Zeal Education Society's

ZEAL COLLEGE OF ENGINEERING & RESEARCH, PUNE – 41

(An Autonomous Institute Affiliated to Savitribai Phule Pune University)

*NAAC Accredited with **A+** Grade / ISO 21001:2018*

DEPARTMENT OF CIVIL ENGINEERING

Curriculum Structure and Syllabus of

F.Y. B. Tech. – Civil Engineering

(With effect from - Academic Year 2024- 25)

VISION OF THE INSTITUTE

To be a premier institute in technical education by imparting academic excellence, research, social and entrepreneurial attitude**.**

MISSION OF THE INSTITUTE

- To achieve academic excellence through innovative teaching and learning process.
- To imbibe the research culture for addressing industry and societal needs.
- To inculcate social attitude through community engagement initiatives.
- To provide conducive environment for building the entrepreneurial skills.

DEPARTMENT OF CIVIL ENGINEERING

VISION:

To contribute to the field of Civil Engineering by focusing state of the art technical knowledge, promoting research, nurturing social responsibility and imparting entrepreneurial attitude.

MISSION:

M1: To strengthen academics with holistic teaching learning practices.
M2: To inculcate a research approach pertaining to the civil engineering domain.
M3: To foster students for the development of entrepreneurial skills.
M4: To nurture the sense of ethics, morality and social responsibility.

PROGRAM EDUCATIONAL OBJECTIVES (PEOs):

PEO1: Graduates will be proficient in critical thinking and problem solving based on a broad range of civil engineering technical areas.
PEO2: Graduates will be good decision makers with a blend of ethical, global, regional and local concerns, effective communication and leadership.
PEO3: Graduates will be able to contribute to society by civic engagement.
PEO4: Graduates will attain the pursuit of professional development and ever learning.

PROGRAM OUTCOMES (POs):

PO1: **Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO2: **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.
PO3: **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.
PO4: **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.
PO5: **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.

PO6: **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.

PO7: **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.

PO8: **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO9: **Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO10: **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.

PO11: **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.

PO12: **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.

PROGRAM SPECIFIC OUTCOMES (PSOs):

PSO1: Graduates will be able to develop the professional skills for analysing and designing of structural, geotechnical, transportation, environmental, irrigation and hydraulic systems to cater societal and /or industrial needs.

PSO2: Graduates will be able to apply the knowledge pertaining to surveying, construction and/or management, town planning, estimation, valuation and soft computing tools to solve real time problems related to civil engineering.

DEPARTMENT OF CIVIL ENGINEERING

LIST OF ABBREVIATIONS

Abbreviation	Description
BSC	Basic Science Course
ESC	Engineering Science Course
PCC	Programme Core Course
PEC	Programme Elective Course
MDM	Multidisciplinary Minor
OE	Open Elective - Other than a particular program
VSEC	Vocational and Skill Enhancement Course
AEC	Ability Enhancement Course
ENTR	Entrepreneurship
EC	Economics
MC	Management Courses
IKS	Indian Knowledge System
VEC	Value Education Courses
RM	Research Methodology
CEP	Community Engagement Project
FP	Field Project
PROJ	Project
INT	Internship
OJT	On Job Training
CC	Co-curricular Courses
HSSM	Humanities Social Science and Management
ELC	Experiential Learning Course
B. Tech	Bachelor of Technology
L	Lecture
P	Practical
T	Tutorial
H	Hours
CR	Credits
CIE	Continuous Internal Evaluation
ETE	End Term Evaluation
TH	Theory
Tut	Tutorial
TW	Term Work
OR	Oral
PR	Practical

DEPARTMENT OF CIVIL ENGINEERING

First Year B. Tech. – Civil Engineering: Semester - I

Course Code	Course Type	Course Name	Teaching Scheme (hrs/Week)							Evaluation Scheme (Marks)					
			L	P	T	H	CR			CIE	ETE	TW	PR	OR	Total
							TH	PR/Tut	Total						
CEBS101	BSC	Engineering Mathematics - I	3	-	-	3	3	-	3	40	60	-	-	-	100
CEBS102	BSC	Engineering Physics	2	2	-	4	2	1	3	40	60	25	-	-	125
CEES101	ESC	Basic Civil Engineering	3	2	-	5	3	1	4	40	60	50	-	-	150
CEES102	ESC	Engineering Geology and Materials in Construction	2	2	-	4	2	1	3	40	60	50	-	-	150
CEVS101	VSEC	Professional Practices in Building Planning and Drawing	-	4	-	4	-	2	2	-	-	25	-	25	50
CECC101	CC	Professional Development - I	-	4	-	4	-	2	2	-	-	50	-	-	50
CECC102	CC	Liberal Learning-I*	-	2	-	2	-	1	1	-	-	25	-	-	25
CEIK101	HSSM-IKS	Indian Knowledge System & Financial Literacy	2	-	-	2	2	-	2	-	-	50	-	-	50
Total			**12**	**16**	**-**	**28**	**12**	**08**	**20**	**160**	**240**	**275**	**-**	**25**	**700**

*** Liberal Learning – I: Choose any one from the following:**

Sr. No.	Course Code	Module	Sr. No.	Course Code	Module
1.	CECC102A	Guitar	6.	CECC102F	Basketball
2.	CECC102B	Singing	7.	CECC102G	Cricket
3.	CECC102C	Cinematography	8.	CECC102H	Rifle and Pistol Shooting
4.	CECC102D	Dance	9.	CECC102I	Volleyball
5.	CECC102E	Synthesizer	10.	CECC102J	Football

BoS Chairman

ZES's Zeal College of Engineering & Research, Dept. of Civil Engineering, Narhe, Pune-41

Director
ZES's Zeal College of Engineering & Research
Narhe, Pune - 411041.

DEPARTMENT OF CIVIL ENGINEERING

First Year B. Tech. – Civil Engineering: Semester - II

Course Code	Course Type	Course Name	Teaching Scheme (hrs/Week)							Evaluation Scheme (Marks)					
			L	P	T	H	CR			CIE	ETE	TW	PR	OR	Total
							TH	PR/Tut	Total						
CEBS203	BSC	Engineering Mathematics - II	3	-	-	3	3	-	3	40	60	-	-	-	100
CEBS204	BSC	Engineering Chemistry	2	2	-	4	2	1	3	40	60	25	-	-	125
CEES203	ESC	Engineering Mechanics	3	2	-	5	3	1	4	40	60	50	-	-	150
CEES204	ESC	Fundamentals of Electrical and Mechanical Engineering	2	-	-	2	2	-	2	40	60	-	-	-	100
CEPC201	PCC	Concrete Technology	3	-	-	3	3	-	3	40	60	-	-	-	100
CEVS202	VSEC	Professional Practices in Concrete Testing	-	4	-	4	-	2	2	-	-	25	-	-	25
CECC203	CC	Professional Development - II	-	4	-	4	-	2	2	-	-	25	-	-	25
CECC204	CC	Liberal Learning-II*	-	2	-	2	-	1	1	-	-	25	-	-	25
CEAE201	HSSM-AEC	IT Proficiency	-	4	-	4	-	2	2	-	-	25	-	-	25
CEIN201	ELC - INT	Internship-I	5 Weeks				2		2	-	-	25	-	-	25
Total			**13**	**18**	**-**	**31**	**13**	**11**	**24**	**200**	**300**	**200**	**-**	**-**	**700**

*** Liberal Learning – II: Choose any one from the following:**

Sr. No.	Course Code	Module	Sr. No.	Course Code	Module
1.	CECC204A	Guitar	6.	CECC204F	Basketball
2.	CECC204B	Singing	7.	CECC204G	Cricket
3.	CECC204C	Cinematography	8.	CECC204H	Rifle and Pistol Shooting
4.	CECC204D	Dance	9.	CECC204I	Volleyball
5.	CECC204E	Synthesizer	10.	CECC204J	Football

 # Internship I: After Semester II during Vacation Period.

BoS Chairman

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Director
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Narhe, Pune - 411041.

DEPARTMENT OF CIVIL ENGINEERING

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SYLLABUS

SEMESTER - I

DEPARTMENT OF CIVIL ENGINEERING

Program: B. Tech. (Civil Engineering)									**Semester:** I
Course: Engineering Mathematics - I									**Code:** CEBS101
Teaching Scheme (Hrs/week)				**Evaluation Scheme (Marks)**					
Lecture	**Practical**	**Tutorial**	**Credit**	**CIE**	**ETE**	**TW**	**OR**	**PR**	**Total**
03	-	-	03	40	60	-	-	-	100

Prerequisites:

Basic concept of Differentiation, Integration, Maxima and Minima, Matrices and Determinants.

Course Objectives:

1. To acquaint the students to rank of matrix, solution of simultaneous equations, Eigen values and Eigen vectors.
2. To acquire techniques of the expansion of functions about any point and to evaluate the indeterminate forms of limits.
3. To make students familiar with multivariable differentiation and its applications.
4. To introduce to student awareness of concept of Fourier series.

Course Outcomes: After completion of this course, students will be able to -

CO1	Use of matrix method for solving system of simultaneous linear equations.
CO2	Find Eigen values and Eigen vectors of the matrix.
CO3	Describe the power series expansion of a given function and evaluate limits.
CO4	Understand the basic concepts of partial derivatives**.**
CO5	Evaluate partial derivatives to estimate maxima and minima of function of multiple variables.
CO6	Determine the Fourier series representation and harmonic analysis for design.

Course Contents:

Unit	**Description**	**Duration (Hrs.)**
1.	**System of Linear Equations:** Rank of a matrix, System of linear equations, Linear dependence and independence of vectors, Linear and orthogonal transformations, Application to problems in engineering.	7
2.	**Eigen Values and Eigen Vectors, Diagonalization:** Eigen values and Eigen vectors, Cayley-Hamilton theorem, Diagonalization of a matrix, Reduction of quadratic forms to canonical form by linear and orthogonal transformations.	7
3.	**Differential Calculus:** Rolle's theorem, Mean value theorems, Taylor's series and Maclaurin's series, Expansion of functions using standard expansions, Indeterminate forms.	7
4.	**Partial Differentiation:** Partial derivatives of first and higher orders, Euler's theorem on homogeneous functions, Partial derivative of composite functions, Total derivative and Implicit differentiation	7
5.	**Applications of Partial Differentiation:** Jacobians and their applications, Errors and Approximations. Maxima and minima of functions of two variables, Lagrange's method of undetermined multipliers.	7
6.	**Fourier Series:** Definition, Dirichlet's conditions, Full range Fourier series, Half range Fourier series, Harmonic analysis.	7
	TOTAL	**42**

DEPARTMENT OF CIVIL ENGINEERING

Text Books:

1. B. V. Ramana, "Higher Engineering Mathematics", Tata McGraw Hill
2. B. S. Grewal , "Higher Engineering Mathematics", Khanna Publication
3. Howard Anton & Chris Rorres , "Elementary Linear Algebra" , John Wiley & sons.
4. Seymour Lipschutz, Marc Lipson , "Schaum's outlines of Linear Algebra", 6th edition McGraw-Hill Education (India) Private Limited, New Delhi.

Reference Books:

1. Erwin Kreyszig , "Advanced Engineering Mathematics" , Wiley Eastern Ltd.
2. M. D. Greenberg , "Advanced Engineering Mathematics" , Pearson Education.
3. Peter V. O'Neil , "Advanced Engineering Mathematics" , Thomson Learning.
4. P. N. Wartikar and J. N. Wartikar , "Applied Mathematics (Vol. I & Vol. II)", Vidyarthi Griha Prakashan, Pune.
5. Ron Larson and David C. Falvo, "Elementary Linear Algebra" ,Houghton Mifflin Harcourt Publishing Company

E-Resources:

1. A NPTEL Course on "Engineering Mathematics-I" IIT Khargpur - https://www.youtube.com/watch?v=4QFsiXfgbzM&list=PLbRMhDVUMngeVrxtbBz-n8HvP8KAWBpI5
2. Paathshala Pandit , "Rank of Matrix | Vector Space | Engineering Mathematics" - https://www.youtube.com/watch?v=jHU3yasfpKw&list=PLU4tRlorU5wWPpemhfdG0Yc4zNiICSMVO&index=1
3. Eigenvalues and Eigenvectors | Properties and Important Result | Matrices- https://www.youtube.com/watch?v=1wjXVdwzgX8
4. Taylor Series | Numericals | Maths 1 | B.Tech 1st year | Engineering | BSc - https://www.youtube.com/watch?v=0bHky1ocA1Y
5. Partial Differentiation Example And Solution | Multivariable Calculus - https://www.youtube.com/watch?v=eTp5wq-cSXY&list=PLU6SqdYcYsfLuIJdHwY92aGBg5-uRHBOb&index=1

DEPARTMENT OF CIVIL ENGINEERING

Program: B. Tech. (Civil Engineering)								**Semester:** I	
Course: Engineering Physics								**Code:** CEBS102	
Teaching Scheme (Hrs/week)				**Evaluation Scheme (Marks)**					
Lecture	**Practical**	**Tutorial**	**Credit**	**CIE**	**ETE**	**TW**	**OR**	**PR**	**Total**
02	02	-	03	40	60	25	-	-	125

Prerequisites:

Fundamentals of Physics, basic of interference, polarization, de-Broglie hypothesis, semiconductor and ultrasonic.

Course Objectives:

1. To make the students understand and study the basic principles of Physics.
2. To provide firm grounding to the students in the concept of physics to resolve many engineering and technological problems.
3. To impart the knowledge of the fundamentals of physics to the students through hands on experiments and extend it to relevant engineering applications.

Course Outcomes: After completion of this course, students will be able to -

CO1	Explain basics of interference and polarization connected to engineering applications.
CO2	Make use of Laser technology and Optical fiber in various disciplines.
CO3	Outline the fundamentals of Quantum Physics and relate it to engineering applications.
CO4	Apply basics of semiconductors for solving the engineering problems.
CO5	Extend the understanding of Ultrasonic and NDT in engineering.
CO6	Interpret the use of nanoparticles and superconductors in the field of engineering.

Course Contents:

Unit	**Description**	**Duration (Hrs.)**
1.	**Wave Optics:** **Units and its conversion-**Length, Mass, Velocity, Acceleration Momentum, Time, Temperature, Wavelength, Energy, Current, Voltage, Power, Intensity, Amplitude, Frequency, Pressure, Resistance, compressibility, resistivity, conductivity, Mobility, Angle. **Interference-** Interference in thin film of uniform thickness and its conditions (Simple Numerical), Engineering Applications – Ant-Reflection coating (ARC). **Polarization**- Polarization and its types, Malus law and Brewster's law (Simple numerical), Double refraction, Huygens's theory of double refraction, Differentiate between positive & negative crystal, Engineering applications of polarization: Liquid Crystal Display (LCD).	5
2.	**Laser and Optical Fiber:** **Laser**- Basic Principles of laser, Elements of Laser, Characteristics of laser, He-Ne laser (Gas laser), Applications of laser – Medical, Industrial and Holography- Recording. **Optical fibers-** Propagation of light - Acceptance angle, Acceptance cone, Numerical aperture, Fractional Refractive Index Change (Simple numerical).	5

	Types of optical fibers, Advantages of optical fiber communication, Applications of optical fiber in Medical, Communication, Entertainment, Data Security.	
3.	**Quantum Physics:** de-Broglie hypothesis of matter waves, de-Broglie wavelength for a particle accelerated by Kinetic Energy (K.E) and a charged particle accelerated by Potential difference (PD) "V", (Simple Numerical), Properties of matter waves, Heisenberg's uncertainty principle for wide wave packet and narrow wave packet (Simple Numerical), Tunneling Effect, Engineering applications - Scanning Tunneling Microscope (STM), Introduction to Quantum Computing.	4
4.	**Semiconductor Physics:** Classification of solids on the basis of band theory, Fermi level for metal and semiconductor, Position of Fermi level in extrinsic semiconductors (only diagram), Solar cell: principle, working, IV-characteristics, Efficiency and fill factor, Factor to improve efficiency of solar cell, Application, advantages and disadvantages of solar cell, Hall effect: derivation for Hall voltage and Hall coefficient (Simple numerical).	5
5.	**Ultrasonic and Non-destructive Testing:** **Ultrasonic**- Properties of ultrasonic waves, Piezoelectric effect and inverse of piezoelectric effect, Generation of ultrasonic waves by inverse piezoelectric effect (using transistor), Compressibility of liquid by using ultrasonic waves (Simple Numerical). **Non- Destructive Testing (**NDT): Definition and its objectives, Difference between destructive testing and non-destructive testing, Application of NDT as an Ultrasonic flaw detection technique (Simple numerical), Advantages of NDT.	4
6.	**Nanophysics and Superconductivity:** **Nanophysics-** Introduction of nanophysics, Properties of nanoparticles (Optical, Electrical, Mechanical), Applications of nanomaterials in Electronics, Automobile, Medical. **Superconductivity-** Definition of superconductivity on the basis of temperature dependence of resistivity, Properties of Superconductors, Meissner effect, Critical magnetic field (Simple Numerical), Type I and Type II Superconductors, Engineering applications of superconductivity in Superconducting Quantum Interface Device (SQUID) with its principle, working, general application of superconductors - Power Transmission, electronics, medical, principle of Maglev train.	5
	TOTAL	**28**

List of Experiments:

Perform any (08) experiment out of 12:

1. Experiment based on Newton's rings (determination of wavelength of monochromatic light, determine radius of curvature of Plano-convex lens).
2. Experiment based on polarization (To verify Law of Malus).
3. Determination of refractive index using Brewster's law.
4. Experiment based on Double Refraction (Determination of refractive indices / Identification of types of crystal).
5. Experiment based on Laser (Determination of thickness of wire / Number of lines on grating surface).

