



Maratha Vidya Prasarak Samaj's
Karmaveer Adv. Baburao Ganpatrao Thakare College of Engineering
An Autonomous Institute affiliated to Savitribai Phule Pune University, Pune
Udoji Maratha Boarding Campus, Gangapur Road, Nashik - 422 013,
Maharashtra, India

Syllabus
Second Year B.Tech. Civil Engineering (2024 Pattern) V1.2
(As per NEP 2020)
Academic Year 2025-26
(Copy for Student Circulation Only)

Program Specific Outcomes (PSOs).

PSO1: Graduates will apply technical knowledge, engineering skills, and competencies necessary for entering civil engineering career.

PSO2: Graduates will demonstrate knowledge and techniques in engineering fields for effective management and professional development.

PSO3: Graduates will apply technical and professional skills to be nationally competitive for employment/self-employment thereby benefit the society.

Program Educational Outcomes (PEOs).

PEO1: To ensure that graduates will have a mastery of fundamental knowledge, problem solving skills, engineering experimental abilities, and design capabilities necessary for entering civil engineering career and/or graduate school.

PEO2: To incorporate verbal and written communication skills necessary for successful professional practice.

PEO3: Demonstrate knowledge of management principles and engineering techniques for effective project management

PEO4: To prepare graduates to deal with ethical and professional issues, taking into account the broader societal implications of civil engineering.

Program Outcomes (POs)

PO1: Engineering Knowledge: Apply knowledge of mathematics, natural science, computing, engineering fundamentals and an engineering specialization as specified in WK1 to WK4 to develop to the solution of complex engineering problems.

PO2: Problem Analysis: Identify, formulate, review research literature and analyze complex engineering problems reaching substantiated conclusions with consideration for sustainable development (WK1 to WK4).

PO3: Design/Development of Solutions: Design creative solutions for complex engineering problems and design/develop systems/components/processes to meet identified needs with consideration for the public health and safety, whole-life cost, net zero carbon, culture, society and environment as required (WK5).

PO4: Conduct Investigations of Complex Problems: Conduct investigations of complex engineering problems using research-based knowledge including design of experiments, modelling, analysis & interpretation of data to provide valid conclusions (WK8).

PO5: Engineering Tool Usage: Create, select and apply appropriate techniques, resources and modern engineering & IT tools, including prediction and modelling recognizing their limitations to solve complex engineering problems. (WK2 and WK6).

PO6: The Engineer and The World: Analyze and evaluate societal and environmental aspects while solving complex engineering problems for its impact on sustainability with reference to economy, health, safety, legal framework, culture and environment. (WK1, WK5 and WK7).

- PO7: Ethics:** Apply ethical principles and commit to professional ethics, human values, diversity and inclusion; adhere to national & international laws. (WK9).
- PO8: Individual and Collaborative Team work:** Function effectively as an individual, and as a member or leader in diverse/multi-disciplinary teams.
- PO9: Communication:** Communicate effectively and inclusively within the engineering community and society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations considering cultural, language, and learning differences.
- PO10: Project Management and Finance:** Apply knowledge and understanding of engineering management principles and economic decision-making and apply these to one's own work, as a member and leader in a team, and to manage projects and in multidisciplinary environments.
- PO11: Life-Long Learning:** Recognize the need for, and have the preparation and ability for
i) Independent and life-long learning, ii) Adaptability to new and emerging technologies and iii) Critical thinking in the broadest context of technological change. (WK8).

Knowledge and Attitude Profile (WK)

- WK1:** A systematic, theory-based understanding of the natural sciences applicable to the discipline and awareness of relevant social sciences.
- WK2:** Conceptually-based mathematics, numerical analysis, data analysis, statistics and formal aspects of computer and information science to support detailed analysis and modelling applicable to the discipline.
- WK3:** A systematic, theory-based formulation of engineering fundamentals required in the engineering discipline.
- WK4:** Engineering specialist knowledge that provides theoretical frameworks and bodies of knowledge for the accepted practice areas in the engineering discipline; much is at the forefront of the discipline.
- WK5:** Knowledge, including efficient resource use, environmental impacts, whole-life cost, re-use of resources, net zero carbon, and similar concepts, that supports engineering design and operations in a practice area.
- WK6:** Knowledge of engineering practice (technology) in the practice areas in the engineering discipline.
- WK7:** Knowledge of the role of engineering in society and identified issues in engineering practice in the discipline, such as the professional responsibility of an engineer to public safety and sustainable development.
- WK8:** Engagement with selected knowledge in the current research literature of the discipline, awareness of the power of critical thinking and creative approaches to evaluate emerging issues.
- WK9:** Ethics, inclusive behavior and conduct. Knowledge of professional ethics, responsibilities, and norms of engineering practice. Awareness of the need for diversity by reason of ethnicity, gender, age, physical ability etc. with mutual understanding and respect, and of inclusive attitudes.

Second Year B.Tech. Civil Engineering
Curriculum Structure (2024 Pattern) V1.2 Semester - III

Course Code	Course Type	Course Name	Teaching Scheme (Hrs/Week)			Evaluation Scheme and Marks					Credits			
			TH	PR	TU	CCE	ESE	TW	PR + OR	TOT	TH	PR	TU	TOT
105301	PCC-2	Building Planning and Technology	2	2	-	40	60	25	25	150	2	1	-	3
105302	PCC-3	Mechanics of Structure	2	2	-	40	60	25	25	150	2	1	-	3
105303	PCC-4	Fluid Mechanics	2	-	-	40	60	-	-	100	2	-	-	2
170304/ 170404	MDM-1	Multi-Disciplinary Minor Course-1	2	-	-	40	60	-	-	100	2	-	-	2
171305/ 171405	OEC-1	Open Elective Course-1	3	2	-	40	60	25	25	150	3	1	-	4
172306/ 172406	EEM-1	EEM Course-1	-	-	2	-	-	50	-	50	-	-	2	2
173307/ 173407	VEC-1	Value Education Course-1	-	2	1	-	-	50	-	50	-	-	2	2
105308	CEP/FP	Community Engagement / Field Project	-	4	-	-	-	50	-	50	-	2	-	2
Total			11	12	3	200	300	225	75	800	11	5	4	20

Group	Course Code	MDM Courses - 1	Course Code	VEC Courses - 1	Course Code	EEM Courses – 1
A	170304A	Engineering Mathematics-III	173307	Universal Human Values	172306	Entrepreneurship Development
B	170404A	Artificial Intelligence	173407	Environmental Studies	172406	Business Economics

