on remote sensing image using image processing software (ERDAS/ENVI/ ILWIS/SNAP)

Text Books/Reference:
Chang T K: Geographic Information Systems, Tata McGraw Hill
Punmia, B C: Surveying II and III, Luxmi Publications
Charles D Ghilani: Adjustment Computations: Spatial Data Analysis (Fifth Edition)
Paul R Wolf, Bon A DeWitt, Benjamin E. Wilkinson: Elements of Photogrammetry with Application in GIS, McGraw-Hill Education
G S Srivastava: An introduction to Geoinformatics
Basudeb Bhatta: Remote Sensing and GIS, OUP India
Ahmed El-Rabbany: Introduction to GPS: The Global Positioning System
Various Online resources including NPTEL

Course outcomes:
On completion of the course, the students will be able to:

CO1. Use a total station and GPS to measure distance, elevation and coordinates.
CO2. Use total station to plot a map of given area with softwares.
CO3. Will have basic knowledge of the use of remote sensing and GIS software.

CEPC215 Structural Analysis (P)

Pre-requisite: Structural Analysis-I

L	T	P/D	Credits	Total contact hours
0	0	2	1	2

Brief description of the course:
The course is designed to provide hands on session for verifying various methods of structural analysis. It will be helpful for understanding behavior of different structures.

Course Content

1. Verification of reciprocal theorem of deflection using a simply supported beam.
2. Verification of bending moment variation at the point of loading in a simply supported beam.
3. Verification of moment area theorems for slopes and deflections.
4. To plot influence line diagram for horizontal thrust in a 3 hinged arch.
5. To plot influence line diagram for horizontal thrust in a 2 hinged arch.
6. Experimental and analytical study of a 3 bar pin jointed Truss.
7. Experimental and analytical study of deflections for unsymmetrical bending of a Cantilever beam.
8. Elastic displacements (vertical & horizontal) of curved members.

Course Outcome: On completion of the course, the students shall be able to:

1. Understand experimentally reciprocal theorem of deflection and moment area theorems.
2. Visualise analysis of truss and curved members.
3. Analyse three hinge arches.
4. Understand bending of beams under different conditions of loadings.

CEPE201 Programme Elective - I (Computational Practical)

Pre-requisite: Knowledge of programming languages

L	T	P/D	Credits	Total contact hours
0	0	2	1	2

Brief description of the course: The course is designed to provide students with the knowledge of various programming languages and softwares in the field of civil engineering.

Course Content:

Solution of the following problems using MATLAB/C language/Excel/Python etc.

1. Design of the structural elements in concrete and steel.
2. Development of simple programs for solving problems related to civil engineering.
3. Learning of Optimisation techniques.
4. Introduction to various civil engineering software and analysis. Design and detailing using softwares.

Text Books/Reference:

1. Rajasekaran S, Computational Structural Mechanics, Prentice Hall of India, New Delhi, 2001.
2. Manickaselvam V.K., Elements of Matrix and Stability Analysis of Structures, Khanna Publishers, New Delhi, 1998.
3. Software Manuals (STAAD Pro, SAP, ETABS, Plaxis, Visual FEA, IITPave etc.)

Course outcomes:

On completion of the course, the students shall be able to:

1. Understand the need for software tools in analysis and design of Civil Engineering Systems.
2. Identify the available open-source software tools used for specific problems in Civil Engineering.
3. Use the latest software tools for Modeling, Analysis and Design of Civil Engineering Systems.
4. Apply the software/computing skills in Civil Engineering.