6. Determination of Planck's constant using available experimental setup.
7. To study IV characteristics of Solar Cell and determine parameters (fill factor and efficiency).
8. To determine Hall coefficient and charge carrier density.
9. Determination of velocity of ultrasonic waves and compressibility of given liquid by using Ultrasonic Interferometer.
10. An experiment based on optical fiber. (To determine the numerical aperture acceptance angel acceptance cone of optical fiber of laser diode.
11. Experiment based on semiconductor (To determine the temperature dependence characteristics of semiconductor).
12. To determine the unknown wavelength by using plane diffraction grating.
13. Study visit to research laboratory/ facility and submit report **(Compulsory).**

Text Books:

1. M. N. Avadhanulu and P.G. Kshirsagar, "Engineering Physics", S. Chand Publications.
2. S. O. Pillai, "Solid State Physics", New age International Publications.
3. J. J. Sakurai, "Modern Quantum Mechanics", Pearson Publication.
4. V K Mehta and Rohit Mehta, "Basic Electrical Engineering", S Chand Publications.
5. Robert L. Jaffe and Washington Tayler, "The Physics of Energy", Cambridge University Press".

Reference Books:

1. H. D. Young and R. A. Freedman, "University Physics", Pearson Publication.
2. Resnick and Halliday, "Principles of Physics", John Wiley and Sons.
3. Jenkins and White, "Optics", Tata McGraw Hill.
4. Noson S. Yanofsky and Mirco A. Mannucci, "Quantum computing for computer scientists", Cambridge University Press

E-Resources:

1. NPTEL Course:
   a) NPTEL lecture based on interference of polarized light by IIT Roorkee - https://youtu.be/e-4QK_JVsdU?si=gWIBt41dDgeABO8Y
   b) NPTEL lecture based on Introduction of Polarization by IIT Roorkee- https://youtu.be/fIVlzKB4bBQ?si=meWFP5matsopCABi
   c) NPTEL lecture based on Malus Law by IIT Roorkee https://youtu.be/iFG82I3nFA0?si=JCln6fJqGNw6ix5U
   d) NPTEL lecture based on Double Refraction by IIT Roorkee https://youtu.be/Pt5wvYyguq0?si=4mowxORZQXGXNxMW
   e) NPTEL lecture based on Semiconductor Physics by IIT Roorkee - https://youtu.be/q7VIITSysMs?si=62lAMoJ2tMHKRiDH
   f) NPTEL lecture based on Introduction to superconductivity https://youtu.be/hGPA1g8fKug?si=FdYfJju6bf6u2zRe
   g) NPTEL lecture based on Meissner Effect- https://youtu.be/EkNnxBakJMs?si=qRnSvPlD2NTe4rf-
2. Feynman lecture series: https://www.feynmanlectures.caltech.edu/

3. Concepts of Modern Physics, Arthur Beiser: - https://nitsri.ac.in/Department/PHYSICS/Beiser_Modern_Physics.pdf
4. Lectures by Walter Lewin: https://www.youtube.com/channel/UCiEHVhv0SBMpP75JbzJShqw
5. Quantum Mechanics Lecture Series by Prof. H.C.Verma - https://www.youtube.com/watch?v=JFWuAQRZPjQ&list=PLWweJWdB_GuISnGkAafMpzzDBvTHg02At
6. Virtual Labs, Amrita University- https://vlab.amrita.edu/?sub=1&brch=195
7. Virtual Labs, IIT Kanpur- https://bop-iitk.vlabs.ac.in/exp/energy-band-gap/simulation.html

DEPARTMENT OF CIVIL ENGINEERING

Program: B. Tech. (Civil Engineering)								**Semester:** I	
Course: Basic Civil Engineering								**Code:** CEES101	
Teaching Scheme (Hrs/week)				**Evaluation Scheme (Marks)**					
Lecture	**Practical**	**Tutorial**	**Credit**	**CIE**	**ETE**	**TW**	**OR**	**PR**	**Total**
03	02	-	04	40	60	50	-	-	150

Prerequisites:

1. Basic mathematics
2. Environmental studies
3. Geography

Course Objectives:

1. To acquaint the students with the broad scope of the different sub-branches of civil engineering.
2. To acquaint the students with basic principles of surveying and applications of surveying instruments.
3. To acquaint the students with the elements of buildings, as well as planning & construction methods of buildings.

Course Outcomes: After the completion of course, students will be able to

CO1	Explain the fundamental domains within civil engineering and emphasize the significance of an interdisciplinary approach.
CO2	Apply the concepts in field surveys and field measurements.
CO3	Employ leveling methods to overcome surveying difficulties and clarify contour characteristics.
CO4	Explain different types of planning principles, building components and building bye-laws.
CO5	Categorize building elements according to their intended functional roles.
CO6	Describe the necessity for automation in construction and the function that civil engineering plays in the development of infrastructure.

Course Contents:

Unit	**Description**	**Duration (Hrs.)**
1.	**Introduction to Civil Engineering:** **A) Basic Areas in Civil Engineering**: Surveying, Construction Engineering, Fluid Mechanics, Transportation Engineering, Project Management, construction management, Water Resource Engineering, Structural Engineering, Geotechnical and Foundation Engineering, Environmental Engineering, Quantity Surveying. Town Planning, Earthquake Engineering. Role of Civil engineer in infrastructural development **B) Units and unit Conversions:** Types of measurement systems, Units of quantities, decimal multiples and sub-multiples Unit Conversions – Numericals included	7

	Lengths – mm to cm, m, km, feet, inch, mile, yard and vice versa Area – mm^2 to cm^2, m^2, km^2, ft^2, in^2, guntha, acre, hectre, yard, brass and vice versa Volume - mm^3 to cm^3, m^3, km^3, ft^3, in^3, brass, mili-litre, litre, and vice versa Mass – mg to gm, kg, quintal, ton, lb and vice versa Time – second to minute, hr, day, year and vice versa Temperature – degree, Celsius, Fahrenheit, kelvin and vice versa Force – dyne to N, KN, kgf and vice versa Pressure – N/mm^2 to N/m^2, Pa and vice versa Angle – Degree to minutes, seconds, radians and vice versa.	
2.	**Surveying:** Principles of surveying, Classification & types of surveys, scale and its types, maps and its types, Linear Measurement: Tape - types. Angular Measurements: Compass & its types, Meridian and its types, Bearing and its types, dip and declination, Calculation of included angles, local attraction &its correction.	7
3.	**Levelling:** Objectives of levelling, Terms in levelling, Types of benchmarks, Levelling instruments, Temporary adjustments of level instruments, Types of levelling, Methods of reduction of levels.	7
4.	**Building planning:** A) Types of buildings: As per National Building Code B) Planning of residential building: Principles of planning, introduction to building Bye-laws. C) Planning of public building: Functional requirements and planning of college, hostel, and hospital.	7
5.	**Components of a Building :** A) Substructure: Definition and functions of Foundation, Types of foundation. B) Plinth: Definition, Purpose C) Superstructure: Definition, Column, Beam, Slab, Wall, Doors and Windows, Sills, Lintels and Weather sheds, Roofs, Stairs, Utility Fixtures D) Types of loads E) Types of Construction: Load Bearing, Framed, Composite.	7
6.	**Infrastructure development and automation in Civil Engineering:** Types of infrastructure, Infrastructure development in India, smart city concept, Automation in civil engineering projects. Concept of Precast and prefab construction, Aluminium Formwork. Introduction to Building Information Modeling	7
	TOTAL	**42**

List of Experiments: (Any 08)

1. Measurement of internal components and capacity determination of any facility in the institute.
2. Measurement of magnetic bearings of sides of a triangle or quadrilateral, correction for local attraction and calculations of true bearings using prismatic compass.
3. Simple and differential leveling with at least three change points using dumpy or auto level.
4. Study of 7/12 and 8 (A) extract and list of documents to be submitted for building permission.
5. Measurement of area of irregular figures by planimeter.
6. Measurement of distance by EDM and comparing it with the distance measured using tape.

7. Preparation of report containing details of building bye-laws regarding building line, open space, carpet area, built up area requirements, Floor Space Index (F.S.I.) / Floor Area Ratio (F.A.R.) and height of building.
8. Drawings of types of masonry and brick bonds (Quarter plate).
9. Drawing details of doors, windows and arches (Quarter plate).
10. Visit to a construction site for studying the various construction materials used, type of structure, type of foundation and components of superstructure and preparation of visit report.
11. Collection of various sanction forms of building construction and brochures of construction materials including cost.
12. Making a poster (Full imperial sheet size) in a group of maximum 04 students, related to infrastructure development and automation in Civil Engineering.

Text Books:

1. G K Hiraskar, "Basic Civil Engineering", Dhanpat Rai Publication, Edition 2004.
2. S.S. Bhavikatti, "Basic Civil Engineering", New Age publications, 2020.
3. Satheesh Gopi, "Basic Civil Engineering", Pearson, 2019.

Reference Books:

1. N.N. Basak, "Surveying", Tata Mc-Graw Hill Publications, Edition 2014.
2. Bindra and Arora, "Building Construction and Drawing", Dhanpat Rai Publications, Edition 2012.
3. Sushil Kumar, "Building Construction and Drawing", Standard Publications, Delhi, Edition 2010.
4. Kanetkar and Kulkarni, "Surveying and Levelling", PVG Publications, Edition 2014.
5. S.K. Garg, "Water Supply Engineering", Khanna Publishers, Delhi, 33rd Edition 2019.
6. Khanna, C.E. G Justo, A. Veersrsgavan, "Highway Engineering", Nem Chand and Bros Publication, Edition 2018.
7. S.C. Saxena, S.P. Arora, "Railway Engineering", Dhanpat Rai Publication, Edition 2015.
8. National Building Code –Bureau of Indian Standards 2016.

E-Resources:

1. NPTEL Video lecture on "What is Civil Engineering"
   https://youtu.be/CsKddkqgwVk?si=h3lx_RFzqACqk9Ko
2. NPTEL Video lecture on "Introduction to Environmental Engineering"
   https://youtu.be/0aXP5qnihns?si=x6K6ZobHo8x2k9ty
3. NPTEL Video lecture on "Interesting Environmental Projects"
   https://youtu.be/LRsla_wsCTs?si=2xuETqFKA1ZNsM3i
4. NPTEL Video lecture on "Hydraulics and Water Resource Engineering"
   https://youtu.be/EOOFN9yKkoY?si=lGtpWsGMoIl8MRCb
5. NPTEL Video lecture on "Geotechnical Engineering"
   https://youtu.be/5mwDneohPk4?si=0MLFlawh2zdGhZvN
6. NPTEL Video lecture on "Infrastructure Management"
   https://youtu.be/WZYwbyB6S6Q?si=ktHyXpAYsQOIdHol
7. NPTEL Video lecture on "Traffic Engineering and Planning"
   https://youtu.be/4ej1XkAvzhc?si=_D-DWfvhLj0KGog4

8. NPTEL Video lecture on "Structural Engineering – Analysis and Design"
   https://youtu.be/H0w4GFRW05M?si=QDKTVYlSamn2a9hH
9. NPTEL Video lecture on "Surveying"
   https://youtube.com/playlist?list=PL20A0651466E8A776&si=ulKIz8G2aAvHUGGj
10. NPTEL web-based learning material
    https://nptel.ac.in/courses/105107122
11. A video series of "Building Planning"
    https://youtube.com/playlist?list=PL46yD-wnVQqxZ8f-_g1PZaFjJIxnJWyFE&si=y3-kBrBf8sid2hiM
12. A video on "How to make a house plan step by step"
    https://www.youtube.com/watch?v=6XNpiqv2XPE&t=252s
13. A video on "House 3D building animation"
    https://youtu.be/CP6xetNWfQk?si=tF_RnO9NcnhhzFyZ
14. An animation on "Components of building"
    https://www.youtube.com/watch?v=Qftr8EeiiMs
15. An animation on "Building Construction Components"
    https://www.youtube.com/watch?v=LGC6Fg-0wso
16. A Video on "Building Construction"
    https://youtube.com/playlist?list=PLfq4fiRrJSn6UMXXmSsBcb_i2cR0hq8pA&si=-gHzBGLq-WAHrs8b
17. NPTEL Video on "Infrastructure planning and management"
    https://youtu.be/WZYwbyB6S6Q?si=LCKF2jvq-d4bBPJb

DEPARTMENT OF CIVIL ENGINEERING

Program: B. Tech. (Civil Engineering)								**Semester:** I	
Course: Engineering Geology and Materials in Building Construction								**Code:** CEES102	
Teaching Scheme (Hrs/week)				**Evaluation Scheme (Marks)**					
Lecture	**Practical**	**Tutorial**	**Credit**	**CIE**	**ETE**	**TW**	**OR**	**PR**	**Total**
02	02	-	03	40	60	25	-	-	125

Prerequisites:

1. Elements of Civil Engineering
2. Geography
3. Chemistry

Course Objectives:

1. To disseminate knowledge about the intrinsic characteristics of different types of rocks and its significance in civil engineering.
2. To develop conceptual understanding of the properties, methods of manufacture, and applications of various building materials, including stone, brick, cement mortar, concrete, glass, and wood, paints and varnishes and advanced materials used in building construction.

Course Outcomes: After the completion of course, students will be able to

CO1	Describe the usage of different rocks and minerals in civil engineering and early geological investigation.
CO2	Interpret the qualities and usage of the building stones and bricks.
CO3	Comprehend Structural and Historical geology applied to civil engineering projects.
CO4	Identify favorable and unfavorable conditions for the proposed construction, precautions and treatments required to improve the site conditions of dams, and tunnels.
CO5	Compare the properties of timber, cement, concrete and ferrous metals.
CO6	Explain the properties of Protective Coatings and modern construction materials.

Course Contents:

Unit	**Description**	**Duration (Hrs.)**
1.	**General Geology, Mineralogy and Petrology:** **A) General Geology:** The Earth as a planet, Interior and General composition of the Earth, The rock cycle. **B) Mineralogy:** Physical Properties of Minerals, Classification of Minerals, Rock forming minerals. **C) Petrology:** Igneous Petrology: Plutonic, Hypabyssal and Volcanic rocks, Structures, Textures and Classification of Igneous rocks. Secondary Petrology: Rock weathering, Sedimentary Structures, lithification and digenesis process. Metamorphic Petrology: Agents, Types of metamorphism, Texture and structures. Engineering applications: Igneous, Sedimentary, metamorphic rocks.	5

2.	**Structural and Historical Geology:** **A) Structural Geology:** Outcrop, dip and strike, conformable series, unconformity, its types and overlap, faults and their types, folds and their types, Joints with their geometric and genetic classification, inlier and outlier. Civil engineering importance of faults and folds with examples. **B) Historical Geology:** Geological formations of Peninsular India, Archean's and Dharwar formations, Cudappah formations, Vindhyan formations, Gondwana formations, Deccan Trap formations, significance of their structural characters in major civil engineering activities.	4
3.	**Applications of Engineering Geology in Dams and Tunneling:** **A) Geology of Dam:** Strength, stability and water tightness of foundation rocks, influence of geological conditions on the choice and type of dam, preliminary geological work on dam and reservoir sites, precautions to be taken to counteract unsuitable conditions and their relevant treatments with case studies. **B) Tunneling:** Preliminary geological investigations, important geological considerations while choosing alignment, difficulties during tunneling as encountered due to various geological conditions, Role of ground water and suitability of common rock types for excavation and tunneling.	4
4.	**Construction Materials:** **A) Stones:** Requirements of good building stone: Basic terminology, strength, durability, ease of dressing, appearance, mineral composition, textures and field structures, suitability of common rocks as building stone, quarrying of stones by wedging and blasting, tests on stone (Acid test, Attrition, crushing, impact and water absorption), characteristics of a good stone, deterioration and preservation of stones. **B) Bricks:** Composition of bricks, standard and conventional brick, modular bricks, manufacture of bricks, Burnt clay bricks, Fly ash bricks, Engineering bricks, Calcium silicate bricks, Sundried Bricks, Eco bricks, Burning of bricks by clamps-intermittent (down draught) and continuous kiln (Hoffman's), Classification of bricks as per IS code, characteristics of good bricks, Substitutes for bricks – Cement concrete blocks (solid), Production process of solid blocks. Fire clay/Refractory bricks, Calcium Silicate Bricks properties and uses.	5
5.	**Timber, Ferrous, Non-Ferrous Metals and Binding Materials:** **A) Timber:** Classification and Properties of timber based on mode of growth, Cross- section of an exogenous and endogenous tree, Properties of good timber, Defects in timber, Preservation of Timber, Seasoning of Timber, Conversion of timber and Market forms - types and uses. **B) Ferrous and Non-Ferrous Metals:** Properties and uses of Cast iron, Wrought iron, Mild steel, Tor steel, TMT, High tensile steel, Market forms of structural steel, aluminum, copper, zinc, brass. **C) Binding Materials:** Functional requirements and properties of binding materials, cement, clay, Lime - types, uses and storage. **D) Mortar and concrete:** Ingredients, types and proportioning of mortar, Types of concrete - Plain Cement Concrete (PCC), (including grades), Reinforced Cement Concrete, Pre-Stressed Concrete, Precast.	5

6.	**Finishing materials:** **A) Plastering:** Requirement of good plaster, plastering types: lime plaster, cement plaster, fire proofing and damp proofing materials, plaster of Paris. **B) Flooring Materials:** Laminate, Vinyl, Bamboo, Cork, Ceramic Tile, Rubber, Ceramic, vitrified, stone, timber, paver, skirting and dado. **C) Roofs and Roofing Materials:** Technical terms - span, rise, hip, pitch, valley, ridge, verge, eaves, hipped end, common rafter, valley rafter, hip rafter, jack rafter, ridge beam, eaves board, wall plates, barge board, battens, post plate, cleat, template, boarding, gable end, types of roofs, truss, types of trusses. Types of roofing materials - Shingles-Solar Shingles, Metal Roofing, Wood Roofing, Clay roofing, Stone Roofing, Green Roofing, Rolled Roofing, Properties of Roofing Material. **D) Paints:** Requirements of paints, Ingredients, Types, Painting on: plastered surfaces, wood surfaces, metal surfaces, defects in painting. **E) Varnishes:** Objective, characteristics of good varnish, ingredients. **F) Distempers:** Composition, properties. **G) Miscellaneous Materials:** Asphalt, bitumen, bitumen felts, blast furnace slag, coal tar, glass, plastic, graphene, borophene, Autoclave Aerated Concrete (AAC) Blocks, paver blocks.	5
	TOTAL	**28**

List of Experiments: (Any 08)

1. Megascopic identification of following mineral specimens
   Rock Forming Minerals, Economic Minerals and Ore Minerals such as:
   Silica group: Rock Crystal, Rosy Quartz, Transparent Quartz, Milky Quartz, Smoky Quartz, Amethyst, Chalcedony, different varieties of Agate, Jasper Banded Hematite Jasper.
   Feldspar group: Orthoclase, Microcline, Plagioclase Mica group: Muscovite, Biotite.
   Olivine group: Olivine Pyroxene group: Augite, Diopside, Hypersthene, Amphibole group: Hornblende, Asbestos.
   Zeolite and other group: Apophyllite, Stilbite, different varieties of Calcite, Gypsum Tourmaline, Chromite, Limonite, Laterite, Kyanite, Graphite, Hematite, Micaceous Haematite. Pyrite, Garnet etc.
2. Interpretation and construction of geological sections from geological maps.
3. Solution of engineering geological problems such as alignment of dams, tunnels, roads, canals, bridges, etc. based on geological maps.
4. Determine tile abrasion.
5. Field tests and determine water absorption, efflorescence test of burnt clay brick.
6. Determine compressive strength of burnt clay brick or fly ash brick.
7. Determination of compression strength of Timber.
8. Determination of flexural (bending) strength of Timber.
9. Determination of compression strength of Paver Block.
10. Collection of Brochures/leaflets/advertisements of modern/advanced construction materials e.g. Protective finishing materials, masonry products etc.
11. Report on field visit to a construction site to study various geological features and various construction materials.