Course Code	Open Elective Course – 1	Course Code	Open Elective Course – 1
171305A	Intellectual Property Rights and Ethics	171405A	Introduction to Cyber Security
171305B	Renewable Energy		
171305C	Health, Care & Management System		
171305D	Smart City and Infrastructure		

Second Year B.Tech. Civil Engineering
Curriculum Structure (2024 Pattern) V1.2 Semester - IV

Course Code	Course Type	Course Name	Teaching Scheme (Hrs/Week)			Evaluation Scheme and Marks					Credits			
			TH	PR	TU	CCE	ESE	TW	PR + OR	TOT	TH	PR	TU	TOT
105401	PCC-5	Geotechnical Engineering	2	2	-	40	60	25	25	150	2	1	-	3
105402	PCC-6	Surveying and Geomatics	2	2	-	40	60	25	25	150	2	1	-	3
105403	PCC-7	Structural Analysis	2	-	-	40	60	-	-	100	2	-	-	2
170304/ 170404	MDM-2	Multi-Disciplinary Minor Course-2	2	-	-	40	60	-	-	100	2	-	-	2
171305/ 171405	OEC-2	Open Elective Course-2	3	2	-	40	60	25	25	150	3	1	-	4
172306/ 172406	EEM-2	EEM Course-2	-	-	2	-	-	50	-	50	-	-	2	2
173307/ 173407	VEC-2	Value Education Course-2	-	2	1	-	-	50	-	50	-	-	2	2
174408	AEC-2	Ability Enhancement Course-2	-	-	2	-	-	50	-	50	-	-	2	2
105409	VSEC-3	Vocational & Skill Enhancement Course-3	-	4	-	-	-	50	-	50	-	2	-	2
Total			11	12	5	200	300	275	75	850	11	5	6	22

Group	Course Code	MDM Courses – 2	Course Code	VEC Courses – 2	Course Code	EEM Courses – 2
A	170404A	Artificial Intelligence	173407	Environmental Studies	172406	Business Economics
B	170304A	Engineering Mathematics-III	173307	Universal Human Values	172306	Entrepreneurship Development

Course Code	Open Elective Course – 2	Course Code	AEC Course – 2	Course Code	VSEC Course – 3
171305A	Intellectual Property Rights and Ethics	174408	Foreign Language	105409	Software Techniques in Civil Engg.
171305B	Renewable Energy				
171305C	Health, Care & Management System	Course Code	Open Elective Course – 2		
171305D	Smart City and Infrastructure	171405A	Introduction to Cyber Security		

- **Summary of Credits and Total Marks:**

Semester	Credits	Marks
III	20	800
IV	22	850
Total	42	1650

- **Definition of Credit :**

The Under Graduate (U.G.) programmes will have credit system. The details of credit will be as follow.

1 Credit = 1 hour/week for lecture
 = 2 hours/week for practical
 = 1 hour/week for tutorial

- **Description of Various Courses:**

Type of Course	Description
PCC	Programme Core Course
MDM	Multidisciplinary Minor Course
OEC	Open Elective Course
EEM	Entrepreneurship / Economics / Management Course
VEC	Value Education Course
CEP/FP	Community Engagement Project / Field Project
VSEC	Vocational and Skill Enhancement Course (Skill Courses)
AEC	Ability Enhancement Course

Semester - III

Course Code: 105301	Course Name: Building Planning and Technology	
Teaching Scheme	Credit	Evaluation Scheme
Theory : 2 Hours/Week Practical : 2 Hours/Week	2 1	CCE : 40 Marks ESE : 60 Marks TW : 25 Marks PR + OR : 25 Marks

Prerequisite Courses:

- Basics of Civil Engineering.

Course Objectives:

- To enumerate different types of structure and their requirement.
- To describe all basic activities of construction.
- To study different types of materials, byelaws and Architectural aspects used in construction for civil engineering projects.
- To plan different building units, Town planning parameters and safety of buildings.

Course Outcomes:

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

CO1: Identify types of building and basic requirements of building construction and masonry.

CO2: Make use of Architectural Principles and Building byelaws for building construction.

CO3: Identify and select various building components according to their requirement.

CO4: Plan effectively various types of Residential Building and green building according to their utility, functions with reference to National Building Code.

CO5: Plan effectively various types of Public Building.

Course Contents:

Unit-I: Introduction to Building Construction and Masonry

06 Hours

Introduction to Building construction: Definition, types of building as per National Building Code. Building components and their basic requirements, like substructure and superstructure requirements. Introduction to automation in construction.

Masonry: Introduction of stone masonry and brick masonry, characteristics of good building bricks, IS specification and tests, classification of bricks, types of bonds: English, Flemish, Header, Stretcher, construction procedure, supervision. Recent trends in light weight construction Form work and casting procedure for reinforced concrete columns, R.C.C. beams, R.C.C. slabs, Slip form work, introduction of underpinning and Scaffolding.



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Unit-II: Building Bye Laws and Architectural Drawing**06 Hours**

Building Bye Laws: Necessity of bye-laws, plot sizes, road width, open spaces, floor area ratio (F.A.R.), concept of V.P.R. Marginal distances, building line, control line, height regulations, room sizes, Area Calculations (built-up area, carpet area etc.), Rules for ventilation, lighting, Vertical circulation, Sanitation and Parking of vehicles. Minimum Standard Dimensions. Concept of Floating FSI and CRZ regulations.

Introduction to Architectural Drawing: Principles of Building Planning and Principles of Architectural design relation between form and function, utility, aesthetics, Concept of Line plan Developed Plan, Elevation, Section, Selection of scales for various drawings, dimensioning, abbreviations and symbols as per IS 962, Elements of perspective drawings.

Unit-III: Building Components**06 Hours**

Doors and Windows: Definition of technical terms, installation of doors and window frames and their size specifications, fixtures and fastenings. Different types of doors and windows: Ventilators: purpose and types.

Arches and Lintels: Introduction of arch construction, Lintels: necessity and types, chajja or weather shade necessity and types. Functional requirement of flooring, types of floor finishes and their suitability, Types of flooring_ Natural and Manmade.

Roofing Materials: Galvanized iron pre-coated aluminum sheets, fiber sheets. Roof construction types and their suitability, method of construction, protective coatings with plastering & finishing.

Unit-IV: Residential Buildings and Green Buildings**06 Hours**

Residential Buildings: Functional requirements and dimensions of Residential Buildings like Bungalows, Twin bungalows, Row houses, and Apartment. Prepare Developed Plan, Elevation and Sectional Elevation of above-mentioned categories. Design of staircase: Dog legged /Quarter turn. Provisions for Physically Handicap Ramps, Lifts, Emergency Staircase.

Green Building: Salient features, benefits, planning concepts of Green Building (site selection, orientation, sun path and wind diagram, etc.), introduction to Leadership in Energy and Environmental Design (LEED).

Unit-V: Planning of Public Buildings**06 Hours**

Functional requirements and dimensions and planning of public buildings like industrial buildings, commercial buildings, school, colleges, hostel, auditorium, restaurant/ hotel building, primary health center/ hospital, shopping complex, sports complex, vegetable market, post office, and bank buildings.



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Learning Resources:**Text Books:**

1. Building Construction by B.C. Punmia, Laxmi Publications, 12 th addition, 2023.
2. Building Materials by S.V. Deodhar, Khanna Publication, 2022.
3. Building Construction by Bindra and Arora, Dhanpat Rai Publications, 2010.
4. Building Drawings with an integrated Approach to Built-Environment by M. G. Shah, C. M. Kale and S. Y. Patki, New Delhi, Tata McGraw Hill. (5th edition).

Reference Books:

1. Building Materials by S. K. Duggal, New Age International Publishers, 2025.
2. Building Construction by S.C. Rangwala, Charotdar Publications, 2022.
3. The construction of buildings; seventh edition, Vol.1 & Vol.2 by R. Barry, Oxford: Blackwell Science.
4. Building Materials Technology, Ruth T. Brantley & L. Reed Brantley, Tata McGraw Hill.
5. National Building Code 2016.
6. Building Design and construction by Frederick Merrit, Tata McGraw Hill, 7 th addition.
7. I.S. 962 – 1989 Code for Practice for Architectural and Building Drawings. Development plan and DCP Rules of urban local body, New Delhi, Volume 1.

Web link for MOOC / NPTEL Links:

1. <http://www.digimat.in/nptel/courses/video/105102088/L01.html>
2. <https://archive.nptel.ac.in/courses/105/103/105103093/>

List of Practicals:

1. Prepare drawings of types of masonry and Brick bonds.
2. Prepare sheet showing details of at least two doors, windows and Arches.
3. Draw the line plans of any one residential building and any two Public Buildings.
4. Draw perspective drawing of a small building element.
5. Prepare working drawing of any one type of building.
6. Draw plan, section and elevation of residential building using AutoCAD.
7. Draw site layout and water supply drainage layout.
8. Site visit: Any on-going construction site/ green building.
9. Document Collection: Different sanction forms and at least six brochures of building materials.

Course Code: 105302	Course Name: Mechanics of Structure	
Teaching Scheme	Credit	Evaluation Scheme
Theory : 2 Hours/Week Practical : 2 Hours/Week	2 1	CCE : 40 Marks ESE : 60 Marks TW : 25 Marks PR + OR : 25 Marks

Prerequisite Courses:

- Fundamentals of Physics, Engineering Mechanics, Engineering Mathematics.

Course Objectives:

- To study various types of stresses for determinate structural members.
- To learn concept of Shear Force and Bending Moment Diagram for determinate beams.
- To learn the concept of slope and deflection for determinate structural members.

Course Outcomes:

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

- CO1:** Describe stress-strain and determine various types of stress, strain in determinate, homogeneous and composite structures.
- CO2:** Calculate shear force and bending moment in determinate beams for various loading conditions and illustrate shear force and bending moment diagram.
- CO3:** Determine, bending stresses, shear stresses and Principal stresses.
- CO4:** Analyze axially loaded and eccentrically loaded column.
- CO5:** Determine the slopes and deflection of determinate beams and trusses.

Course Contents:**Unit-I: Simple Stresses and Strains****10 Hours**

Materials used in construction and their nature, Hook's Law, Stress-Strain Diagram for elastic, plastic materials and brittle material, Idealized stress-strain diagram, Concept of axial stresses (compression, tension), strains (linear, lateral, shear and volumetric), Elastic constants and their relations.

Stresses and strains due to change in temperature. Stresses, strains and deformations in determinate structures for homogeneous and composite structures under concentrated loads and temperature changes.

Unit-II: Shear Force and Bending Moment Diagrams**08 Hours**

Concept of shear force and bending moment. Relation between shear force, bending moment and intensity of loading. Shear force and bending moment diagrams for determinate beams due



to concentrated, uniformly distributed, uniformly varying loads and couples. Bending moment and loading diagram from given shear force diagram.

Unit-III: Shear, Bending and Principal Stresses

06 Hours

Shear Stresses in Beams: concept of shear, complimentary shear, derivation of shear stress formula, shear stress distribution for various cross sections, maximum and average shear stress for circular and rectangular sections. Theory of simple or pure bending, assumptions, derivation of flexure formula, bending stress distribution diagrams, Moment of Resistance of cross-section.

Concept of principal planes and principal stresses, normal and shear stresses on an oblique plane, magnitude and orientation of principal stresses and maximum shear stress.

Unit-IV: Axially and Eccentrically Loaded Columns

06 Hours

Axially Loaded Columns: concept of critical load and buckling, Euler's formula for buckling load with hinged ends, concept of equivalent length for various end conditions, Rankine's formula, safe load on column and limitations of Euler's formula.

Direct and bending stresses for eccentrically loaded short column. Effect of lateral force and self-weight. Resultant stress diagrams due to axial loads, uni-axial, and bi-axial bending. Concept of core of section for solid rectangular and circular sections.

Unit-V: Slope, Deflection and Torsion

06 Hours

Slope and Deflection of determinate Beams and Trusses. Slope and deflection of determinate beams by Macaulay's method and Strain energy method, Castigliano's first theorem. Joint displacement of determinate trusses by Unit load method.

Theory of torsion, assumptions, derivation of torsion formula. Stresses, strains and deformations in determinate shafts solid, homogeneous cross-sections subjected to twisting moments.

Learning Resources:

Text Books:

1. Mechanics of Structures Vol. I & II by S. B. Junnarkar and Dr. H. J. Shah, (32nd Edition 2016), Charotar Publishing House Pvt Ltd., Anand India.
2. Strength of Materials by R. Subramanian, (3rd ed., (2016)) Oxford University Press.
3. Strength of Materials by S. S. Ratan, (3rd Ed., 2016), Tata McGraw Hill.

Reference Books:

1. Elements of Strength of Materials by Timoshenko and Young, (5th edition, 2003), East-West Press Ltd.
2. Strength of Materials by F.L. Singer and Andrew Pytel, (4th edition, 1990), Harper and

Row Publication.