DEPARTMENT OF CIVIL ENGINEERING

Text Books:

1. R. B. Gupte, "Text Book of Engineering Geology", P.V.G. Publications, Pune, 2001.
2. N. Chenna Kesavulu, "Text Book of Engineering Geology", MacMillan India Ltd., 2010.
3. B.C. Punmia, "Building Construction", Laxmi Publications.
4. S. V. Deodhar, "Building Materials", Khanna Publication.

Reference Books:

1. D. Venkat Reddy, "Principles of Engineering Geology", Vikas Publishers, 2010.
2. F. G. Hbly and De Frietus, "Engineering Geology", Reed Elsevier India.
3. S. K. Duggal, "Building Materials", New Age International Publishers.
4. D.N. Ghose, "Materials of Construction", Tata McGraw Hill.
5. B. K. Agrawal, "Introduction to Engineering Materials", Tata McGraw Hill, New Delhi.
6. Bindra and Arora, "Building Construction", Dhanpat Rai Publications.
7. Ruth T. Brantley and L. Reed Brantley, "Building Materials Technology", Tata McGraw Hill.
8. S. K. Garg, "Physical and Engineering Geology", Khanna Publication.
9. Parbin Sing, "Engineering and General Geology", Katson Books.

E-Resources:

1. Geology and Earth Science News, Articles, Photos, Maps and More
2. The Mineral and Gemstone Kingdom: Home (minerals.net)
3. Geology and Earth Science News, Articles, Photos, Maps and More
4. Engineering Geology - Course (nptel.ac.in)
5. Welcome to Virtual Labs (vlabs.ac.in)

DEPARTMENT OF CIVIL ENGINEERING

Program: B. Tech. (Civil Engineering)								**Semester:** I	
Course: Professional Practices in Building Planning and Drawing								**Code:** CEVS101	
Teaching Scheme (Hrs/week)				**Evaluation Scheme (Marks)**					
Lecture	**Practical**	**Tutorial**	**Credit**	**CIE**	**ETE**	**TW**	**OR**	**PR**	**Total**
-	04	-	02	-	-	25	25	-	50

Prerequisites:

1. Basic Civil Engineering
2. Basics of building planning and drawing

Course Objectives:

1. To acquaint the students with the broad scope of the different sub-branches of civil engineering.
2. To acquaint the students with basic principles of surveying and applications of surveying instruments.
3. To acquaint the students with the elements of buildings, as well as planning & construction methods of buildings.

Course Outcomes: After the completion of course, students will be able to

CO1	Utilize appropriate drawing sheets, scales, symbols, lines, and dimensioning styles.
CO2	Apply principles of planning and building byelaws.
CO3	Produce accurate orthographic and isometric drawings of various objects and perspective drawings of buildings.
CO4	Create detailed plans, sections, and elevations of engineering components and buildings.
CO5	Design line plans for residential and public buildings collaboratively.
CO6	Draft site plans with integrated water supply and drainage systems.

Course Contents:

Unit	**Description**	**Duration (Hrs.)**
1.	**Scales & Symbols:** Definition of term Scale, Introduction to the various types of scales and symbols to be used in Engineering Drawing.	10
2.	**Lines & Dimensioning in Engineering Drawing:** Explaining the various types of Lines, Engineering Dimensioning & Lettering rules to be followed to draw various types of lines.	10
3.	**Orthographic View & Isometric View:** Definition and purpose of orthographic projection, basic principles and rules governing orthographic views. Definition and necessity of isometric projection, Basics of isometric drawing: axis, angles, scale, symbols, annotations, and notation conventions specific to isometric drawings	10
4.	**Perspective Drawing:** Definition of perspective projection, principle of perspective projection, various elements of perspective projection (basic terminology), types of perspective.	10

5.	**Introduction to Line Plan & Detailed Plan:** Explaining the concept of plan, section, and elevation**:** Explaining the basic concept of line plan and its importance in Civil Engineering, brief description of a detailed plan, explanation of all the components of substructure & superstructure, dimensioning techniques, difference between Carpet Area and Built up area.	8
6.	**Sustainable Water Management:** Brief description about topographical features near the site, location, brief explanation about various sources of water, introduction to various pipe networks including main supply lines and branches to individual buildings or areas.	8
	TOTAL	**56**

List of Experiments:

1. Drawing containing types of scales and symbols.
2. Drawing of types of lines and dimensioning style (Lettering) in Engineering Drawing.
3. Drawing an orthographic view of various objects such as cube and cuboid.
4. Drawing isometric views of simple objects.
5. Perspective drawing of a building.
6. Drawing simple line plan for a residential building, single storied framed/load bearing structure indicating water supply and drainage line (on Graph paper).
7. Drawing of line plan for any single storeyed public building indicating water supply and drainage line (on Graph paper). \
8. Drawing of plan, elevation and section for a proposed residential building, single storeyed framed/load bearing structure, preparing schedule of openings.

Text Books:

1. N.D. Bhatt, "Engineering Drawing", Charotar Publishing House Pvt. Ltd., Edition 2021.
2. R.K. Dhawan, "A Textbook of Engineering Drawing", S. Chand Publishing, Edition 2020.
3. Balagopal, "Building Design and Drawing", Charotar Publishing House Pvt. Ltd.
4. B.P. Verma, "Civil Engineering Drawing and House Planning", Khanna Publishers.

Reference Books:

1. David A. Madsen, David P. Madsen, and Terence M. Shumaker, "Engineering Drawing and Design", Cengage Learning, Edition 2018.
2. S.C. Rangwala, "Civil Engineering Drawing", Charotar Publishing House Pvt. Ltd., Edition.
3. M.N. Shrinivas, "Basic Civil Engineering Drawing", Sanguine Technical Publishers, Edition.

E-Resources:

1. A video series of "Building Planning" https://youtube.com/playlist?list=PL46yD-wnVQqxZ8f-_g1PZaFjJIxnJWyFE&si=y3-kBrBf8sid2hiM
2. A video on "How to make a house plan step by step https://www.youtube.com/watch?v=6XNpiqv2XPE&t=252s
3. A video on "House 3D building animation", https://youtu.be/CP6xetNWfQk?si=tF_RnO9NcnhhzFyZ
4. An animation on "Components of Building" https://www.youtube.com/watch?v=Qftr8EeiiMs

DEPARTMENT OF CIVIL ENGINEERING

Program: B. Tech. (Civil Engineering)						**Semester:** I			
Course: Professional Development – I						**Code:** CECC101			
Teaching Scheme (Hrs/week)				**Evaluation Scheme (Marks)**					
Lecture	**Practical**	**Tutorial**	**Credit**	**CIE**	**ETE**	**TW**	**OR**	**PR**	**Total**
-	04	-	02	-	-	50	-	-	50

Course Objectives:

1. To introduce students on professional development skills and its importance in building personal and professional life.
2. To bring in self-awareness and realization of Values, Self-discipline and self-grooming for betterment of life and contribution to our Society.

Course Outcomes: After completion of this course, students will be able to -

CO1	Know their own values and how to use in their career and personal life.
CO2	Understand the importance of self-discipline and how it can empower individuals to take control of their actions and decision in any situation.
CO3	Know the importance of self-grooming to maintain good health and self-confidence.

Course Contents:

Unit	**Description**	**Duration (Hrs.)**
1.	**Values:** Understand, Know, Define and Use of your Values, Types of Values, Internal and External Stakeholders, What is SWOT analysis and how to do, Action planning and execution, Self-review.	24
2.	**Self-discipline:** Definition, Self-discipline impact in your life and society, Techniques to build self-discipline, Self-review and actions.	16
3.	**Self-grooming:** What is personal grooming and its importance, Making Self-care guide and practice, Self-care for health and well-being.	16
	TOTAL	**56**

Text Books:

1. R. Srinivasan, "Strategic Management: Text and Cases", PHI Publication.
2. M. K. Sinha, "Success Through Self-Discipline: Your Personal Guide to Achieving Your Goals".

Reference Books:

1. Stephen R. Covey, "The 7 Habits of Highly Effective People: Powerful Lessons in Personal Change", Simon & Schuster, 1989.
2. Jack Canfield, "The Success Principles", HarperCollins, 2005.
3. Norman Vincent Peale, "The Power of Positive Thinking", Prentice Hall, 1952.

E-Resources:

1. Coursera: "The Science of Well-Being" by Yale University, - https://www.coursera.org/learn/the-science-of-well-being
2. Udemy: "Self-Care: Take Care of Yourself to Better Take Care of Others" by Jessica Rogers https://www.udemy.com/course/caring-self/?couponCode=UPGRADE02223

DEPARTMENT OF CIVIL ENGINEERING

Program: B. Tech. (Civil Engineering)								**Semester:** I	
Course: Liberal Learning – I (Guitar)								**Code:** CECC102A	
Teaching Scheme (Hrs/week)				**Evaluation Scheme (Marks)**					
Lecture	**Practical**	**Tutorial**	**Credit**	**CIE**	**ETE**	**TW**	**OR**	**PR**	**Total**
-	02	-	01	-	-	25	-	-	25

Prerequisites:

Basic knowledge of Indian classical music and Guitar musical instrument.

Course Objectives:

1. To build a strong foundation in Indian classical dance through mastering basic techniques, rhythms, expressions, and repertoire, culminating in a performance.

Course Outcomes: After completion of this course, students will be able to -

CO1	Illustrate the fundamental aspects of Guitar instrument.
CO2	Demonstrate the performance of Guitar Instrument.
CO3	Apply different types Chords.
CO4	Apply basic outline through various prescribed ragas practically.

Course Contents:

Sr. No.	**Description**	**Duration (Hrs.)**
1.	Introduction to the Guitar	2
2.	Understanding standard tuning	2
3.	Introduction to tablature and note reading	2
4.	Introduction to basic music theory concepts	2
5.	Understanding scale, intervals, and chords	2
6.	Learning more open chords: D major, D minor, C major, G major	2
7.	Understanding power chords and their shapes	2
8.	Understanding barre chord shapes: F major, B minor	2
9.	Finding Chords by Ear	2
10.	Chord Progressions	2
11.	Advanced Chord Types	2
12.	Transposing Chord	2
13.	Review and Practice	2
14.	Introduction to Scales	2
	TOTAL	**28**

Text Books:

1. David Hodge, "Guitar Theory", DK Publishing.

Reference Books:

1. Russ Shipton, "The Complete Guitar Player", Published by Wise.
2. Vincent Ong, Alfred Khp," Classical Guitar Advanced Studies Repertoires", Dynamic Publication.

E-Resources:

1. https://www.youtube.com/watch?v=BBz-Jyr23M4

DEPARTMENT OF CIVIL ENGINEERING

Program: B. Tech. (Civil Engineering)							**Semester:** I		
Course: Liberal Learning – I (Singing)							**Code:** CECC102B		
Teaching Scheme (Hrs/week)				**Evaluation Scheme (Marks)**					
Lecture	**Practical**	**Tutorial**	**Credit**	**CIE**	**ETE**	**TW**	**OR**	**PR**	**Total**
-	02	-	01	-	-	25	-	-	25

Prerequisites:

Basic knowledge of Indian classical music in singing.

Course Objectives:

1. To offer students' knowledge of the basic concepts of Singing in a very easy to understand manner with their practical applicability.

Course Outcomes: After completion of this course, students will be able to -

CO1	Illustrate the fundamental aspects of Singing.
CO2	Demonstrate the performance of Singing.
CO3	Apply basic outline through various prescribed ragas practically.

Course Contents:

Sr. No.	**Description**	**Duration (Hrs.)**
1.	Voice Culture in Indian Semi Classical Singing.	2
2.	Basics of Singing o Introduction to semi classical singing.	2
3.	Basics of Indian Semi Classical Music.	2
4.	Learning Basic Ragas.	2
5.	Music Theory Basics.	2
6.	Vocal Warm-ups.	2
7.	Introduction to Ear Training.	2
8.	Breathe Control.	2
9.	Resonance and Tone Production.	2
10.	Diction and Articulation.	2
11.	Dynamics and Expression.	2
12.	Introduction to Repertoire.	2
13.	Practice Techniques.	2
14.	Interpretation and Expression.	2
	TOTAL	**28**

Text Books:

1. Dr. Theodore Dimon, "Anatomy of the Voice, This Is a Voice".

Reference Books:

1. Richard Miller, "The Structure of Singing", Schirmer Books, London.
2. Jennifer Hamady, "The Art of Singing", Published by Hal Leonard.

E-Resources:

1. https://www.youtube.com/watch?v=4hNq9qykOyE
2. https://www.youtube.com/watch?v=b14gkmECz-Y

DEPARTMENT OF CIVIL ENGINEERING

Program: B. Tech. (Civil Engineering)						**Semester:** I			
Course: Liberal Learning – I (Cinematography)						**Code:** CECC102C			
Teaching Scheme (Hrs/week)				**Evaluation Scheme (Marks)**					
Lecture	**Practical**	**Tutorial**	**Credit**	**CIE**	**ETE**	**TW**	**OR**	**PR**	**Total**
-	02	-	01	-	-	25	-	-	25

Prerequisites:

A basic understanding of film theory, Camera operation, Lighting techniques and visual storytelling is essential for cinematography.

Course Objectives:

1. To make students effectively use their camera's components, study fundamental photography techniques and apply basic to advanced editing skills.

Course Outcomes: After completion of this course, students will be able to -

CO1	Illustrate the fundamental aspects of camera equipment.
CO2	Demonstrate the performance of camera equipment
CO3	Ability to translate creative concepts into visually engaging and coherent film or video projects.
CO4	Mastery in crafting compelling visual narratives through camera angles, lighting, and composition

Course Contents:

Sr. No.	**Description**	**Duration (Hrs.)**
1.	Introduction to Photography	2
2.	Understanding camera components (lens, shutter, sensor)	2
3.	Exposure Triangle	2
4.	Introduction to the rule of thirds, leading lines, and framing	2
5.	Understanding autofocus vs. manual focus	2
6.	Introduction to natural and artificial lighting	2
7.	White Balance and Color Theory	2
8.	Motion and Long Exposure	2
9.	Basics of portrait photography	2
10.	Basics of landscape photography	2
11.	Overview of post-processing software (e.g., Adobe Light room, Photoshop)	2
12.	Introduction to advanced editing tools	2
13.	Organizing and Storing Photos	2
14.	Final Project Presentation and Review	2
	TOTAL	**28**

Text Books:

1. Tania Hoser, "Introduction to Cinematography", Taylor & Francis.

Reference Books:

1. Anat Pick, "Screening Nature", Berghahn Books.
2. Blain Brown, "Cinematography: Theory and Practice", Taylor & Francis.

E-Resources:

1. https://youtu.be/V7z7BAZdt2M?si=to4yQ46zEKRbxKOm
2. https://youtu.be/WXdAX0No2hM?si=GZu_mJsmyJ7NGnAU

DEPARTMENT OF CIVIL ENGINEERING

Program: B. Tech. (Civil Engineering)							**Semester:** I		
Course: Liberal Learning – I (Dance)							**Code:** CECC102D		
Teaching Scheme (Hrs/week)				**Evaluation Scheme (Marks)**					
Lecture	**Practical**	**Tutorial**	**Credit**	**CIE**	**ETE**	**TW**	**OR**	**PR**	**Total**
-	02	-	01	-	-	25	-	-	25

Prerequisites:

Good stamina, flexibility and familiarity with simple rhythmic patterns and beats.

Course Objectives:

1. To build a strong foundation in Indian classical dance through mastering basic techniques, rhythms, expressions, and repertoire, culminating in a performance.

Course Outcomes: After completion of this course, students will be able to -

CO1	Understand the fundamental postures, hand gestures and basic steps of Indian classical dance.
CO2	Understand and perform dance sequences to various rhythmic cycles (Tala) with confidence.
CO3	Convey emotions and stories through facial expressions (Abhinaya) and body language.