3. Mechanics of Materials by Beer and Johnston (8th Edition, 2020), McGraw Hill Publication.
4. Introduction to Mechanics of Solids by E.P. Popov, (V), (1989), Pearson Education (US).
5. Elementary Structural Analysis by Norris, Wilbur and Utku, (4th Edition, 1991), Tata McGraw Hill Publisher.
6. Intermediate Structural Analysis by R. C. Hibbler (9th Edition, 2017), Pearson Education Publishers.

Web link for MOOC / NPTEL Links:

1. <https://nptel.ac.in/courses/112106141>
2. https://onlinecourses.nptel.ac.in/noc25_me73/preview

List of Practicals:

Part-A: Metals

1. Tension test on TMT steel.
2. Shear (Single & Double) test on mild steel.
3. Torsion test on mild steel.
4. Impact (Izod & Charpy) test on mild steel, aluminum, brass.

Part-B: Timber and Ply Wood

1. Compression test on timber (Parallel & Perpendicular)
2. Bending test on timber and plywood.

Part-C: Bricks and Tiles

1. Water absorption test on bricks
2. Compressive strength test on bricks.
3. Flexural strength of flooring tiles.
4. Abrasion test of flooring tiles.

Oral Practical examination will be based on above term work.

Course Code: 105303	Course Name: Fluid Mechanics	
Teaching Scheme	Credit	Evaluation Scheme
Theory : 2 Hours/Week	2	CCE : 40 Marks ESE : 60 Marks

Prerequisite Courses:

- Engineering Physics, Engineering Mathematics, Engineering Mechanics.

Course Objectives:

- To understand and impart knowledge of the properties of fluid, fluid statics, fluid kinematics and fluid dynamics with reference to modified Bernoulli's equation
- To get acquainted with open channel flow, laminar and turbulent flow, dimensional analysis, boundary layer theory and buoyancy.
- To build the concept of flow around submerged objects and gradually varied flow.

Course Outcomes:

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

CO1: Identify fluid properties, fluid statics, and its application .

CO2: Perform dimensional analysis and boundary layer theory for solving practical problems of fluid flow.

CO3: Determine various flow and losses through pipes

CO4: Determine fluid kinematics, dynamics and flow around submerged bodies.

CO5: Design of most economical open channel flow section.

Course Contents:**Unit-I: Fluid Properties, Fluid Statics and Buoyancy****06 Hours**

Properties of Fluids: Definition of fluid and fluid mechanics: examples and practical applications, classification of fluids, physical properties of fluids and Newton's law of viscosity.

Fluid Statics and Buoyancy: Basic equation of hydrostatics, concept of pressure, pressure head, Pascal's Law, measurement of pressure, pressure transducers and their types, Principle of floatation and buoyancy, stability of floating and submerged bodies.

Unit-II: Dimensional Analysis and Boundary Layer**06 Hours**

Dimensions of physical quantities, Dimensional homogeneity, dimensional analysis using Buckingham's π theorem method, geometric, kinematic and dynamic similarity, important dimensionless numbers and their significance. Model laws, Concept, development of boundary

layer on flat plate and factors affecting growth, Hydro dynamically smooth and rough boundary and methods to control boundary layer separation.

Unit-III: Fluid Kinematics and Fluid Dynamics**06 Hours**

Classification of flows, stream line, stream tube, path line, streak line, continuity equation, Euler's equation of motion along stream line, Bernoulli's equation & application & limitations, concept of HGL & TEL, water hammer phenomenon.

Flow Around Submerged Objects: Definitions, expressions for drag, lift, type of drag, drag coefficient and lift coefficient, introduction to Magnus effect, lift on cylinder and aerofoil & polar diagram.

Unit-IV: Flow through Pipes**06 Hours**

Energy losses in pipe flow, characteristics of laminar flow & turbulent flow through pipe, Hagen Poiseuille equation, Prandtl's mixing length theory, Dupit's equation, Darcy's Weisbach equation, water hammer in pipes, pipe network analysis, pipe in series, pipe in parallel & introduction to siphon.

Unit-V: Flow through Open Channel**06 Hours**

Classification of channel & flows, Uniform flow formulae: Chezy's & Manning's formulae, most efficient rectangular & trapezoidal channel section, specific energy, Froude's number & flow classification based on it.

Gradually Varied Flow in Open Channel: Theory and computation basic assumptions of GVF, definition and methods of GVF computation.

Learning Resources:**Text Books:**

1. Hydraulics and Fluid Mechanics including Hydraulic Machine by Dr P. N. Modi & S. M. Seth 21st Edition, Standard Book House Publication, 2017.
2. A Text Book on Fluid Mechanics and Hydraulic Machines by Sukumar Pati Pub: McGraw Hill, New Delhi.
3. A Text Book of Fluid Mechanics and Hydraulic Machines, by Dr. R. K. Bansal Laxmi Publications (P) Ltd.

Reference Books:

1. Fluid Mechanics by Streeter, Wylie and Bedford – Pub: McGraw Hill International, New Delhi.
2. Fluid Mechanics by R. J. Garde and A.J. Mirajgaonkar Pub: SCITECH Publications (India) Pvt. Ltd, Chennai, 2010
3. Open Channel Hydraulics by Ven Tee Chow, Pub : McGraw Hill Book Company, Koga, 2009.



4. Fluid Mechanics, Fundamentals and applications by Yunus A. Cengel and John M. Cimbala, Mc Graw Hill International, 2019.

Weblink for MOOC / NPTEL Links:

1. <https://nptel.ac.in/courses/112104118>
2. <https://archive.nptel.ac.in/courses/112/105/112105269/>
3. <https://nptel.ac.in/courses/105101082>

Course Code: 170304A	Course Name: Engineering Mathematics-III	
Teaching Scheme	Credit	Evaluation Scheme
Theory : 2 Hours/Week	2	CCE : 40 Marks ESE : 60 Marks

Prerequisite Courses:

- Differential and Integral calculus, Differential equations of first order and first degree.

Course Objectives:

- To make the students familiarize with concepts and techniques in Ordinary Differential Equations, numerical methods, Laplace transform, Z-transform.
- To equip students with the techniques to understand advanced level mathematics and its applications that would enhance analytical thinking power, useful in their disciplines.

Course Outcomes:

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

CO1: Solve higher order linear differential equations using appropriate techniques.

CO2: Apply Laplace transform and Z-Transform to solve differential equations, difference equations.

CO3: Apply vector calculus concepts to analyze problems and solve system of linear equations by using numerical methods.