Course Contents:

Sr. No.	**Description**	**Duration (Hrs.)**
1.	Overview of Indian Classical Dance	2
2.	Fundamental Postures and Hand Gestures (Hasta Mudras)	2
3.	Introduction to Basic Steps (Adavus or Tatkars)	2
4.	Rhythmic Patterns and Clapping (Tala)	2
5.	Advanced Basic Steps	2
6.	Strength and Conditioning	2
7.	Introduction to Basic Expressions (Abhinaya)	2
8.	Integrating Steps and Expressions	2
9.	Intermediate Rhythmic Patterns	2
10.	Improvisation and Creative Movement	2
11.	Introduction to Advanced Movements	2
12.	Review and Feedback	2
13.	Learning a Simple Dance Piece - Part 1	2
14.	Learning a Simple Dance Piece - Part 2	2
	TOTAL	**28**

Text Books:

1. Padma Subrahmanyam, "Indian Classical Dance: A Beginner's Manual", Abhinav Publications.

Reference Books:

1. Dr. Aditi Sriram, "Indian Classical Dance: A Guide", Vikas Publishing House.

E-Resources:

1. https://youtu.be/5apCTHzvkWI?si=p11CR_4XxPocTbjO
2. https://youtu.be/OIKOHzePJCA?si=7pnPZKuvfT5EIWhf

DEPARTMENT OF CIVIL ENGINEERING

Program: B. Tech. (Civil Engineering)						**Semester:** I			
Course: Liberal Learning – I (Synthesizer/Keyboard)						**Code:** CECC102E			
Teaching Scheme (Hrs/week)				**Evaluation Scheme (Marks)**					
Lecture	**Practical**	**Tutorial**	**Credit**	**CIE**	**ETE**	**TW**	**OR**	**PR**	**Total**
-	02	-	01	-	-	25	-	-	25

Prerequisites:

Basic knowledge of Indian classical music and Keyboard musical instrument.

Course Objectives:

1. To offer students' knowledge of the basic concepts of playing Keyboard in a very easy to understand manner with their practical applicability.

Course Outcomes:

CO1	Illustrate the fundamental aspects of Keyboard instrument.
CO2	Demonstrate the performance of Keyboard Instrument.
CO3	Apply different types of Chords.
CO4	Apply basic outline through various prescribed ragas practically.

Course Contents:

Sr. No.	**Description**	**Duration (Hrs.)**
1.	Introduction to the Keyboard	2
2.	Understanding Notes and Keys	2
3.	Basic Music Theory	2
4.	Introduction to the C major scale	2
5.	Learning to play simple melodies in C major	2
6.	Introduction to Chords	2
7.	Combining Melodies and Chords	2
8.	Review and practice melodies and chords	2
9.	Introduction to Minor Scales	2
10.	Introduction to additional chords (D major, E minor)	2
11.	Understanding chord progressions (e.g., I-IV-V)	2
12.	Review scales, chords, and progressions	2
13.	Introduction to Arpeggios	2
14.	Dynamics and Expression	2
	TOTAL	**28**

Text Books:

1. Chuan C. Chang, "Fundamentals of Piano Practice", Create space Independent Publishing Platform.

Reference Books:

1. Michael Rodman, "Keyboard for the Absolute Beginners", Alfred Publishing.
2. Davis Dorrough, "Piano Scales".

E-Resources:

1. https://youtu.be/2mPS-2guHVo?si=8X_4KKezIdrMejLH
2. https://youtu.be/tEtukfFv3Wk?si=2iJ8wdD0dfjWauPb

DEPARTMENT OF CIVIL ENGINEERING

Program: B. Tech. (Civil Engineering)							**Semester:** I		
Course: Liberal Learning – I (Basketball)							**Code:** CECC102F		
Teaching Scheme (Hrs/week)				**Evaluation Scheme (Marks)**					
Lecture	**Practical**	**Tutorial**	**Credit**	**CIE**	**ETE**	**TW**	**OR**	**PR**	**Total**
-	02	-	01	-	-	25	-	-	25

Prerequisites:

Proper health, Basic knowledge of rules of the game.

Course Objectives:

1. To develop foundational basketball skills, including dribbling, passing, shooting, and defense, while understanding game rules and strategies through practical gameplay and scrimmage.

Course Outcomes: After completion of this course, students will be able to -

CO1	Demonstrate basic basketball skills such as dribbling, passing, shooting, and defensive fundamentals effectively.
CO2	Apply offensive and defensive strategies, including transition play, during gameplay and scrimmages.
CO3	Understand and implement basketball game rules and referee gestures accurately in practical situations.

Course Contents:

Sr. No.	**Description**	**Duration (Hrs.)**
1.	Introduction to Basketball	2
2.	Basic Skills – Dribbling	2
3.	Basic Skills- Passing	2
4.	Basic Skills- Shooting	2
5.	Defensive Fundamentals	2
6.	Rebounding Basics	2
7.	Ball Handling & Control	2
8.	Shooting Mechanics	2
9.	Offensive Strategies	2
10.	Defensive Strategies	2
11.	Transition Play	2
12.	Gameplay & Scrimmage	2
13.	Game Rules , Refree Gestures	2
14.	Practical	2
	TOTAL	**28**

Text Books:

1. K.K. Sharma, "Basketball: Skills and Drills", Sports Publications.

Reference Books:

1. Dr. P.K. Kher, "Basketball Coaching: A Complete Guide", Khel Prakashan.
2. S. Reddy, "The Ultimate Guide to Basketball Training", Blue Rose Publisher.

E-Resources:

1. Introduction to Exercise Physiology & Sports Performance, IIT Madras, https://nptel.ac.in/courses/109106406

DEPARTMENT OF CIVIL ENGINEERING

Program: B. Tech. (Civil Engineering)						**Semester:** I			
Course: Liberal Learning – I (Cricket)						**Code:** CECC102G			
Teaching Scheme (Hrs/week)				**Evaluation Scheme (Marks)**					
Lecture	**Practical**	**Tutorial**	**Credit**	**CIE**	**ETE**	**TW**	**OR**	**PR**	**Total**
-	02	-	01	-	-	25	-	-	25

Prerequisites:

Proper health, Basic knowledge of rules of the game.

Course Objectives:

1. To enhance cricket skills from basics to advanced techniques, focusing on tactics, fitness, and specialized fielding and wicket keeping through targeted practice and match simulations.

Course Outcomes: After completion of this course, students will be able to -

CO1	Master fundamental and advanced cricket techniques, including batting, bowling, and specialized fielding and wicket keeping.
CO2	Demonstrate an understanding of game scenarios and tactical strategies, applying them effectively during match simulations and pressure situations.
CO3	Improve physical fitness, strength, and conditioning, with targeted skill enhancement and mid-season assessments to track progress.

Course Contents:

Sr. No.	**Description**	**Duration (Hrs.)**
1.	Introduction and Fundamentals.	2
2.	Basic Techniques.	2
3.	Introduction to Game Scenarios.	2
4.	Physical Fitness and Match Simulations.	2
5.	Advanced Batting Techniques	2
6.	Advanced Bowling Techniques	2
7.	Specialized Fielding and Wicket keeping	2
8.	Tactical Understanding	2
9.	Refining Batting Techniques	2
10.	Refining Bowling Techniques	2
11.	Fielding Under Pressure	2
12.	Strength and Conditioning	2
13.	Targeted Skill Improvement	2
14.	Mid-Season Assessment	2
	TOTAL	**28**

Text Books:

1. Sanjay Manjrekar, "Cricket Fundamentals", Orient BlackSwan
2. Ravi Shastri, "Winning Cricket: Skills and Strategies", Notion Press

Reference Books:

1. Sachin Tendulkar, "Playing It My Way", Hachette India
2. Rahul Dravid, "Cricket: The Game of Life", Penguin India

E-Resources:

1. Sports and Performance Nutrition, IIT Madras, https://onlinecourses.nptel.ac.in/noc24_hs82/

DEPARTMENT OF CIVIL ENGINEERING

Program: B. Tech. (Civil Engineering)						**Semester:** I			
Course: Liberal Learning – I (Rifle and Pistol Shooting)						**Code:** CECC102H			
Teaching Scheme (Hrs/week)				**Evaluation Scheme (Marks)**					
Lecture	**Practical**	**Tutorial**	**Credit**	**CIE**	**ETE**	**TW**	**OR**	**PR**	**Total**
-	02	-	01	-	-	25	-	-	25

Prerequisites:

Proper health, Basic knowledge of rules of the game.

Course Objectives:

1. To develop fundamental skills in rifle and pistol shooting through technical knowledge, practical drills, and mental preparation for competitive performance.

Course Outcomes: After completion of this course, students will be able to -

CO1	Master fundamental and advanced shooting techniques for both rifle and pistol, including aiming, breathing, and triggering.
CO2	Develop strong mental focus and relaxation techniques essential for high-performance shooting and competition readiness.
CO3	Gain hands-on experience in live shooting drills and positional shooting, preparing them for competitive shooting scenarios.

Course Contents:

Sr. No.	**Description**	**Duration (Hrs.)**
1.	Introduction about shooting game	2
2.	Basic technical knowledge	2
3.	Technique Refinement(aiming, breathing and triggering)	2
4.	Learning about live shooting and technics	2
5.	Practicing standard Positional rifle Shooting	2
6.	Mental Preparation and Focus	2
7.	Practice and learning session of live shooting(rifle)	2
8.	Learning about pistol shooting(pistol)	2
9.	Introduction of pistol positions and dry practice	2
10.	Practical Shooting Drills (basic)	2
11.	Learning about live shooting and technics(standing position)	2
12.	Learning of Concentration, breathing and relaxing exercise for shooting	2
13.	Introduction of competition level and practice	2
14.	Final test and oral (rifle and pistol match)	2
	TOTAL	**28**

Reference Books:

1. David Watson, "ABCs of Rifle Shooting", Gun Digest (Imprint of KP Books), 2014

E-Resources:

1. Introduction to Exercise Physiology & Sports Performance, IIT Madras, https://nptel.ac.in/courses/109106406

DEPARTMENT OF CIVIL ENGINEERING

Program: B. Tech. (Civil Engineering)							**Semester:** I		
Course: Liberal Learning – I (Volleyball)							**Code:** CECC102I		
Teaching Scheme (Hrs/week)				**Evaluation Scheme (Marks)**					
Lecture	**Practical**	**Tutorial**	**Credit**	**CIE**	**ETE**	**TW**	**OR**	**PR**	**Total**
-	02	-	01	-	-	25	-	-	25

Prerequisites:

Proper health, Basic knowledge of rules of the game.

Course Objectives:

1. To develop foundational volleyball skills, including serving, passing, setting, spiking, and blocking, while mastering game rules and strategies through practical gameplay and scrimmage.

Course Outcomes: After completion of this course, students will be able to -

CO1	Demonstrate proficiency in basic volleyball skills such as serving, passing, setting, spiking, and blocking.
CO2	Apply offensive and defensive strategies effectively, including serve receive and transition play, during gameplay.
CO3	Understand and implement volleyball rules and referee gestures, applying them accurately during practical gameplay and scrimmages.

Course Contents:

Sr. No.	**Description**	**Duration (Hrs.)**
1.	Introduction to Volleyball	2
2.	Basic Skills - Serving	2
3.	Basic Skills- Passing	2
4.	Basic Skills- Setting	2
5.	Spiking Basics	2
6.	Blocking Basics	2
7.	Digging Basics	2
8.	Serve Receive	2
9.	Offensive Strategies	2
10.	Defensive Strategies	2
11.	Transition Play	2
12.	Gameplay & Scrimmage	2
13.	Game Rules , Refree Gestures	2
14.	Practical	2
	TOTAL	**28**

Text Books:

1. Jitendra Kumar, "The Complete Guide to Volleyball", Blue Rose Publisher

Reference Books:

1. N. Ramachandran, "Volleyball: Steps to Success", Sports Publication

E-Resources:

1. https://coachtube.com/course/volleyball/volleyball-for-beginners/7004

DEPARTMENT OF CIVIL ENGINEERING

Program: B. Tech. (Civil Engineering)						**Semester:** I			
Course: Liberal Learning – I (Football)						**Code:** CECC102J			
Teaching Scheme (Hrs/week)				**Evaluation Scheme (Marks)**					
Lecture	**Practical**	**Tutorial**	**Credit**	**CIE**	**ETE**	**TW**	**OR**	**PR**	**Total**
-	02	-	01	-	-	25	-	-	25

Prerequisites:

Proper health, Basic knowledge of rules of the game.

Course Objectives:

1. To enhance players' technical skills, tactical understanding, physical fitness, teamwork, and sportsmanship, fostering a comprehensive understanding and appreciation of the game.

Course Outcomes: After completion of this course, students will be able to -

CO1	To identify and describe the fundamental skills and strategies involved in football, including ball control, dribbling techniques, basic offensive and defensive tactics.
CO2	To apply advanced dribbling and passing techniques during practice sessions.
CO3	To design and execute a cohesive game plan that integrates set pieces, team chemistry, and communication, evaluating its effectiveness through simulation matches.

Course Contents:

Sr. No.	**Description**	**Duration (Hrs.)**
1.	Introduction and Basic Skills.	2
2.	Ball Control and Movement.	2
3.	Advanced Dribbling and Passing.	2
4.	Shooting and Finishing.	2
5.	Offensive Tactics.	2
6.	Defensive Tactics.	2
7.	Set Pieces (Offensive and Defensive).	2
8.	Team Chemistry and Communication.	2
9.	Midfield Dominance.	2
10.	Forward Play and Creativity.	2
11.	Defense Organization.	2
12.	Goalkeeper Training.	2
13.	Speed and Agility.	2
14.	Simulation Matches.	2
	TOTAL	**28**

Text Books:

1. Srinivasan J. B, "Football Coaching: A Comprehensive Guide", Sports Publishing.

Reference Books:

1. Rob Ellis, "The Complete Guide to Coaching Soccer", Meyer & Meyer Sport.

E-Resources:

1. Udemy – Soccer Courses - https://www.udemy.com/topic/soccer/

DEPARTMENT OF CIVIL ENGINEERING

Program: B. Tech. (Civil Engineering)						**Semester:** I			
Course: Indian Knowledge System and Financial Literacy						**Code:** CEIK101			
Teaching Scheme (Hrs/week)				**Evaluation Scheme (Marks)**					
Lecture	**Practical**	**Tutorial**	**Credit**	**CIE**	**ETE**	**TW**	**OR**	**PR**	**Total**
02	-	-	02	-	-	50	-	-	50

Prerequisites:

Basic knowledge of algebra and mathematical operations.

Course Objectives:

1. To facilitate the students with the concepts of Indian traditional knowledge and to make them understand the importance of roots of Indian Knowledge System.
2. To make students proficient in fundamental financial concepts essential for managing personal finances effectively.
3. To equip students with practical budgeting skills to empower them to achieve financial independence.

Course Outcomes: After completion of this course, students will be able to -

CO1	Understand IKS fundamentals, Indian numeral system, and key contributions in mathematics and measurement.
CO2	Recognize metal working techniques, Vastushastra principles, historical engineering and architecture practices.
CO3	Understand financial concepts, money types, bank accounts, and essential financial terms for practical application.
CO4	Manage budgets, credit, loans, and develop financial plans for career and education goals.
CO5	Understand various investments, risk management, insurance types, and develop retirement planning strategies.
CO6	Comprehend tax forms, compliance, fraud protection, and financial considerations for investments and business.

Course Contents:

Unit	**Description**	**Duration (Hrs.)**
1.	**Foundations of Indian Knowledge System:** Definition and scope of IKS, Historical development and significance. **Number System and Units for Measurement**: Salient features of the Indian numeral system, The discovery of zero and its importance, Decimal Systems, Measurement of time, distance and weight. **Mathematics**: Unique aspects of Indian mathematics, Great mathematicians and their significant contributions in the area of arithmetic, algebra, geometry, trigonometry, binary mathematics.	5
2.	**Application of Indian Knowledge System:** Metals and Metal Working: Mining and ore extraction, Extraction of iron from Biotite by indigenous techniques, Lost wax casting of idols and artefacts, Architecture and Structures: Vastushastra, Unitary buildings and Town planning, Temple architecture. Physical structures in India, Irrigation and water management	5

3.	**Finance:** Importance of Financial Literacy for Engineers, Understanding Money, Types of Money- Cash, Cheque, UPI Payment, Digital Currency, etc Types of bank accounts - saving, salary, current, loan, etc., Basic financial Terms- Income, Expenditure, Balance, saving, loan, interest rates, compound interest rate, credit, Investment, Taxes.	4
4.	**Financial Planning:** Personal budgeting, Understanding debit and credit card, credit score, Types of credit card, credit card payment cycle, Barrowing, Loans / Debts, Types of loans, Terms of barrowing, Loan, Interest rate, Principal, EMI, EMI Calculation, Repayment of loan/debt strategy, Financial Planning for Career Development, Higher studies,	5
5.	**Investment and Wealth Management:** Basics of Investing, Effect of compounding, Types of Investment (fixed deposit, recurring deposits, Insurance policies, Bonds, Mutual Funds, Stocks, real estate, etc.) Risk and Return, Concept of SIP, STP and SWP, Stock Market, Stock Exchanges, reading of stock market indices, Life insurance, healthcare insurance, vehicle insurance, Importance of early retirement planning, Investment strategy, Pension Plan, Portfolio management,	5
6.	**Finance Compliance:** Types of Taxes, Types of Income Tax return form and Filling, Taxes and reforms, Impact of taxation policy on Investment, Scams and Frauds, Protection of personal information, Financial consideration for starting business, Real estate and purchase	4
	TOTAL	**28**

Text Books:

1. B. Mahadevan, Vinayak Rajat Bhat, Nagendra Pawana R. N., "Introduction to Indian Knowledge System – Concepts and Applications", PHI Learning Pvt. Ltd., New Delhi.
2. Dr. Babu V., Mr. Mohammed Umair, "Financial Literacy", Himalaya Publishing House, First Edition.

Reference Books:

1. A. K. Bag, "History of Technology in India", Vol. I, Indian National Science Academy, New Delhi.
2. Dr. S. Gurusamy, "Indian Financial System", Tata McGraww-Hill Education Pvt. Ltd 2nd Edition.
3. D.N. Bose, S.N. Sen and B. V. Subbarayappa, "A Concise History of Science in India", Indian National Science Academy, New Delhi.

E-Resources:

1. SWAYAM - "Indian Knowledge System(IKS): Concepts and Applications in Engineering", Indian Institute of Management Bangalore (IIMB), Chanakya University, Bangalore. https://onlinecourses.swayam2.ac.in/imb23_mg53/preview
2. SWAYAM - "Introduction to Banking and Financial Markets", Indian Institute of Management Bangalore (IIMB), - https://onlinecourses.swayam2.ac.in/imb23_mg14/preview
3. Online free course on "Financial Literacy" by Khan Academy. https://www.khanacademy.org/college-careers-more/financial-literacy/xa6995ea67a8e9fdd:welcome-to-financial-literacy

SYLLABUS

SEMESTER - II

DEPARTMENT OF CIVIL ENGINEERING

Program: B. Tech. (Civil Engineering)								**Semester:** II	
Course: Engineering Mathematics - II								**Code:** CEBS203	
Teaching Scheme (Hrs/Week)				**Evaluation Scheme (Marks)**					
Lecture	**Practical**	**Tutorial**	**Credit**	**CIE**	**ETE**	**TW**	**OR**	**PR**	**Total**
03	-	-	03	40	60	-	-	-	100

Prerequisites:

Basic concept of Differentiation, Integration and Vector.

Course Objectives:

1. To introduce student some methods to find the solution of first order & first degree ordinary differential equations with its applications.
2. To make students familiar with vector differentiation.
3. To acquaint the student with mathematical tools needed in evaluating improper integrals, multiple integrals and their usage.

Course Outcomes: After completion of this course, students will able to -

CO1	Solve first order ordinary differential equation.
CO2	Apply differential equation in engineering applications.
CO3	Find the velocity vector, gradient, divergence, curl.
CO4	Evaluate improper integrals.
CO5	Set up and solve multiple integrals for regions in the plane.
CO6	Use of multiple integrals to find area bounded by curves & volume bounded by surfaces.

Course Contents:

Unit	**Description**	**Duration (Hrs.)**
1.	**First Order Ordinary Differential Equation:** Exact differential equations, Equations reducible to exact form. Linear differential equations, Equations reducible to linear form and Bernoulli's equation.	7
2.	**Applications of Differential Equations:** Applications of differential equations to orthogonal trajectories, Newton's law of cooling, Kirchhoff's law of electrical circuits, Rectilinear motion, Simple harmonic motion, One dimensional conduction of heat.	7
3.	**Vector Differential Calculus:** Velocity vector, acceleration vector, tangential and normal component of acceleration, Vector differential operator, gradient, directional derivatives, angle between surfaces, Divergence and curl, solenoidal and irrotational field	7
4.	**Integral Calculus:** Reduction formulae, Beta and Gamma functions, Differentiation under integral sign and Error functions.	7
5.	**Multiple Integrals:** Double integration in cartesian & polar coordinates, Change of order of integration, Triple integral in cartesian & polar coordinates.	7

6.	**Applications of Multiple Integral:** Applications to find Area, Volume, Mass, Centre of gravity and Moment of inertia.	7
	TOTAL	**42**

Text Books:

1. B. V. Ramana, "Higher Engineering Mathematics", Tata McGraw Hill.
2. B. S. Grewal , "Higher Engineering Mathematics" , Khanna Publication
3. H. K. Dass, "Higher Engineering Mathematics", S. Chand Publication
4. C. Ray Wylie & L. Barrett, "Advanced Engineering Mathematics", McGraw Hill Publications.

Reference Books:

1. Erwin Kreyszig, "Advanced Engineering Mathematics", Wiley Eastern Ltd.
2. M. D. Greenberg , "Advanced Engineering Mathematics" , Pearson Education
3. Peter V. O'Neil , "Advanced Engineering Mathematics" , Thomson Learning
4. P. N. Wartikar and J. N. Wartikar, "Applied Mathematics (Vol. I & Vol. II)", Vidyarthi Griha Prakashan, Pune.
5. Ron Larson and David C. Falvo, "Elementary Linear Algebra" , Houghton Mifflin Harcourt Publishing Company

E-Resources:

1. A NPTEL Course on "Engineering Mathematics-II" IIT Khargpur - https://youtube.com/playlist?list=PLbRMhDVUMngeVrxtbBz-n8HvP8KAWBpI5&si=3xAONJdT2ph_jcvG
2. Applications of Differential Equations | Orthogonal Trajectories - https://www.youtube.com/watch?v=Ziu0y2kWTCM&list=PLT3bOBUU3L9juyFTI3lpeXXhIetVB00cr
3. "Applications of Differential Equations| Newton's law of Cooling –" https://www.youtube.com/watch?v=gJSvcf9_Duc
4. Dr. Gajendra Purohit, "Gradient of a Scalar Field & Directional Derivative | Normal Vector" https://www.youtube.com/watch?v=9CHfHuFBTw8&list=PLU6SqdYcYsfJz9FAzbgocIjlkw4NXAar-&index=2
5. Dr. Gajendra Purohit, "Double Integral & Area By Double Integration | Multiple Integral" https://www.youtube.com/watch?v=db7d_a0wiUg&list=PLU6SqdYcYsfLoKyzF_dwxAQf8lIi6VC54
6. Double Integration - Change of Order of Integration | Cartesian & Polar https://www.youtube.com/watch?v=fXMyLYwBB3s&list=PLU6SqdYcYsfLoKyzF_dwxAQf8lIi6VC54&index=4

DEPARTMENT OF CIVIL ENGINEERING

Program: B. Tech. (Civil Engineering)								**Semester:** II	
Course: Engineering Chemistry								**Code:** CEBS204	
Teaching Scheme (Hrs/week)				**Evaluation Scheme (Marks)**					
Lecture	**Practical**	**Tutorial**	**Credit**	**CIE**	**ETE**	**TW**	**OR**	**PR**	**Total**
02	02	-	03	40	60	25	-	-	125

Prerequisites:

Basic knowledge of volumetric analysis, structure property relationship, classification and properties of polymers, electromagnetic radiation, electrochemical series.

Course Objectives:

1. To familiarize the students with the basic phenomenon/concepts of chemistry and its applications in various fields of Engineering.
2. To impart knowledge of technologies involved in water analysis to improve water quality.
3. To learn significance science of corrosion and preventive methods used for minimizing corrosion.
4. To understand structure, properties and applications of speciality polymers and nanomaterials.

Course Outcomes: After completion of this course, students will be able to -

CO1	Analyze water softening parameters.
CO2	Utilize different analytical methods for analysis of various chemical compounds.
CO3	Understand the mechanism of destruction of metals (corrosion) and effective preventive measures.
CO4	Explore the knowledge of advanced engineering materials for various engineering applications.
CO5	Analyze fuel and suggest use of alternative fuels.
CO6	Familiarize with classification, properties and applications of nanomaterials.

Course Contents:

Unit	**Description**	**Duration (Hrs.)**
1.	**Water Technology:** Introduction, Chemical Analysis of Water- Hardness; Temporary and Permanent, Alkalinity (Hydroxide, Carbonate and Bicarbonate), Softening Methods: Zeolite and Demineralization Process, Water Purification: Reverse Osmosis. Simple Numerical on Hardness Determination and Alkalinity Calculation.	5
2.	**Instrumental Methods of Analysis:** Types of analysis: Quantitative and Qualitative analysis Introduction, Instrumentation and Applications of following methods: Colorimetry, pHmetry (Titration of Strong acid versus Strong base), Conductometry (Titration of Strong acid versus Strong base)	5
3.	**Corrosion Science:** Introduction, Types of Corrosion-Dry and Wet corrosion, Wet Corrosion Mechanism: Hydrogen Evolution and Oxygen Absorption, Factors affecting rate of corrosion. Methods of prevention of corrosion: Cathodic Protection (Sacrificial Anode), Anodic Protection (Anodizing), Methods to apply Metallic Coatings-Hot dipping, Electroplating.	4

4.	**Engineering Polymers:** Polymers: Introduction, Definition of Polymer, Monomer and Functionality of monomers Speciality Polymers: Introduction, Preparation, Properties and Applications of the following polymers: 1. Engineering Thermoplastic: Polycarbonate 2. Conducting Polymer: Polyacetylene Polymer Composites: Introduction, Constituents of composite, Advantages over conventional materials, Applications, Fiber Reinforced Plastic (FRP)-Glass reinforced and Carbon reinforced.	5
5.	**Fuels and Combustion:** Introduction, Calorific value - Definition, Gross and Net calorific value, Determination of Calorific value: Principle, Construction and Working of Bomb Calorimeter (Simple Numerical), Solid fuel: Coal: Analysis of Coal-Proximate (Simple Numerical). Alternate fuels: Biodiesel and Power alcohol. Hydrogen as future fuel: Production, Advantages, Storage and Applications in Hydrogen fuel cell.	5
6.	**Nanomaterials:** Introduction, Classification of Nanomaterials Based on Dimensions, Nanoscale materials: Structure, Properties and Applications of Graphene and Quantum dots (semiconductor nanoparticles), Importance of Nanotechnology in engineering applications.	4
	TOTAL	**28**

List of Experiments:

A. Lab Experiments (Any Seven)

1. Determination of hardness of water by EDTA method.
2. Determination of alkalinity of water.
3. Determination of strength of strong acid using pH meter.
4. Determination of maximum wavelength of absorption of $CuSO_4$/$FeSO_4$/$KMnO_4$, verify Beer's law and find unknown concentration of given sample.
5. Titration of a mixture of strong acid with strong base using Conductometer.
6. Preparation of phenol-formaldehyde/urea-formaldehyde resin.
7. Proximate analysis of coal.
8. Coating of copper or zinc on iron plate using electroplating.
9. Determination of the molecular weight of a polymer by using Ostwald's Viscometer.

B. Demonstration (virtual) (Any One)

10. Demonstration of effect of environmental conditions on metal by weight loss method.
11. Synthesis of oxide nanoparticles.

C. Mandatory visit to chemical industry/research laboratory/water treatment plant.

Text Books:

1. O.G. Palanna," Engineering Chemistry", Tata McGraw Hill Education Pvt. Ltd.
2. Dara S. S., Umare S. A., "Textbook of Engineering Chemistry", 12th Ed, S. Chand & Com Ltd.
3. Jain and Jain, "Engineering Chemistry", 16th Ed, Dhanpat Rai and Co. (Pvt.) Ltd., Delhi.

Reference Books:

1. G. R. Chatwal& S. K. Anand, "Instrumental Methods of Chemical Analysis", Himalaya Publishing House.
2. Dr. Sunita Rattan; A Textbook of Engineering Chemistry; 3rd Ed, S. K. Kataria & Sons, New Delhi
3. V. R. Gowarikar, N. V. Viswanathan, Jayadev Sreedhar, "Polymer Science", Wiley Eastern Limited.
4. Billmeyer F. W., "Textbook of polymer science", John Wiley and Sons.
5. B. Sivasankar, "Engineering Chemistry", Tata Mcgraw-Hill Education Publishing company Limited.
6. G. L. Hornyak, J. J. Moone, H. F. Tihhale, J. Dutta "Fundamentals of Nanotechnology", CRC press.

E-Resources:

MOOC / NPTEL/YouTube Links:

1. NPTEL Course on Corrosion, IISc Banglore : http://nptel.ac.in/courses/113108051/
2. NPTEL Course on Polymer, IIT Kharagpur: http://nptel.ac.in/courses/104105039/, http://nptel.ac.in/courses/104103071/40
3. NPTEL Course on Water Technology, IIT Kanpur: http://nptel.ac.in/courses/105104102/
4. NPTEL Course on UV-Visible Spectroscopy: http://nptel.ac.in/courses/102103044/4
5. NPTEL Course on Energy Sources: http://nptel.ac.in/courses/103105110/4
6. NPTEL Course on "Engineering Chemistry-I, https://nptel.ac.in/courses/122/106/122106028/
7. NPTEL Course on "Fundamentals of Spectroscopy", NCL,IISER Pune https://nptel.ac.in/courses/104/106/104106122/

Virtual Labs:

1. PICT Pune: http://chemistryvl.pict.edu/#/
2. NITK Surathkal: Hardness of water: https://ee1-nitk.vlabs.ac.in/exp/determination-of-hardness/simulation.html#:
3. NITK Surathkal: Alkalinity of water: https://ee1-nitk.vlabs.ac.in/exp/determination-of-alkalinity/ simulation.html
4. IIT Hyderabad: Colorimeter, verification of Beer's law, https://mas-iiith.vlabs.ac.in/exp/beer-law/ simulation.html
5. IIT Kanpur: Preparation of phenol-formaldehyde resin, http://ebootathon com/labs/beta/chemistry/ EngineeringChemistryLab/exp1/simulation.html
6. Amrita University: Determination of viscosity average molecular weight polymer, https://pcv-au.vlabs.ac.in/physicalchemistry/Determination_of_ViscosityAverageMolecularWeightofPolymer/

DEPARTMENT OF CIVIL ENGINEERING

Program: B. Tech. (Civil Engineering)								**Semester:** II	
Course: Engineering Mechanics								**Code:** CEES203	
Teaching Scheme (Hrs/week)				**Evaluation Scheme (Marks)**					
Lecture	**Practical**	**Tutorial**	**Credit**	**CIE**	**ETE**	**TW**	**OR**	**PR**	**Total**
03	02	-	04	40	60	50	-	-	150

Prerequisites:

1. Fundamental grasp of physics, particularly mechanics, including concepts such as force, motion, and equilibrium.
2. Proficiency in mathematics, especially algebra, trigonometry, and calculus.
3. Understanding concepts related to forces, Stress strain etc.
4. Familiarity with engineering principles and terminology, as well as basic knowledge of materials and their properties.

Course Objectives:

1. To develop students' ability to analyze the problems involving forces, moments with their applications.
2. To analyze the member forces in trusses
3. To make students to learn the effect of friction on different planes
4. To develop the student's ability to find out the center of gravity and moment of inertia and their applications.
5. To make the students learn about kinematics and kinetics and their applications.

Course Outcomes: After the completion of course, students will be able to

CO1	Compute the resultant of a force system and resolution of a force.
CO2	Comprehend the action for forces, moments, and other types of loads on rigid and analyze the frictional resistance offered by different planes.
CO3	Determine reactions of beams and calculate forces in trusses using principles of equilibrium.
CO4	Locate the centroid and compute the moment of inertia of sections.
CO5	Calculate position, velocity and acceleration of particle using principles of kinematics.
CO6	Calculate position, velocity and acceleration of particle using principles of kinetics and Work, Power, Energy.

Course Contents:

Unit	**Description**	**Duration (Hrs.)**
1.	**Fundamentals of Force and Force Systems:** Fundamental Laws in mechanics, Force, System of Forces, Resolution and Composition of Forces, Resultant of coplanar force system, Moment, Varignon's Theorem, Law of Moments, Couple, Equivalent force couple system, Numerical examples.	7
2.	**Equilibrium of Bodies and Friction:** **Equilibrium of systems/bodies:** Conditions of Equilibrium, Lami's Theorem, Free Body Diagram Numerical examples.	7

	Friction: Laws of friction, application of friction on inclined planes, Wedges and ladders friction, belt friction, Numerical examples.	
3.	**Analysis of Beams and Trusses:** **Beams:** Types of supports, Types of beams, Types of loads, Analysis of Simple and Compound beams, Determination of support reactions Numerical examples. **Introduction of Trusses**, Perfect Truss, Deficient Truss, Redundant Truss, Analysis of Statically determinate plane trusses by Method of Joints & Method of Section Numerical examples.	8
4.	**Centroid & Moment of Inertia:** **Centroid of Plane areas:** Introduction, Locating the centroid of rectangle, triangle, circle, semicircle, quadrant and sector of a circle, centroid of composite areas and simple built-up sections, Numerical examples. **Moment of inertia of plane areas:** Introduction, Rectangular moment of inertia, polar moment of inertia, product of inertia, radius of gyration, parallel axes theorem, perpendicular axis theorem, moment of inertia of rectangular, triangular and circular areas, moment of inertia of composite areas and simple built-up sections, Numerical examples	8
5.	**Kinematics:** Kinematics of linear motion- Basic concepts Equation of motion for constant acceleration Motion under gravity, Variable acceleration, Kinematics of curvilinear motion- Basic Concepts, Equation of motion in Cartesian coordinates, Motion of projectile. Numerical examples.	6
6.	**Kinetics of Particle:** Kinetics- Newton's Second Law of motion & its application. Work, power, energy, conservative and non-conservative forces Conservation of energy for motion of particle Numerical examples.	6
	TOTAL	**42**

List of Experiments:

1. Verification of law of parallelogram of forces
2. Verification of law of polygon of forces.
3. To determine the support reaction of simple beams.
4. To determine the support reaction of compound beams.
5. Determination of coefficient friction of belt/inclined plane.
6. To study the curvilinear motion.
7. Determination of coefficient of restitution.
8. Assignment of five problems on every unit to be solved during practical
9. A site visit to godown/ warehouse/ mobile tower/ suspension bridge having truss, cables and frames.

Text Books:

1. F. P. Beer and E. R. Johnson, "Vector Mechanics for Engineers", McGraw-Hill Publication.
2. R. C. Hibbeler, "Engineering Mechanics", Pearson Education.
3. Bansal R. K., Rakesh Ranjan Beohar, and Ahmad Ali Khan, "Basic Civil Engineering and Engineering Mechanics", Laxmi Publications.
4. R.S. Khurmi, "Engineering Mechanics", S. Chand Publications.
5. P.G. Deshpande, "Applied Mechanics", Mahalaxmi Publication.

6. Bhavikatti S. S., "Engineering Mechanics", New Age International, 2019.

Reference Books:

1. S. P. Timoshenko and D. H. Young, "Engineering Mechanics", McGraw-Hill Publication.
2. J. L. Meriam and Craig, "Engineering Mechanics", John Wiley.
3. F. L. Singer, "Engineering Mechanics", Harper and Rowe Publication.
4. A. P. Boresi and R. J. Schmidt, "Engineering Mechanics", Brooks/Cole Publication.