CO4: Analyze discrete and continuous random variables using Binomial, Poisson and Normal distributions.

CO5: Analyze data through hypothesis tests like Chi-square and *t*-tests.

Course Contents:**Unit-I: Linear Differential Equations 04 Hours**

Linear Differential Equations (LDE) of n^{th} order with constant coefficients, complementary function, particular integral by using shortcut methods.

Unit-II: Transforms 06 Hours

Laplace Transform: Laplace Transform, Inverse Laplace Transform & their theorems, Applications of LT for solving linear differential equations.

Z – Transform: Z-transforms and its region of convergence, properties of Z-transform, inverse Z-Transforms and its properties, application of Z-transform to solve difference equations.

Unit-III: Vector Calculus and Numerical Methods 08 Hours

Vector Differentiation: Scalar and vector fields, vector differential operator, gradient,

divergence & curl, solenoid, irrotational and scalar potential.

Vector Integration: Line integrals, surface integrals, Gauss's divergence theorem and Stoke's theorem (without proof).

Interpolation: Newton's forward interpolation, Newton's backward interpolation, Lagrange's interpolation.

Solution to System of Linear Simultaneous Equations:

Direct method: Determinant method, matrix inversion method, Gauss-Jordan method, Gauss-elimination method.

Iterative method: Gauss Jacobi, Gauss –Seidel method.

Unit-IV: Probability

06 Hours

Introduction to probability, random variable, discrete random variable, continuous random variable, binomial distribution, Poisson distribution, normal distribution.

Unit-V: Sampling and Inference

06 Hours

Testing of hypothesis, null hypothesis, alternate hypothesis, critical region, two types of errors, level of significance, Chi-square test for the goodness of fit, Student's t-test for single mean.

Learning Resources:

Text Books:

1. Higher Engineering Mathematics by B. V. Ramana (Tata McGraw Hill).
2. Higher Engineering Mathematics by B. S. Grewal (Khanna Publication).

Reference Books:

1. Advanced Engineering Mathematics by Erwin Kreyszig (Wiley Eastern Ltd.).
2. Advanced Engineering Mathematics by M. D. Greenberg (Pearson Education).
3. Advanced Engineering Mathematics by Peter V. O'Neil (Thomson Learning).
4. Thomas' Calculus by George B. Thomas, (Addison-Wesley, Pearson).

Weblink for MOOC / NPTEL Links:

1. Advanced Probability Theory by Prof. Niladri Chatterjee, IIT Delhi
https://onlinecourses.nptel.ac.in/noc25_ma04/preview
2. Transform Calculus and its applications in DE by Prof. Adrijit Goswami, IIT Kharagpur
https://onlinecourses.nptel.ac.in/noc25_ma56/preview
3. Numerical Methods by Prof. Ameeya Kumar Nayak, Prof. Sanjeev Kumar, IIT Roorkee
https://onlinecourses.nptel.ac.in/noc25_ma83/preview

Course Code: 170404A	Course Name: Artificial Intelligence	
Teaching Scheme	Credit	Evaluation Scheme
Theory : 2 Hours/Week	2	CCE : 40 Marks ESE : 60 Marks

Prerequisite Courses:

- Fundamentals of Programming Language.

Course Objectives:

- To introduce fundamental concepts of Artificial Intelligence (AI) and its real-world applications across various engineering domains.
- To explore problem-solving strategies using AI techniques such as search, logic, and decision-making.
- To familiarize students with the basics of machine learning and data-driven decision systems.
- To demonstrate how AI is used in engineering design, automation, prediction, and optimization.
- To enable students to appreciate ethical considerations and societal impact of AI in engineering.

Course Outcomes:

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

CO1: Explain the basic principles and scope of Artificial Intelligence and its relevance to different engineering disciplines.

CO2: Apply search algorithms for solving simple engineering problems.

CO3: Understand and differentiate between types of machine learning and data representations.

CO4: Identify and analyze AI applications in domains such as predictive maintenance, smart cities, automation, and control systems.

CO5: Recognize ethical, social, and professional issues in deploying AI solutions in engineering contexts.

Course Contents:**Unit-I: Introduction to Artificial Intelligence****06 Hours**

Definition and scope, history and evolution of AI, AI in daily life and industry, relevance of AI to different engineering disciplines, basics of intelligent agents and environments.

Unit-II: AI Problem Solving and Search Techniques**06 Hours**

Problem formulation and state space, Uninformed search (BFS, DFS), Informed search (Greedy, A*); **Use cases:** Path planning for robots, resource allocation in construction, fault detection in electrical circuits.

Unit-III: Fundamentals of Machine Learning**06 Hours**

Supervised vs Unsupervised learning vs Reinforcement Learning, concept of training, testing and validation. **Common algorithms:** Regression, k-NN, k-means, Introduction to neural networks, **Applications:** Quality control, load forecasting, image classification, Introduction to AI Tools (e.g., Python, scikit-learn, TensorFlow overview/ Excel / Google Colab).

Unit-IV: AI Applications in Engineering Domains**06 Hours**

AI in design and optimization (e.g., generative design), AI for predictive maintenance and diagnostics, smart manufacturing, building management systems and IoT, AI in traffic management and construction safety, AI in healthcare devices and embedded systems.

Unit-V: Ethical, Legal and Societal Aspects**06 Hours**

AI and Ethics: Bias, fairness, and transparency, data privacy and security concerns.

Social Impact of Automation: Job displacement, decision accountability. Responsible AI practices and guidelines, regulatory aspects in India and globally (brief overview).

Learning Resources:**Text Books:**

1. Artificial Intelligence, Elaine Rich, Kevin Knight, Shivashankar B. Nair, ISBN: 9780070087705, Tata McGraw-Hill Education, 2009.
2. Introduction to Machine Learning, Ethem Alpaydin, ISBN: 9780262028189, MIT Press, 2014.
3. Machine Learning, Tom M. Mitchell, ISBN: 9780070428072, McGraw-Hill, 1997.

Reference Books:

1. Artificial Intelligence: A Modern Approach, Stuart Russell and Peter Norvig, ISBN: 9780136042594, Pearson Education, 2010.
2. Introduction to Machine Learning with Python: A Guide for Data Scientists, Andreas C. Müller and Sarah Guido, ISBN: 9781449369415, O'Reilly Media, 2016.
3. The Elements of Statistical Learning, Trevor Hastie, Robert Tibshirani, and Jerome Friedman, ISBN: 9780387848570, Springer, 2009.
4. Deep Learning, Ian Goodfellow, Yoshua Bengio, and Aaron Courville, ISBN: 9780262035613, MIT Press, 2016.