E-Resources:

1. A Video on "Introduction to Engineering Mechanics"- https://www.youtube.com/watch?v=ksmsp9OzAsI
2. A Video on "Newton's First law of motion" - https://www.youtube.com/watch?v=LEHR8YQNm_Q
3. A Video on "Newton's Second law of motion" https://www.youtube.com/watch?v=ZvPrn3aBQG8
4. A Video on "Newton's Third law of motion" https://www.youtube.com/watch?v=aKCQv4UpOfo
5. A Video on "Force system" https://www.youtube.com/watch?v=iy8l6vUm0iw
6. A Video on "Couple" https://www.youtube.com/watch?v=hy7Tg8UoaP4
7. A video on "Free Body Diagram (FBD)" https://www.youtube.com/watch?v=4Bwwq1munB0
8. NPTEL Video Lecture on "Friction, Types of friction & Laws of friction" https://t.ly/Lpe-q
9. NPTEL Video Lecture on "Types of supports, Beams & Loads acting on beam" https://shorturl.at/W3AId
10. A Video on "Truss & it's Types" https://www.youtube.com/watch?v=gd5bMFWtuHU
11. NPTEL Video Lecture on "Analysis of trusses by method of joints" https://t.ly/JMViq
12. NPTEL Video Lecture on "Analysis of trusses by method of section" https://t.ly/104Yr
13. A Video on "Centroid" https://www.youtube.com/watch?v=R8wKV0UQtlo
14. A Video on "Types of Motion" https://www.youtube.com/watch?v=8qh--3X6E5w
15. A Video on "Curvilinear Motion" https://www.youtube.com/watch?v=7J_Pi4Xuk7Y
16. A Video on "Motion Under Gravity" https://www.youtube.com/watch?v=9IIPl-eXBqs
17. NPTEL Video Lecture on "Projectile Motion" https://shorturl.at/c4Jt1
18. A Video on "Potential Energy & Kinetic Energy" https://www.youtube.com/watch?v=IqV5L66EP2E
19. A Video on "Work, Force & Energy", https://www.youtube.com/watch?v=WSY4HzWZIlo

DEPARTMENT OF CIVIL ENGINEERING

Program: B. Tech. (Civil Engineering)								**Semester:** II	
Course: Fundamental of Electrical and Mechanical Engineering								**Code:** CEES204	
Teaching Scheme (Hrs/Week)				**Evaluation Scheme (Marks)**					
Lecture	**Practical**	**Tutorial**	**Credit**	**CIE**	**ETE**	**TW**	**OR**	**PR**	**Total**
02	-	-	02	40	60	-	-	-	100

Prerequisites:

Basic knowledge of Physics, Familiarity with fundamental electrical principles, Basics of linear algebra, Basics of thermodynamics.

Course Objectives:

1. To familiarize students with the fundamentals of Electrical Engineering.
2. To make students understand the fundamentals of refrigeration, air-conditioning and internal combustion engines.
3. To make students aware about psycrometry and HVAC system for human comforts.

Course Outcomes: On completion of the course, learner will be able to -

CO1	Explain the relationships among work, power, and energy, as well as the charging and discharging processes of Lead Acid and Lithium-Ion batteries.
CO2	Describe operational principle of transformer, DC machines and induction motor used in electrical applications.
CO3	Explore electrical wiring components and accessories.
CO4	Analyze refrigeration and air-conditioning systems.
CO5	Assess human comfort conditions using psychrometric principles and HVAC systems.
CO6	Compare internal combustion engines.

Course Contents:

Unit	**Description**	**Duration (Hrs.)**
1.	**Work, Power, Energy and Batteries:** **Part A)** Effect of temperature on resistance, resistance temperature coefficient (derivation and numerical), insulation resistance of single core cable (derivation and numerical), conversion of energy from one form to another in electrical, mechanical, and thermal systems. **Part B)** Lead acid and Lithium-Ion battery – (Construction, working, charging and discharging of batteries), concept of depth of charging, state of charge of battery, battery capacity, battery efficiency, ampere-hour and watt-hour of battery, maintenance of batteries.	5
2.	**Transformer and Electrical Machines:** **Part A)** Construction, principle, working, e.m.f. equation of transformer, ideal and practical transformer, losses, types of transformers (step up and step-down transformer), concept of voltage regulation and efficiency (numerical). **Part B)** Construction, working principle, types, and applications of DC generator and motor, voltage expression of generator and motor (derivation not expected),	6

	concept of back-emf, and armature and shaft torque equation (derivation not expected, numerical), construction, working, principle, types, applications of three-phase induction motor.	
3.	**Electrical wiring components and accessories:** Overview of conducting and insulating materials used for Electrical fitting, common electrical accessories (switches, socket outlets and plugs, lamp holder, cable clamp, wires) - their functions and types, conduit wiring and concealed wiring (Types, material used), different types of measuring instruments in Electrical Engineering (multimeter, voltmeter, wattmeter, ammeter etc.) – only their function, general safety measures while working with Electrical appliances, protective devices – fuse, MCB, MCCB (their function and types), earthing - (definition, importance of earthing, types, advantages of earthing, difference between earthing and neutral).	4
4.	**Refrigeration and Air Conditioning System:** Refrigeration: Introduction, its meaning and application, unit of refrigeration; Components and working of Refrigerator, Basic Refrigeration Cycle - Bell-Coleman cycle of refrigeration, their Coefficient of Performance (COP) (Simple Numericals) Air-Conditioning: Introduction, its meaning and general application, Classification, Components and working of window air-conditioning system.	5
5.	**Psychrometric and Introduction to HVAC:** Human Comfort Condition, factors affecting human comfort, Psychrometry and Psychrometric Properties, Basic Terminologies & Psychrometric Relations, Psychrometric Processes, Psychrometric Chart, Introduction to Heating, Ventilation, Introduction to HVAC and its applications.	4
6.	**Internal Combustion (IC) Engines:** Engine, Classification, Construction, Terminology, working of 2 Stroke (2S) and 4 stroke (4S) engines, comparison of 2S and 4S engines, Petrol and Diesel Engines, Applications of IC Engines.	4
	TOTAL	**28**

Text Books:

1. B.L. Theraja, A. K. Theraja, "A Textbook of Electrical Technology" - Volume I: Basic Electrical Engineering", S Chand Publication.
2. V. K. Mehta, Rohit Mehta, "Basic Electrical Engineering", S. Chand and Company Private Ltd.
3. Nag P. K., "Engineering Thermodynamics," Tata McGraw-Hill Publisher Co. Ltd.
4. Rajput R.K., "Basic Mechanical Engineering", Laxmi Publications Pvt. Ltd.

Reference Books:

1. E. Hughes, "Electrical and Electronics Technology", Pearson, 2010.
2. L. S. Bobrow, "Fundamentals of Electrical Engineering", Oxford University Press, 2011.
3. Khurmi R.S. and Gupta J. K., "A Textbook of Thermal Engineering", S. Chand & Sons.
4. Ganeshan V., "Internal Combustion Engines", McGraw Hill.

E-Resources:

1. https://archive.nptel.ac.in/courses/108/105/108105112/
2. https://archive.nptel.ac.in/courses/108/108/108108076/
3. https://archive.nptel.ac.in/courses/112/105/112105129/
4. https://archive.nptel.ac.in/courses/112/103/112103262/

DEPARTMENT OF CIVIL ENGINEERING

Program: B. Tech. (Civil Engineering)							**Semester:** II		
Course: Concrete Technology							**Code:** CEPC201		
Teaching Scheme (Hrs/week)				**Evaluation Scheme (Marks)**					
Lecture	**Practical**	**Tutorial**	**Credit**	**CIE**	**ETE**	**TW**	**OR**	**PR**	**Total**
03	-	-	03	40	60	-	-	-	100

Prerequisites:

1. Basic understanding of materials science and engineering principles.
2. Familiarity with construction practices and terminology.
3. Knowledge of mathematics, particularly in calculations involving proportions and measurements.
4. Awareness of safety protocols and procedures related to working with construction materials.

Course Objectives:

1. To know properties of various ingredients of concrete and concept of mix design.
2. To learn the behavior and properties of concrete in a fresh and hardened state.
3. To understand special concrete and their applications.
4. To understand the durability aspects and preventive measures to enhance the fife of concrete.

Course Outcomes: After the completion of course, students will be able to

CO1	Identify the ingredients of concrete and its suitable proportion to achieve desired results.
CO2	Compare the properties of concrete in fresh state.
CO3	Demonstrate the properties of concrete in a hardened state.
CO4	Design the concrete mix as per relevant codes.
CO5	Distinguish concreting equipments, techniques and types of special concrete.
CO6	Determine repairing methods and techniques after examining deteriorations in concrete.

Course Contents:

Unit	**Description**	**Duration (Hrs.)**
1.	**Concrete Ingredients:** **A) Cement:** Cement manufacturing process, chemical composition and their importance, hydration of cement, types of cement. testing of cement (list and significance only), steps to reduce carbon footprint. **B) Fine aggregates:** Functions, requirements, alternatives to river sand, m-sand introduction, and manufacturing. **C) Coarse aggregates:** Importance of size, shape and texture. grading and blending of aggregates. properties and testing (list and significance only) of aggregates, recycled aggregates. **D) Water –** Requirements of water quality as per IS code. **E) Chemical admixtures –** Plasticizers, accelerators, retarders, and air entraining agents. **Mineral admixtures –** Pozzolanic and cementitious materials, fly ash, GGBS, silica fumes, metakaolin and rice husk ash.	7

2.	**Production and Properties of Fresh Concrete:** **A) Production of Fresh Concrete:** Nominal mixes, water-cement ratio, process of manufacturing fresh concrete-batching, mixing, transportation, compaction, curing of concrete, curing methods, influence of temperature, maturity rule. B) **Properties of Fresh Concrete:** Workability and factors affecting workability, consistency and setting time, bleeding, segregation, and laitance- causes and prevention, rheology of fresh concrete, temperature effects, effect of admixture on workability of concrete and optimum dosage of admixture using marsh cone test.	7
3.	**Properties of Hardened Concrete:** **A) Properties:** Factors affecting strength, micro-cracking and stress-strain relationship, relation between tensile and compressive strength, impact strength, abrasion resistance, creep and shrinkage. **B) Significance of Tests:** destructive tests: compression strength, flexural strength and tensile strength, pullout test, core test. nondestructive tests: rebound hammer, ultrasonic pulse velocity, and impact echo test, magnetic particle testing, liquid penetration testing, visual testing, laser testing methods, leak testing, carbonation test, half-cell potentiometer and corrosion of steel and relevant provisions of I.S. codes.	7
4.	**Mix Design of Concrete:** **A) Concrete Mix Design:** Characteristic strength concept and objectives of mix design, factors to be considered, statistical quality control, acceptance criteria for concrete as per IS specifications. quality control guidelines. **B) Methods of Mix Design:** IS code method (Numerical included on with and without mineral admixture).	7
5.	**Concreting Equipment, Techniques and Special concretes:** **A) Concreting Equipment:** Concrete mixers, pumps, vibrators and compaction equipment. **B) Special concreting techniques:** Pumped concrete, ready mix concrete, under water concreting, roller compacted concrete, cold and hot weather concreting, shotcrete concreting. **C) Special concrete:** Light weight concrete and its types, self-compacting concrete, high strength concrete, high performance concrete, reinforced cement concrete, prestressed and precast concrete, fiber reinforced concrete, geo-polymer concrete, vacuum concrete, ferrocement concrete.	7
6.	**Deterioration and Repairs in Concrete:** **A) Deterioration** –Durability and factors affecting durability, permeability, sulphate attack, acid attack, chloride attack, effect of sea water, carbonation of concrete, corrosion of reinforcement. **B) Repairs** – Evaluation of cracks and diagnosis of concrete, repair of defects using various types and techniques, shotcrete and grouting. Introduction to retrofitting of concrete, corrosion monitoring.	7
	TOTAL	**42**

Text Books:

1. M. S. Shetty, "Concrete Technology", S Chand, New Delhi-110055.
2. M. L. Gambhir, "Concrete Technology", Tata McGraw-Hill.

3. A. M. Neville and J.J. Brooks, "Concrete Technology", Pearson.

Reference Books:

1. A. R. Shantakumar, "Concrete Technology", Oxford University Press, 2018.
2. A. M. Neville, "Properties of Concrete", Longman Publishers.
3. R.S. Varshney, "Concrete Technology", Oxford and IBH.
4. P. Kumar Mehta, "Microstructure and Properties of Concrete", Prentice Hall.
5. A. P. Remideos, "Concrete Mix Design", Himalaya Publishing House.
6. J. Bhattacharjee, "Concrete Structures, Repair, Rehabilitation and Retrofitting", CBS Publishers & Distributors Pvt. Ltd.
7. A. Sarja and E. Vesiari, "Durability Design of Concrete Structures", E & FN Spon Publication.

IS Codes:

Latest revised editions of IS codes: IS 456, IS 269, IS 1489, IS 4031, IS 383, IS 2386, IS 9103, IS 516, IS 1199, IS 10262

E-Resources:

1. Cement https://nptel.ac.in/courses/105102012/1
2. Aggregates https://nptel.ac.in/courses/105102012/6
3. Mineral admixtures https://nptel.ac.in/courses/105102012/11
4. Chemical admixtures https://nptel.ac.in/courses/105102012/9, https://nptel.ac.in/courses/105102012/10
5. Concrete mix design https://nptel.ac.in/courses/105102012/14
6. Concrete production & fresh concrete https://nptel.ac.in/courses/105102012/19
7. Engineering properties of concrete https://nptel.ac.in/courses/105102012/23
8. Dimensional stability & durability https://nptel.ac.in/courses/105102012/27
9. Durability of concrete https://nptel.ac.in/courses/105102012/31
10. Special concretes https://nptel.ac.in/courses/105102012/36

DEPARTMENT OF CIVIL ENGINEERING

Program: B. Tech. (Civil Engineering)								**Semester:** I	
Course: Professional Practices in Concrete Testing								**Code:** CEVS202	
Teaching Scheme (Hrs/Week)				**Evaluation Scheme (Marks)**					
Lecture	**Practical**	**Tutorial**	**Credit**	**CIE**	**ETE**	**TW**	**OR**	**PR**	**Total**
-	04	-	02	-	-	25	-	-	25

Prerequisites:

1. Foundational Knowledge of Materials Science.
2. Familiarity with Laboratory Techniques.
3. Understanding of Concrete Technology.
4. Awareness and knowledge of relevant standards and I S Codes.

Course Objectives:

1. To test the basic properties of ingredients of concrete, fresh concrete and hardened concrete.

Course Outcomes: After completion of this course, students will able to-

CO1	Evaluate the suitability of the cement for use in concrete construction.
CO2	Assess the suitability of fine and coarse aggregate for utilization in concrete construction.
CO3	Determine the optimal selection of concrete ingredients and their respective proportions to attain the desired strength.
CO4	Test the properties of concrete in a fresh (not set) state.
CO5	Test the properties of concrete in a hardened state.
CO6	Synthesize operational methods of the RMC plant.

Course Contents:

Unit No.	**Description**	**Duration (Hrs.)**
1.	**Testing of Cement:** Overview of cement manufacturing process, Chemical composition and phases of cement, Types of cement and their applications- **Fineness Test:** Significance and methods (Blaine's air permeability method, sieve analysis),Interpretation of results- **Soundness Test:** Le-Chatelier method, Autoclave method, Causes of unsoundness and its implications- **Consistency and Setting Time Tests:** Vicat apparatus test, Initial and final setting time, Factors affecting setting time- **Compressive Strength Test:** Methods (cubes, prisms), Factors influencing strength development, Evaluation of results- **Tensile Strength Test:** Briquette test, Flexural strength test- **Durability Tests:** Resistance to sulfates, Resistance to alkalis, Carbonation resistance	8
2.	**Testing of Aggregates:** **Coarse aggregates:** Definition and types of coarse aggregates (e.g., gravel, crushed stone), Importance in concrete and asphalt mixtures, Sources and geological considerations- **Particle Size Distribution:** Sieve analysis method- **Shape and Texture:** Flakiness and elongation index tests, Angularity number determination- **Aggregate quality:** Specific gravity, water absorption, moisture	8

	content, Bulk density- **Freeze-Thaw Durability:** Testing methods and standards, Resistance to environmental conditions. **Fine aggregates:** Types of fine aggregates, sources of fine aggregates- **Particle Size Distribution:** Sieve analysis and zoning- **Specific Gravity, Bulking and water Absorption:** Test methods and calculations, Importance in proportioning concrete mixtures**.**	
3.	**Concrete Mix design:** **Introduction to concrete mix design**, principles and objectives- Aggregate selection and grading for optimal concrete performance- Cementitious materials and their influence on mix characteristics- Water-cement ratio and its critical role in strength and durability- Admixtures and their effects on workability, setting time, and strength- **Method of Mix Design:** IS code method (Manual method and using Excel sheet).	8
4.	**Testing of Fresh concrete:** **Introduction to testing of fresh concrete**- importance and objectives- **Workability tests:Slump test:** specimen preparation, and significance- **Compaction factor test:** specimen preparation, and significance- **Flow test:** specimen preparation, and significance- **Vee bee consistency test:** specimen preparation, and significance- Sampling procedures and preparation of test specimens- Interpretation of test results and implications for concrete quality control.	8
5.	**Testing of Hard concrete:** **Introduction to testing hardened concrete**- objectives and importance- **Compressive strength testing**: methods, specimen preparation, and interpretation- **Flexural strength testing:** principles, specimen preparation, and significance- **Density and porosity assessment:** methods and implications for durability- **Non-destructive testing methods:** ultrasound, rebound hammer, and their applications in assessing concrete quality.	12
6.	**Ready Mix and Precast Concrete:** **Ready-Mix Concrete (RMC)**: Production process and batching techniques, Quality control measures and testing procedures, Applications in construction projects, Environmental considerations and sustainability, Advantages over traditional concrete mixing methods- **Precast Concrete:** Manufacturing methods and casting techniques, Quality assurance and testing protocols, Design considerations and structural applications, Installation and handling techniques, Economic and environmental benefits	12
	TOTAL	**56**

List of Experiments: (Any 10)

1. Testing of cement: Consistency, Fineness and Setting time.
2. Testing of cement: Specific Gravity, Soundness and Strength of cement.
3. Testing of fine aggregate: Specific Gravity, Sieve analysis and zoning,
4. Testing of fine aggregate: Bulking of fine aggregate, Bulk density and silt content.
5. Testing of coarse aggregate: Specific Gravity, Sieve analysis and Bulk density.
6. Testing of coarse aggregate: Flakiness index, elongation index, Water absorption & moisture content.
7. Workability of concrete by Slump cone, Compaction factor and/or Vee Bee test.

8. Tests on self-compacting concrete- Mix design of self-compacting concrete, Slump flow test, V-funnel test, J-Ring test, U Box test and L Box test
9. Determination of Compressive strength test of concrete by Crushing and Rebound hammer/ ultrasonic pulse velocity.
10. Determination of indirect tensile strength and Flexural strength of hardened concrete.
11. Fatigue test on concrete.
12. Concrete mix design by IS code method manually and using spreadsheet (Assignment).
13. Site visit and Report writing of RMC plant or precast concrete plant.
14. Assignment on each unit covering those tests which are not included in compulsory experiments.

Text Books:

1. M. S. Shetty, "Concrete Technology", S Chand, New Delhi-110055.
2. M. L. Gambhir, "Concrete Technology", Tata McGraw-Hill.
3. A. M. Neville, "Concrete technology", J.J. Brooks, Pearson.

Reference Books:

1. M. L. Gambir, "Concrete Manual", Dhanpatrai and sons, New Delhi.
2. Mehta P.K, "Properties of Concrete", Tata McGraw Hill Publications, New Delhi.
3. Neville AM, "Properties of Concrete", ELBS Publications, London.

E-Resources:

1. Cement testing: https://www.youtube.com/watch?v=sl0smPfvVAo&authuser=0
2. Cement testing: https://www.youtube.com/watch?v=EJVSxsCin3E&authuser=0
3. Cement testing: https://www.youtube.com/watch?v=vP2NFJk2G0w&authuser=0
4. Cement testing: https://www.youtube.com/watch?v=EIHBX-dBjYg&authuser=0
5. Sand testing: https://www.youtube.com/watch?v=7nhp3vmi860&authuser=0
6. Sand testing: https://www.youtube.com/watch?v=l6vk0EM4yPg&authuser=0
7. Sand testing: https://www.youtube.com/watch?v=qz0-nF_2hH8&authuser=0
8. Sand testing: https://www.youtube.com/watch?v=kCpG3_nbL0Y&authuser=0
9. Sand testing: https://www.youtube.com/watch?v=Fz1PCixlSiI&authuser=0
10. Sand testing: https://www.youtube.com/watch?v=MuhpE0Sk4EI&authuser=0
11. Aggregate testing: https://www.youtube.com/watch?v=hqXFPq676iM&authuser=0
12. Aggregate testing: https://www.youtube.com/watch?v=F_xuEo3scwQ&authuser=0
13. Aggregate testing: https://www.youtube.com/watch?v=acfJIG9o8iw&authuser=0
14. Aggregate testing: https://www.youtube.com/watch?v=Mn7aeorMpTs&authuser=0
15. Aggregate testing: https://www.youtube.com/watch?v=lE7LFOuGKyI&authuser=0
16. Fresh concrete testing: https://www.youtube.com/watch?v=ERnKVQcOfJU&authuser=0
17. Fresh concrete testing: https://www.youtube.com/watch?v=VVDhq-bdeUE&authuser=0
18. Hard concrete testing: https://www.youtube.com/watch?v=e8bH26-3PCw
19. Virtual lab: https://cs-iitd.vlabs.ac.in/List%20of%20experiments.html

DEPARTMENT OF CIVIL ENGINEERING

Program: B. Tech. (Civil Engineering)						**Semester:** II			
Course: Professional Development - II						**Code:** CECC203			
Teaching Scheme (Hrs/week)				**Evaluation Scheme (Marks)**					
Lecture	**Practical**	**Tutorial**	**Credit**	**CIE**	**ETE**	**TW**	**OR**	**PR**	**Total**
-	04	-	02	-	-	25	-	-	25

Course Objectives:

1. To introduce students on professional development skills and its importance in building personal and professional life.
2. To bring in self-awareness and realization of Values, Self-discipline and self-grooming for betterment of life and contribution to our Society.

Course Outcomes: After completion of this course, students will be able to -

CO1	Understanding the interpersonal skills importance and finding skill gaps for development.
CO2	Know how to be effective in managing our time with application of simple tools & techniques.
CO3	Know the effective components of teamwork and how to be effective in our role for team performance and goals.

Course Contents:

Unit	**Description**	**Duration (Hrs.)**
1.	**Interpersonal Skills:** Understanding on IP skills; Essentials of IP; How to develop IP skills.	24
2.	**Time management:** What is time management? Time study and mapping; Knowing the time management tools & techniques; How to apply tools & techniques for effective time management; Self-evaluation.	16
3.	**Teamwork:** Team and Individual thinking; Characteristics of Teamwork; Importance at work profession; Benefits	16
	TOTAL	**56**

Text Books:

1. Dr. P. K. Sinha, "Interpersonal Skills for Managers", Sage Publications.

Reference Books:

1. John C. Maxwell and Les Parrott, "25 Ways to Win with People", Thomas Nelson, 2013.
2. Robert Bolton, "People Skills: How to Assert Yourself, Listen to Others, and Resolve Conflicts", Touchstone, 1986.
3. Chris Bailey, "The Productivity Project: Accomplishing More by Managing Your Time, Attention, and Energy", Crown Business, 2016.
4. Jon Gordon, "The Power of a Positive Team: Proven Principles and Practices that Make Great Teams Great", Wiley, 2017.

E-Resources:

1. Coursera - "Improving Your Interpersonal Skills", https://www.coursera.org/learn/interpersonal-skills
2. Coursera - "Leading Teams", https://www.coursera.org/learn/leading-teams

DEPARTMENT OF CIVIL ENGINEERING

Program: B. Tech. (Civil Engineering)								**Semester:** II	
Course: Liberal Learning – II (Guitar)								**Code:** CECC204A	
Teaching Scheme (Hrs/week)				**Evaluation Scheme (Marks)**					
Lecture	**Practical**	**Tutorial**	**Credit**	**CIE**	**ETE**	**TW**	**OR**	**PR**	**Total**
-	02	-	01	-	-	25	-	-	25

Prerequisites:

Basic knowledge of Indian classical music and Guitar musical instrument.

Course Objectives:

1. To enhance guitar skills through intermediate fingerpicking, lead techniques, and genre exploration, culminating in a polished final performance.

Course Outcomes: After completion of this course, students will be able to -

CO1	Execute intermediate fingerpicking techniques with precision and rhythm.
CO2	Apply advanced lead guitar techniques and pentatonic scales effectively.
CO3	Perform confidently across various genres including blues, rock, folk, and classical.
CO4	Deliver a polished final performance through focused practice and preparation.

Course Contents:

Sr. No.	**Description**	**Duration (Hrs.)**
1.	Rhythm and Timing.	2
2.	Time Signatures.	2
3.	Understanding Basic Rhythms.	2
4.	Circle of Fifths.	2
5.	Introduction to Minor Scales.	2
6.	Advanced Chord Shapes.	2
7.	Introduction to Lead Techniques.	2
8.	Introduction to Pentatonic Scale.	2
9.	Practice and Review.	2
10.	Exploring Different Genres.	2
11.	Final Project Planning.	2
12.	Intensive Practice.	2
13.	Pre-Performance Preparation.	2
14.	Final Performance.	2
	TOTAL	**28**

Text Books:

1. David Hodge, "Guitar Theory", DK Publishing.

Reference Books:

1. Russ Shipton, "The Complete Guitar Player", Published by Wise.
2. Vincent Ong, Alfred Khp," Classical Guitar Advanced Studies Repertoires", Dynamic Publication.

E-Resources:

1. https://www.youtube.com/watch?v=BBz-Jyr23M4

DEPARTMENT OF CIVIL ENGINEERING

Program: B. Tech. (Civil Engineering)								**Semester:** II	
Course: Liberal Learning – II (Singing)								**Code:** CECC204B	
Teaching Scheme (Hrs/week)				**Evaluation Scheme (Marks)**					
Lecture	**Practical**	**Tutorial**	**Credit**	**CIE**	**ETE**	**TW**	**OR**	**PR**	**Total**
-	02	-	01	-	-	25	-	-	25

Prerequisites:

Basic knowledge of Indian classical music in singing.

Course Objectives:

1. To develop advanced singing techniques and ear training through Indian classical music, focusing on repertoire selection, effective rehearsal, and performance presentation.

Course Outcomes: After completion of this course, students will be able to -

CO1	Master legato, staccato, and advanced vocal methods in Indian classical music.
CO2	Improve musical ear through rigorous training and diverse classical repertoire.
CO3	Apply effective rehearsal strategies to prepare and present a polished performance.
CO4	Deliver a well-executed performance of selected Indian classical pieces with artistic expression

Course Contents:

Sr. No.	**Description**	**Duration (Hrs.)**
1.	Vibrato and Ornamentation.	2
2.	Range Extension.	2
3.	Legato and Staccato.	2
4.	Advanced Ear Training.	2
5.	Basics of Indian Semi Classical Music.	2
6.	Improvisation Techniques.	2
7.	Selecting Repertoire for Performance.	2
8.	Rehearsal Techniques.	2
9.	Dress Rehearsal.	2
10.	Final Performance.	2
11.	Performance Review.	2
12.	Exploring New Repertoire.	2
13.	Advanced Techniques and Styles.	2
14.	Course Recap and Future Directions.	2
	TOTAL	**28**

Text Books:

1. **Dr. Theodore Dimon, "Anatomy of the Voice, This Is a Voice".**

Reference Books:

1. Richard Miller, "The Structure of Singing", Schirmer Books, London.
2. Jennifer Hamady, "The Art of Singing", Published by Hal Leonard.

E-Resources:

1. https://www.youtube.com/watch?v=4hNq9qykOyE
2. https://www.youtube.com/watch?v=b14gkmECz-Y

DEPARTMENT OF CIVIL ENGINEERING

Program: B. Tech. (Civil Engineering)						**Semester:** II			
Course: Liberal Learning – II (Cinematography)						**Code:** CECC204C			
Teaching Scheme (Hrs/week)				**Evaluation Scheme (Marks)**					
Lecture	**Practical**	**Tutorial**	**Credit**	**CIE**	**ETE**	**TW**	**OR**	**PR**	**Total**
-	02	-	01	-	-	25	-	-	25

Prerequisites:

A basic understanding of film theory, Camera operation, Lighting techniques and visual storytelling is essential for cinematography.

Course Objectives:

1. To master videography by learning camera techniques, shooting methods, and editing, culminating in a final project showcasing advanced skills in video production.

Course Outcomes: After completion of this course, students will be able to -

CO1	Operate camera components and techniques for steady, sharp video shooting.
CO2	Apply rule of thirds, framing, and stabilization methods effectively.
CO3	Use advanced editing tools and sound design for polished video projects.
CO4	Deliver a comprehensive final video project demonstrating learned skills.

Course Contents:

Sr. No.	**Description**	**Duration (Hrs.)**
1.	Introduction to Videography	2
2.	Understanding camera components (lens, sensor, viewfinder)	2
3.	Techniques for steady shooting (tripods, handheld, gimbals)	2
4.	Understanding the rule of thirds, leading lines, and framing in video	2
5.	In-depth explanation of the exposure triangle: aperture, shutter speed, and ISO	2
6.	Importance of audio in videography	2
7.	Techniques for achieving sharp focus	2
8.	Motion and Stabilization	2
9.	Storyboarding and Planning	2
10.	Filming Techniques	2
11.	Introduction to Video Editing	2
12.	Introduction to advanced editing tools (color correction, audio editing, effects)	2
13.	Sound Design and Mixing	2
14.	Final Project Presentation and Review	2
	TOTAL	**28**

Text Books:

1. Tania Hoser, "Introduction to Cinematography", Taylor & Francis.

Reference Books:

1. Anat Pick, "Screening Nature", Berghahn Books.
2. Blain Brown, "Cinematography: Theory and Practice", Taylor & Francis.

E-Resources:

1. https://youtu.be/V7z7BAZdt2M?si=to4yQ46zEKRbxKOm
2. https://youtu.be/WXdAX0No2hM?si=GZu_mJsmyJ7NGnAU

DEPARTMENT OF CIVIL ENGINEERING

Program: B. Tech. (Civil Engineering)							**Semester:** II		
Course: Liberal Learning – II (Dance)							**Code:** CECC204D		
Teaching Scheme (Hrs/week)				**Evaluation Scheme (Marks)**					
Lecture	**Practical**	**Tutorial**	**Credit**	**CIE**	**ETE**	**TW**	**OR**	**PR**	**Total**
-	02	-	01	-	-	25	-	-	25

Prerequisites:

Good stamina, flexibility and familiarity with simple rhythmic patterns and beats.

Course Objectives:

1. To develop advanced dance techniques, expressive skills, and performance readiness in Indian classical dance, culminating in a final performance.

Course Outcomes: After completion of this course, students will be able to -

CO1	Develop advanced techniques in footwork, postures, and hand gestures, with a focus on fluidity and expression.
CO2	Embody various characters and emotions through in-depth exploration of Abhinaya (expressional dance).
CO3	Execute learned dance pieces with precision, synchronization, and advanced rhythmic variations.

Course Contents:

Sr. No.	**Description**	**Duration (Hrs.)**
1.	Introduction to Character Portrayal.	2
2.	Rehearsal and Feedback.	2
3.	Advanced Footwork and Postures.	2
4.	Advanced Hand Gestures and Movements.	2
5.	Rhythmic Variations and Combinations.	2
6.	Rehearsal of Dance Piece.	2
7.	Performance Techniques.	2
8.	Integrating Steps and Expressions.	2
9.	Full Dress Rehearsal.	2
10.	Improvisation and Creative Movement.	2
11.	Corrections and Adjustments.	2
12.	Mini Performance.	2
13.	Introduction to Abhinaya in Depth.	2
14.	Preparing a New Short Dance Item.	2
	TOTAL	**28**

Text Books:

1. Kapila Vatsyayan, "Indian Classical Dance", Publications Division Ministry of Information & Broadcasting.

Reference Books:

1. Shubhada Varadkar, "The Glimpse of Indian Classical Dance", Krimiga Books, Krimiga Content Development Pvt. Ltd.

E-Resources:

1. https://youtu.be/VP2jLLk8_jA?si=zg6_muy1w7jE5mbi
2. https://youtu.be/xZEP4XupwJA?si=YBt3RmcHxCRc2JSr

DEPARTMENT OF CIVIL ENGINEERING

Program: B. Tech. (Civil Engineering)								**Semester:** II	
Course: Liberal Learning – II (Synthesizer/Keyboard)								**Code:** CECC204E	
Teaching Scheme (Hrs/week)				**Evaluation Scheme (Marks)**					
Lecture	**Practical**	**Tutorial**	**Credit**	**CIE**	**ETE**	**TW**	**OR**	**PR**	**Total**
-	02	-	01	-	-	25	-	-	25

Prerequisites:

Basic knowledge of Indian classical music and Keyboard musical instrument.

Course Objectives:

1. To develop advanced musical skills through complex progressions, improvisation, and composition, culminating in a polished performance and mastery of selected repertoire.

Course Outcomes: After completion of this course, students will be able to -

CO1	Apply complex chord progressions and advanced scales effectively in performance.
CO2	Demonstrate proficiency in improvisation and advanced chord voicings.
CO3	Perform selected repertoire with refined technique and stage presence.
CO4	Successfully showcase learned skills through a polished recital or performance.

Course Contents:

Unit	**Description**	**Duration (Hrs.)**
1.	Introduction to more complex progressions (e.g., ii-V-I)	2
2.	Basics of improvisation	2
3.	Learning advanced scales (e.g., blues scale, pentatonic scale)	2
4.	Learning advanced chord voicings and inversions	2
5.	Advanced Arpeggios and Runs	2
6.	Basics of composing music	2
7.	Initial practice on selected repertoire	2
8.	Focused practice on repertoire pieces	2
9.	Understanding stage presence and performance techniques	2
10.	Final adjustments and practice on repertoire	2
11.	Attending or reviewing a masterclass	2
12.	Receiving personalized feedback on playing	2
13.	Dress rehearsal for recital or performance	2
14.	Showcasing learned skills and pieces	2
	TOTAL	**28 hrs.**

Text Books:

1. Chuan C. Chang, Fundamentals of Piano Practice, Createspace Independent Publishing Platform

Reference Books:

1. Michael Rodman, "Keyboard for the Absolute Beginners", Alfred Publishing.
2. Davis Dorrough, "Piano Scales".

E-Resources:

1. https://youtu.be/2mPS-2guHVo?si=8X_4KKezIdrMejLH
2. https://youtu.be/tEtukfFv3Wk?si=2iJ8wdD0dfjWauPb

DEPARTMENT OF CIVIL ENGINEERING

Program: B. Tech. (Civil Engineering)								**Semester:** II	
Course: Liberal Learning – II (Basketball)								**Code:** CECC204F	
Teaching Scheme (Hrs/week)				**Evaluation Scheme (Marks)**					
Lecture	**Practical**	**Tutorial**	**Credit**	**CIE**	**ETE**	**TW**	**OR**	**PR**	**Total**
-	02	-	01	-	-	25	-	-	25

Prerequisites:

Proper health, Basic knowledge of rules of the game.

Course Objectives:

1. To master advanced basketball skills, strategies, and mental conditioning to excel in team play, complex scenarios, and tournament preparation.