Weblink for MOOC / NPTEL Links:

1. Google AI Education
<https://ai.google/education/>

2. MIT OpenCourseWare – Artificial Intelligence
<https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-034-artificial-intelligence-fall-2020/>
3. Coursera – AI For Everyone by Andrew Ng (Beginner Friendly)
<https://www.coursera.org/learn/ai-for-everyone>
4. Microsoft Learn – AI Fundamentals
<https://learn.microsoft.com/en-us/training/paths/introduction-artificial-intelligence/>
5. IBM SkillsBuild (Free Courses on AI & Data Science)
<https://skillsbuild.org/>
6. Google Colab (for coding practice)
<https://colab.research.google.com/>

Suggested In-Class Activities

Unit No.	Activity	Description
I	AI Around You	Group activity: Identify and present 5 real-life examples of AI in their domain (mechanical, civil, etc.).
II	Search Algorithm Simulation	Paper-based or Python/Excel simulation of BFS/DFS/A* for maze/pathfinding problems.
III	Hands-on with ML Tools	Use Google Colab to run a simple regression/classification example (k-NN or linear regression).
III	Model Demo with Data	Upload a dataset (e.g., student marks) and perform basic ML predictions in class.
IV	Domain Use Case Analysis	Groups present how AI is used in their engineering field (1 use case each).
V	Ethics Debate	Conduct a structured debate: <i>"Will AI lead to massive job loss in engineering?"</i>
V	AI Ethics Case Study	Review and discuss an AI failure (e.g., biased facial recognition, self-driving accidents).

Course Code: 171305A	Course Name: Intellectual Property Rights and Ethics	
Teaching Scheme	Credit	Evaluation Scheme
Theory : 3 Hours/Week Practical : 2 Hours/Week	3 1	CCE : 40 Marks ESE : 60 Marks TW : 25 Marks PR + OR : 25 Marks

Prerequisite Courses:

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Course Objectives:

- To understand basics of intellectual property rights (IPR).
- To learn copyright, trademarks and industrial design.
- To inculcate the ethical behaviour in the personal and professional lives.
- To facilitate the holistic development (life and profession) of students.

Course Outcomes:

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

CO1: Understand the basics of intellectual property rights.

CO2: Learn the patent filing process.

CO3: Understand the copyright/trademark/industrial design and filing process.

CO4: Understand the importance of ethics in their personal and professional life.

CO5: Learn the workplace responsibilities and rights as an engineer in the industry.

Course Contents:

Unit-I: Introduction to IPR

08 Hours

Concept of property, concept and relevance of IPR, importance of IPR in socio-economic development and technological innovation, prosecution of patent, patent infringement, geographical indications, patent search.

Unit-II: Contents of IPR

08 Hours

Meaning of patent, concept of novelty, inventiveness and utility, inventions not patentable, process and product patents, prosecution of patent, patent infringement.

Patent search, IPR filing process and documents, IPR commercialization and portfolio management.

Unit-III: Copyrights and Trademarks

08 Hours

Copyright: Meaning & scope, concept of originality.

Trademarks and Industrial Design: certification marks, property marks, well known marks, domain name protection.

Unit-IV: Ethics**08 Hours**

Concepts and principles, personal and professional ethics, emotional intelligence, code of conduct, roots of unethical behavior and ethics for engineers & managers.

Unit-V: Workplace Responsibilities and Rights**08 Hours**

Moral development, codes of ethics, ethical decision making, ethical dilemmas.

Learning Resources:**Text Books:**

1. WeGo Library Foundation Book (2025): Top 16 Secrets of Wealth Creation by Patent
2. Prabuddha Ganguli, (2001): Intellectual Property Rights. Tata McGraw Hill.
3. Mayall, Industrial Design, McGraw Hill.

Reference Books:

1. W.R. Cornish, (2013): Intellectual Property: Patents, Copyright, Trade Marks and Allied Rights. Sweet and Max Well London
2. Fernando AC (2018). Business Ethics and Corporate Governance (2nd Ed). Pearson, Education India
3. Martin MW & Schinzinger R (2005). Ethics in Engineering (4th Ed). McGraw Hill.

Web link for MOOC / NPTEL Links:

1. <https://ipindia.gov.in/>
2. https://onlinecourses.nptel.ac.in/noc22_hs04/preview
3. <https://nptel.ac.in/courses/127105008>

List of Practicals:

1. Search any five product or process recent patents from Indian patent website, prepare and give the presentation on it.
2. Prepare the patent filing draft of any one process patent.
3. Prepare the patent filing draft of any one product patent.
4. Demonstrate the trademark for any five industrial designs based on market survey
5. Case study on copyright filing.
6. Case study on trademark/industrial design filing.

Course Code: 171305B	Course Name: Renewable Energy	
Teaching Scheme	Credit	Evaluation Scheme
Theory : 3 Hours/Week Practical : 2 Hours/Week	3 1	CCE : 40 Marks ESE : 60 Marks TW : 25 Marks PR + OR : 25 Marks

Prerequisite Courses:

- Engineering Physics, Engineering Chemistry, Engineering Mathematics.

Course Objectives:

- To understand the principle of renewable energy generation such as hydro, solar, wind and bio-mass energy.
- To identify potential of renewable energy.
- To understand working of technologies to harness renewable energy.

Course Outcomes:

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

CO1: Describe the basics of renewable energy.

CO2: Explain the constructional details and working of hydro-electric power plant.

CO3: Describe the fundamentals and technology to harness solar energy.

CO4: Explain the wind energy conversion system.

CO5: Discuss the bio-energy conversion pathways.

Course Contents:

Unit-I: Introduction to Renewable Energy	08 Hours
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Energy scenario in the World, energy scenario in India, need of renewable energy, scenario of renewable energy generation in India and government policies, fundamentals of hydro, solar, wind, biomass, geothermal, tidal, ocean thermal, magneto hydro-dynamic and hydrogen energy.

Unit-II: Hydroelectric Energy	08 Hours
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Basics of hydrology, Hydroelectric Power Plant (HEPP): Classification, site selection, types of turbines, spillways, surge tanks, advantages and disadvantages, major HEPPs in India, hydroelectric energy scenario in India.

Unit-III: Solar Energy	08 Hours
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Terminology, solar radiation data, solar energy collectors, solar energy storage, power conditioning equipment, economics of solar photovoltaic power plant, advantages and

disadvantages of solar energy, solar energy scenario in India.