Course Outcomes: After completion of this course, students will be able to -

CO1	Demonstrate mastery of advanced dribbling, passing, shooting, and defensive techniques.
CO2	Apply complex defensive systems, advanced team play, and game strategies in mixed scenarios.
CO3	Develop the mental toughness, conditioning, and strategic insights needed for successful tournament performance

Course Contents:

Sr. No.	**Description**	**Duration (Hrs.)**
1.	Advanced Dribbling Techniques	2
2.	Advanced Passing Techniques	2
3.	Advanced Shooting Techniques	2
4.	Advanced Defense Techniques	2
5.	Position Specific Training	2
6.	Conditioning & Strength Training	2
7.	Mental Toughness & Focus	2
8.	Advance Team Play	2
9.	Complex Defensive System	2
10.	Mixed Scenarios & Situational Drills	2
11.	Tournament Preparation	2
12.	Advance Game Play & Strategy	2
13.	Mastery & Final Assessment	2
14.	Final Scrimmage	2
	TOTAL	**28**

Text Books:

1. K.K. Sharma, "Basketball: Skills and Drills", Sports Publications

Reference Books:

1. Dr. P.K. Kher, "Basketball Coaching: A Complete Guide", Khel Prakashan
2. S. Reddy, "The Ultimate Guide to Basketball Training", Blue Rose Publisher

E-Resources:

1. Introduction to Exercise Physiology & Sports Performance, IIT Madras, https://nptel.ac.in/courses/109106406

DEPARTMENT OF CIVIL ENGINEERING

Program: B. Tech. (Civil Engineering)						**Semester:** II			
Course: Liberal Learning – II (Cricket)						**Code:** CECC204G			
Teaching Scheme (Hrs/week)				**Evaluation Scheme (Marks)**					
Lecture	**Practical**	**Tutorial**	**Credit**	**CIE**	**ETE**	**TW**	**OR**	**PR**	**Total**
-	02	-	01	-	-	25	-	-	25

Prerequisites:

Proper health, Basic knowledge of rules of the game.

Course Objectives:

1. To develop advanced cricket skills and strategies in batting, bowling, and fielding, with a focus on mental conditioning, tactical execution, and competitive performance through intensive practice and match simulations.

Course Outcomes: After completion of this course, students will be able to -

CO1	Demonstrate advanced techniques in batting, bowling, and fielding, including targeted drills and intensive practice.
CO2	Apply batting and bowling strategies, and execute tactical plans during match simulations and competitive play.
CO3	Develop strong mental conditioning and teamwork skills, preparing for high-performance in competitive matches and final assessments.

Course Contents:

Sr. No.	**Description**	**Duration (Hrs.)**
1.	Batting Strategies.	2
2.	Bowling Strategies.	2
3.	Fielding Strategies.	2
4.	Match Simulations and Tactical Execution.	2
5.	Targeted Skill Improvement.	2
6.	Mental Conditioning.	2
7.	Intensive Match Simulations.	2
8.	Advanced Batting Drills.	2
9.	Advanced Bowling Drills.	2
10.	Fielding and Wicket keeping in Game Conditions.	2
11.	Game Analysis and Strategy Sessions.	2
12.	Final Skill Polishing.	2
13.	Teamwork and Communication.	2
14.	Competitive Matches and Final Assessments.	2
	TOTAL	**28**

Text Books:

1. Sanjay Manjrekar, "Cricket Fundamentals", Orient Black Swan.
2. Ravi Shastri, "Winning Cricket: Skills and Strategies", Notion Press.

Reference Books:

1. Sachin Tendulkar, "Playing It My Way", Hachette India
2. Rahul Dravid, "Cricket: The Game of Life", Penguin India

E-Resources:

1. Sports and Performance Nutrition, IIT Madras, https://onlinecourses.nptel.ac.in/noc24_hs82/preview

DEPARTMENT OF CIVIL ENGINEERING

Program: B. Tech. (Civil Engineering)								**Semester:** II	
Course: Liberal Learning – II (Rifle and Pistol Shooting)								**Code:** CECC204H	
Teaching Scheme (Hrs/week)				**Evaluation Scheme (Marks)**					
Lecture	**Practical**	**Tutorial**	**Credit**	**CIE**	**ETE**	**TW**	**OR**	**PR**	**Total**
-	02	-	01	-	-	25	-	-	25

Prerequisites:

Proper health, Basic knowledge of rules of the game.

Course Objectives:

1. To achieve advanced proficiency in rifle shooting through specialized training, technical refinement, and mental preparation for competitive performance.

Course Outcomes: After completion of this course, students will be able to -

CO1	Master advanced rifle shooting techniques and positions to achieve higher scores.
CO2	Develop strong mental preparation and focus techniques for peak performance and overcoming technical hurdles.
CO3	Gain specialized training and match practice, preparing them for ISSF events and advanced shooting challenges.

Course Contents:

Sr. No.	**Description**	**Duration (Hrs.)**
1.	Understand and learning about advance rifle position	2
2.	Advance technical knowledge	2
3.	Advance Technique Refinement	2
4.	Learning about advance shooting and technics for achieving score	2
5.	Specialized Training	2
6.	Mental Preparation and Focus	2
7.	Peak Performance and analyses	2
8.	Advanced Skills Development	2
9.	Tactical Applications and working about single shoot	2
10.	Advanced Challenges and Readiness	2
11.	Review and Consolidation	2
12.	Focus on technical and mental hurdles	2
13.	Person to person attention	2
14.	Match practice and preparation as per ISSF event	2
	TOTAL	**28**

Reference Books:

1. David Watson, "ABCs of Rifle Shooting", Gun Digest (Imprint of KP Books), 2014.

E-Resources:

1. Introduction to Exercise Physiology & Sports Performance, IIT Madras, https://nptel.ac.in/courses/109106406

DEPARTMENT OF CIVIL ENGINEERING

Program: B. Tech. (Civil Engineering)						**Semester:** II			
Course: Liberal Learning – II (Volleyball)						**Code:** CECC204I			
Teaching Scheme (Hrs/week)				**Evaluation Scheme (Marks)**					
Lecture	**Practical**	**Tutorial**	**Credit**	**CIE**	**ETE**	**TW**	**OR**	**PR**	**Total**
-	02	-	01	-	-	25	-	-	25

Prerequisites:

Proper health, Basic knowledge of rules of the game.

Course Objectives:

1. To achieve advanced proficiency in volleyball by mastering complex techniques, strategic systems, and mental conditioning, while preparing for competitive play and tournament scenarios.

Course Outcomes: After completion of this course, students will be able to -

CO1	Demonstrate expertise in advanced serving, spiking, setting, and blocking techniques tailored to specific positions.
CO2	Implement complex offensive and defensive systems and adapt to mixed scenarios through situational drills and gameplay.
CO3	Develop mental toughness, conditioning, and strategic insights necessary for successful tournament preparation and performance.

Course Contents:

Sr. No.	**Description**	**Duration (Hrs.)**
1.	Advanced Serving Techniques	2
2.	Advanced Spiking Techniques	2
3.	Advanced Setting Techniques	2
4.	Advanced Blocking Techniques	2
5.	Position – Specific Training	2
6.	Conditioning & Strength Training	2
7.	Mental Toughness & Focus	2
8.	Game Analysis & Feedback	2
9.	Complex Offensive System	2
10.	Complex Defensive System	2
11.	Mixed Scenarios & Situational Drills	2
12.	Advanced Gameplay & Strategies	2
13.	Review & Reinforcement	2
14.	Tournament Preparation	2
	TOTAL	**28**

Text Books:

1. Jitendra Kumar, "The Complete Guide to Volleyball", Blue Rose Publisher.

Reference Books:

1. N. Ramachandran, "Volleyball: Steps to Success", Sports Publication.

E-Resources:

1. https://coachtube.com/course/volleyball/volleyball-for-beginners/7004

DEPARTMENT OF CIVIL ENGINEERING

Program: B. Tech. (Civil Engineering)						**Semester:** II			
Course: Liberal Learning – II (Football)						**Code:** CECC204J			
Teaching Scheme (Hrs/week)				**Evaluation Scheme (Marks)**					
Lecture	**Practical**	**Tutorial**	**Credit**	**CIE**	**ETE**	**TW**	**OR**	**PR**	**Total**
-	02	-	01	-	-	25	-	-	25

Prerequisites:

Proper health, Basic knowledge of rules of the game.

Course Objectives:

1. To enhance players' technical skills, tactical understanding, physical fitness, teamwork, and sportsmanship, fostering a comprehensive understanding and appreciation of the game.

Course Outcomes: After completion of this course, students will be able to -

CO1	To explain key concepts of transition play, positional drills, and the importance of endurance and stamina in football.
CO2	Apply advanced tactics during simulation matches, analyze high-pressure situations.
CO3	Students will design a game week routine that covers match preparation, mental and physical readiness, and post-match analysis, evaluating its impact on team performance and skills.

Course Contents:

Sr. No.	**Description**	**Duration (Hrs.)**
1.	Transition Play.	2
2.	Positional Drills.	2
3.	Endurance and Stamina.	2
4.	Video Analysis and Feedback.	2
5.	Advanced Tactics and Strategy.	2
6.	High-Pressure Situations.	2
7.	Leadership and Team Roles.	2
8.	Refining Skills and Tactics.	2
9.	Match Preparation.	2
10.	Mental and Physical Preparation.	2
11.	Game Week Routine.	2
12.	Post Goalkeeper Training.	2
13.	Post-Match Analysis and Recovery.	2
14.	Simulation Matches.	2
	TOTAL	**28**

Text Books:

1. Srinivasan J. B, "Football Coaching: A Comprehensive Guide", Sports Publishing.

Reference Books:

1. Rob Ellis, "The Complete Guide to Coaching Soccer", Meyer & Meyer Sport.

E-Resources:

1. Udemy – Soccer Courses - https://www.udemy.com/topic/soccer/

DEPARTMENT OF CIVIL ENGINEERING

Program: B. Tech. (Civil Engineering)						**Semester:** II			
Course: IT Proficiency						**Code:** CEAE201			
Teaching Scheme (Hrs/week)				**Evaluation Scheme (Marks)**					
Lecture	**Practical**	**Tutorial**	**Credit**	**CIE**	**ETE**	**TW**	**OR**	**PR**	**Total**
-	04	-	02	-	-	25	-	-	25

Prerequisites:

Basic Computer Skills

Course Objectives:

1. To develop proficiency in essential office software and tools, including MS Word, MS Excel, MS PowerPoint, and LaTeX, to create, analyze, and present professional documents and data effectively, while understanding ethical internet use and leveraging AI tools.

Course Outcomes: After completion of this course, students will be able to -

CO1	Create and format professional documents using MS Word.
CO2	Organize and analyze data using Excel's features.
CO3	Analyze and visualize complex data with pivot tables and charts.
CO4	Analyze advanced Excel functions, pivot tables, macros, and data protection techniques.
CO5	Create Professional Documents Using LaTeX.
CO6	Apply ethical practices in using internet resources and AI tools.

Course Contents:

Unit	**Description**	**Duration (Hrs.)**
1.	**Basics of Computer and MS Word:** Awareness of computer Basics **MS-Word:** Text Basics, Text Formatting and saving file, Working with objects, Header &footers, Working with bullets and numbered lists, Tables, Styles and Content, Merging documents, Sharing and maintaining document, Proofing the document, Printing.	08
2.	**MS-Excel:** Introduction to Excel, Formatting excel work book, Perform calculations with functions, Sort and Filter data with Excel, Create effective 2D and 3D charts to Present data visually.	10
3.	**Advance MS-Excel**: Analyze data using pivot tables and pivot charts, Protecting and sharing the work book, Use Macros to automate tasks, Proofing and Printing, More useful functions in excel, Goal seek and scenario features, V-lookup and H-lookup functions, Advanced sort and filter in excel.	10
4.	**MS-PowerPoint**: Setting up PowerPoint environment, Creating slides and applying themes, Working with bullets and numbering, Working with objects, Hyperlinks and action buttons, Working with movies and sounds, Using SmartArt and Tables, Animation and slide transition, Using slide master, Slide show option, Proofing and Printing.	10
5	**Introduction to Latex:** Installation of the software LaTeX , Understanding Latex compilation, Basic Syntax, Writing equations, Matrix, Tables. **Page Layout** – Titles, Abstract Chapters, Sections, References, Equation references, citation. List making environments, Table of contents, Generating new commands, Figure handling, Numbering, List of figures, List of tables, Generating index.	10

	Packages - Geometry, Hyperref, amsmath, amssymb, algorithms, algorithmic graphic, color, tilez listing. Classes: article, book, report, beamer, slides. IEEtran. **Applications -** Writing Resume, Writing articles/ research papers, project report.	
6	**Internet Ethics & AI tools** Working with Internet and-mail, Using the Internet, Internet Ethics and Safety, Social Media, **AI Tools**: Jasper, GitHub Copilot, Synthesia, Writesonic.	08
	TOTAL	**56**

List of Experiments:

1. Create a collaborative document project where multiple users contribute to a document using MS Word's track changes and commenting features.
2. To analyze and visualize data effectively using Excel's functions and charts, aiming to create insightful and dynamic data visualizations.
3. Develop a financial modeling project using Excel, incorporating advanced functions like goal seek, scenario analysis, and pivot tables. Build automation using macros for repetitive tasks.
4. Create an interactive multimedia presentation on a complex topic of interest. Incorporate animations, transitions, embedded videos, and interactive elements like hyperlinks and action buttons.
5. Design and implement a digital marketing campaign for a fictitious product or service. Create email newsletters, social media posts, and analyze campaign performance metrics.
6. Prepare research article using Latex.

Text Books:

1. Banerjee Snigdha, "MS Word 2000", New Age International.
2. Quentin Docter, Q., et al., "CompTIA IT Fundamentals Study Guide: Exam FC0-U61", Wiley, USA.
3. Lambert, J., Frye, C., et al., "Microsoft Office 2019 Step by Step", Microsoft Press, USA.

Reference Books:

1. Walkenbach John, "Excel 2013 Bible", Wiley Publishing House.
2. Wempen Faithe, "Microsoft PowerPoint 2010 Bible", Wiley Publishing House.
3. Miller, M., "Internet Basics Absolute Beginner's Guide", Que Publishing, USA.
4. Miller, M., "Computer Basics Absolute Beginner's Guide", Que Publishing, USA.

E-Resources:

1. Microsoft Office Support provides tutorials and guides for MS Office applications. https://support.microsoft.com/en-us/training
2. Digital Skilling by NPTEL - https://elearn.nptel.ac.in/shop/nptel/digital-skilling/?v=c86ee0d9d7ed

DEPARTMENT OF CIVIL ENGINEERING

Program: B. Tech. (Civil Engineering)								**Semester:** II	
Course: Internship - I								**Code:** CEIN201	
Teaching Scheme (Hrs/Week)				**Evaluation Scheme (Marks)**					
Lecture	**Practical**	**Tutorial**	**Credit**	**CIE**	**ETE**	**TW**	**OR**	**PR**	**Total**
-	-	-	02	-	-	50	-	-	50

Preamble:

Internships serve as vital educational and career development experiences, offering practical exposure in a specific field. Employers seek individuals who possess the necessary skills and an understanding of industry environments, practices, and cultures. This internship is designed as a structured, short-term, supervised training program, often centered on specific tasks or projects with clear timelines. The primary goal is to immerse technical students in an industrial setting, providing experiences that cannot be replicated in the classroom. This exposure aims to develop competent professionals who understand the social, economic, and administrative factors influencing the operations of industrial organizations.

Course Objectives:

1. To exposure to students to the industrial environment, which cannot be provided in the classroom and hence creating deployable professionals for the industry.
2. To learn to implement the technical knowledge in real industrial situations.

Course Outcomes: Learner will -

CO1	Gain exposure to industry practices and understand how academic concepts are applied in professional settings.
CO2	Develop and demonstrate effective communication and teamwork skills within a work environment.
CO3	Improve your problem-solving and time management skills by working in real-world industry settings.

Internship Requirements

1. **Internship Duration:** It is mandatory for all students to undergo an internship after every semester during vacations for the duration of 3 to 5 weeks. Internships completed during this period will be considered for the assessment of Term Work (TW).
2. **Internship Opportunities:** Students can explore various opportunities for internships at:
    a. Industries
    b. Research labs or organizations
    c. Collegiate clubs
    d. In-house research projects
    e. Online internships
3. **Support and Assistance:** Students can seek assistance for securing internships from:
    a. The Training and Placement cell, along with departmental coordinators
    b. Department or institute faculty members
    c. Personal contacts
    d. Directly connecting with industries or organizations

4. **Request Letter:** Once an industry, research organization, or collegiate club is identified, students must obtain a request letter from the concerned department or placement office. This letter, in the standard format must be duly signed by the authority, should be addressed to the HR manager or relevant authority.
5. **Confirmation Letter:** Students must submit the confirmation letter from the industry, research organization, or collegiate club to the Internship Coordinator and the Head of Department (HOD) office.
6. **Joining Report:** Upon commencing the internship, students must submit the joining report, joining letter, or a copy of the confirmation email to the Internship Coordinator and the HOD office.
7. **Faculty Mentor:** A faculty member will be assigned as a mentor to a group of students. The mentor will be responsible for monitoring, evaluating, and assessing student internship activities. The faculty mentor is also required to visit the internship location and submit formal feedback to the Internship Coordinator.
8. **Faculty Visits:** Faculty members are advised to visit the internship site once or twice during the internship period to monitor progress.
9. **Progress Report:** Students must submit progress report fortnightly to their faculty guide and the final internship report to the Internship Coordinator and department office.
10. **Evaluation Report:** After the completion of the internship, the mentor, along with the assessment panel members, should submit the evaluation report of the students to the department office and the Internship Coordinator.
11. **Internship Certificate:** Students must receive the Internship Certificate from the industry and submit it to the Internship Coordinator and department office.
12. **Presentation and Assessment:** Students are required to give a presentation on their internship work as part of the term work. The internship diary and report will also be verified and assessed.