Unit-IV: Wind Energy

08 Hours

Wind availability data, basic components of wind mills, aerodynamics and design of wind turbine, performance operating characteristics, wind solar hybrid power plants, cost economics, wind energy scenario in India.

Unit-V: Biomass Energy

08 Hours

Biomass types and characterization, biomass energy potential in India, Biomass energy pathways – chemical and thermal, conversion technologies - digester and gasifier, biofuels, biomass energy scenario in India.

Learning Resources:

Text Books:

1. R.K.Rajput, Power Plant Engineering, Laxmi Publications New Delhi.
2. G. D. Rai, Energy Sources, Khanna Publications.

Reference Books:

1. B. H. Khan, Non-Conventional Energy Sources, Second Edition. Tata Mc-Graw Hill.
2. S P Sukhatme and J P Nayak, Solar Energy: Principles of Thermal Collection and Storage, McGraw-Hill Education, 2017.
3. G. N. Tiwari, Solar Energy: Fundamentals, Design, Modelling and Applications, Alpha Science, 2002.
4. J. F. Manwell, J. G. McGowan and A. L. Rogers., Wind Energy Explained- Theory, Design and Application. John Wiley and Sons Ltd.
5. Prabir Basu, Biomass Gasification, Pyrolysis and Torrefaction, Academic Press, Elsevier, 2013.

Web link for MOOC / NPTEL Links:

1. <https://nptel.ac.in/courses/103103206>
2. <https://nptel.ac.in/courses/103103207>
3. <https://nptel.ac.in/courses/108108078>

Web References:

1. Website of International Energy Agency
<https://www.iea.org/energy-system/renewables>
2. Website of Ministry of New and Renewable Energy
<https://mnre.gov.in/en/>
3. India_2020_Energy_Policy
https://iea.blob.core.windows.net/assets/2571ae38-c895-430e-8b62-bc19019c6807/India_2020_Energy_Policy_Review.pdf



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List of Practicals:

1. Plotting of PV and IV curve of solar panel using simulation.
2. Finding Maximum Power Point Tracking (MPPT) of solar panel using simulation.
3. Design and component selection for solar photovoltaic power plant with net metering.
4. Measurement of wind speed using anemometer.
5. Visit to solar PV power plant / wind turbine power plant.
6. Visit to hydroelectric power plant / biomass power plant.
7. Case study on biomass digester or biomass gasifier and analysis of properties of products.
8. Case study on government policies on adoption of renewable energy.

Course Code: 171305C	Course Name: Health, Care and Management Systems	
Teaching Scheme	Credit	Evaluation Scheme
Theory : 3 Hours/Week Practical : 2 Hours/Week	3 1	CCE : 40 Marks ESE : 60 Marks TW : 25 Marks PR + OR : 25 Marks

Expected Prerequisite Courses:

- Engineering Chemistry, Fundamentals of Electronics Engineering, Basic Electrical Engineering.

Course Objectives:

- To introduce the basics of human body systems relevant to healthcare.
- To understand common health issues and their engineering solutions.
- To explore biomedical instruments and hospital technologies.
- To gain awareness of digital healthcare systems and hospital management.

Course Outcomes:

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

CO1: Explain the structure and functions of key human body systems relevant to healthcare and diagnosis.

CO2: Identify common health issues and describe their causes and symptoms.

CO3: Apply principles and uses of basic biomedical instruments for diagnosis and patient monitoring.

CO4: Analyze the role of advanced medical devices and imaging systems in clinical decision-making and treatment.

CO5: Apply hospital management systems and digital health technologies like EHR, telemedicine, and emergency tracking in healthcare scenarios.

Course Contents:

Unit-I: Introduction to Human Body Systems 08 Hours

Overview of Major Body Systems: Heart and blood circulation (Cardiovascular system), Breathing system (Respiratory system), Nervous system, Muscular system. Five senses. Working of eyes and ears. Kidney and its functions.

Unit-II: Common Health Problems and Causes 08 Hours

Health Issues Related to: Heart: Cardiac arrest, high/low blood pressure, Brain: Neurological disorders, Eye and ear: Vision issues, hearing loss, Lungs: Respiratory problems, Muscles:

Movement disorders, Blood flow. Kidneys: Kidney failure, Bones: Fractures.

Unit-III: Basic Engineering Devices in Healthcare**08 Hours**

Electro-Cardiography (ECG), Blood pressure monitor, Electro-Encephalography (EEG), Eye tools: Visual Acuity, Ear tools: audiometer, Lung tools: Spirometer, Muscle activity: Electro-Myography (EMG), Blood flow meters, Dialysis machine (artificial kidney).

Unit-IV: Advanced Technologies in Hospitals**09 Hours**

Digital X-ray machine, Pacemaker, Defibrillator, Ventilator, Ultrasound imaging, Computer Tomography (CT scan), Magnetic Resonance Imaging (MRI), Robotic-assisted surgery.

Unit-V: Hospital Management System**07 Hours**

Patient registration process, Health records: paper-based vs. electronic, Software used in hospitals, Electronic Health Records, Telemetry and telemedicine, Emergency systems (e.g., ambulance tracking), Real-world examples of hospital IT systems.

Learning Resources:**Text Books:**

1. R. S. Khandpur, Handbook of Biomedical Instrumentation, Tata McGraw Hill.
2. C. N. Chatterjee, Human Physiology (Vol 1 & 2), Medical Allied Agency.

Reference Books:

1. Leslie Cromwell, Biomedical Instrumentation and Measurements, Prentice-Hall of India.
2. John Enderle & Joseph Bronzino, Introduction to Biomedical Engg., Academic Press.
3. Anne Waugh & Allison Grant, Ross and Wilson Anatomy and Physiology in Health and Illness, Elsevier.

Web link for MOOC / NPTEL Links:

1. Biomedical Instrumentation
<https://nptel.ac.in/courses/108/105/108105101/>
2. Human Anatomy and Physiology
<https://www.khanacademy.org/science/health-and-medicine>
3. Coursera – Introduction to Medical Imaging
<https://www.coursera.org/learn/medical-imaging>
4. Anatomy and medical illustration videos.
<https://www.youtube.com/@armandohasudungan>
5. Simple demos of biomedical concepts.
<https://www.youtube.com/@BiomedicalEngineersTV/videos>
6. WHO eLearning Resources <https://openwho.org/>

**List of Practicals:**

1. Measure your own blood pressure using a digital Sphygmomanometer/APP.
2. Record and analyze heart rate using a pulse sensor/App.
3. To study ECG waveform and understand its parts.
4. To study Spirometer and understand its waveforms
5. To study and understand EEG waveforms.
6. To study and understand EMG waveforms.
7. To study Audiometer and understand Audiogram.
8. Case study on Hospital Information Systems (any one): Patient Registration (using MS Excel), EHR, Telemedicine, Emergency Systems and Healthcare IT Tools.
9. Presentation / report on a visit to a nearby clinic, use of a Health App or study of a related healthcare facility.
10. Virtual Lab Experiments: <https://bmi-iitr.vlabs.ac.in/>

Course Code: 171305D	Course Name: Smart City and Infrastructure	
Teaching Scheme	Credit	Evaluation Scheme
Theory : 3 Hours/Week Practical : 2 Hours/Week	3 1	CCE : 40 Marks ESE : 60 Marks TW : 25 Marks PR + OR : 25 Marks

Prerequisite Courses:

- Basic of Computer Knowledge, Indian Knowledge System.

Course Objectives:

- To introduce the concept and components of smart cities, including infrastructure, technology and sustainability.
- To enable the students to apply the basic need and planning concept to solve various infrastructure problems such as transportation, water supply and waste management, etc.
- To apply emerging technologies such as IoT, GIS and data analytics in designing and developing smart city infrastructure solutions.
- To encourage critical thinking through case studies and real-world examples of smart city projects, focusing on challenges and best practices.

Course Outcomes:

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

CO1: Describe the concept, features, and components of smart cities with relevant examples.

CO2: Demonstrate the structure and regulatory mechanisms of smart city development in context of Indian and international benchmarks.

CO3: Apply GIS and remote sensing techniques for spatial analysis and infrastructure planning in smart cities.

CO4: Relate smart transportation technologies and their role in improving urban mobility and sustainability.

CO5: Suggest smart solutions for urban water, air and waste management using IOT technologies.

Course Contents:**Unit-I: Introduction to Smart Cities****08 Hours**

Definition and key features of smart cities, smart infrastructure components, urban planning's role in smart cities, challenges and opportunities in smart city development, successful smart city case studies from around the World.

Unit-II: Planning and Development of Smart Cities**08 Hours**

Smart city mission of India, global standards and performance benchmarks, practice codes, smart city planning and development, financing smart cities development, governance of smart cities, SDG goals.

Unit-III: Applications of GIS and Remote Sensing**08 Hours**

Fundamentals of GIS and remote sensing, role of GIS in urban planning and development, spatial data analysis and visualization for smart cities, applications in infrastructure management: roads, utilities and land use.

Unit-IV: Smart Urban Transportation Infrastructure**08 Hours**

Smart transportation systems, Intelligent Transportation Systems (ITS): sensors and communication, AI and machine learning in traffic management, public transport integration with smart technologies, EV infrastructure and sustainable urban mobility, successful smart transportation project case studies.

Unit-V: Smart Technologies for Sanitation Infrastructure**08 Hours**

Water demand and supply planning in smart cities, smart water grids: real-time monitoring, IoT integration in water and sewer management, air quality management and smart solid waste management.

Learning Resources:**Text Books/Guidelines:**

1. Smart Cities Mission, India: Localizing Sustainable Development Goals, UN-Habitat. MoHUA, GoI. 2023.
2. Smart Cities, Mission Statement & Guidelines, Ministry of Urban Development Government of India, June 2015.

Reference Books:

1. Role of Edge Analytics on Sustainable Smart City Development: Challenges and Solutions by G. R. Kanagachidambaresan.
2. Solving Urban Infrastructure Problems Using Smart City Technologies: Handbook on Planning, Design, Development, and Regulation by John R. Vacca.
3. Sustainable Smart Cities in India: Challenges and Future Perspectives (The Urban Book Series) by Poonam Sharma and Swati Rajput.
4. Smart Cities: Big Data, Civic Hackers, and the Quest for a New Utopia by Anthony M. Townsend.
5. GIS for Urban and Regional Planning by Peter O'Connell.
6. Artificial Intelligence in the 21st Century by Stephen Lucci and Danny Kopec.
7. Internet of Things for Smart Cities: Technologies, Big Data and Security by Zaigham



Mahmood.

Web link for MOOC / NPTEL Links:

1. https://onlinecourses.swayam2.ac.in/ntr25_ed38/preview
2. <https://www.edx.org/learn/urban-planning/world-bank-group-e-learning-course-on-smart-city?index=product&queryId=5033b061a1acb99dd13abd8a53491c99&position=1>
3. <https://www.coursera.org/learn/smart-cities>

List of Practicals/Assignments:

1. Prepare a report and presentation on a selected Indian smart city.
2. Analyze and evaluate smart city governance structures and funding models, highlighting major strategies, strengths, and concerns.
3. Introduction to GIS and remote sensing in smart city planning
4. Prepare a case study report on how AI and Machine Learning are used for traffic congestion management in a smart city project.
5. Identify the applications for smart solid waste management with IoT.
6. Introduction to EPANET software and its application in smart city development.
7. Field visit at smart city project and prepare technical report.
8. Mini Project: Identify problems in the infrastructure facility of city and propose a smart solution for the identified problem.

Course Code: 172306	Course Name: Entrepreneurship Development	
Teaching Scheme	Credit	Evaluation Scheme
Tutorial : 2 Hours/Week	2	TW : 50 Marks

Prerequisite Courses:

- Professional Communication Skills.

Course Objectives:

- To equip to recognize the importance of entrepreneurship in economic and social development.
- To assist students in validating innovative business ideas.
- To inculcate principles of financial feasibility, revenue model, and funding options in an entrepreneurial context.
- To facilitate to pitch the business ideas effectively and develop a structured business plan.

Course Outcomes:

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

CO1: Explain the concept of entrepreneurship and its importance in economic and social development.

CO2: Identify, evaluate, and validate innovative business ideas using market research techniques.

CO3: Analyze startup funding options, revenue models, and financial feasibility of new businesses.

CO4: Demonstrate the ability to pitch business ideas effectively to potential stakeholders.

CO5: Develop a structured business plan incorporating all key aspects of entrepreneurship.

Course Contents:**Unit-I: Understanding Entrepreneurship****04 Hours**

Definition and importance of entrepreneurship, characteristics of successful entrepreneurs, types of entrepreneurs (innovators, imitators, social entrepreneurs, corporate entrepreneurs, etc.), entrepreneurial mindset and problem-solving approach, startup ecosystem in India – govt. Schemes (Startup India, Mudra, etc.).

Unit-II: Business Idea Generation and Validation**04 Hours**

Sources of business ideas (personal experience, market gaps, innovations, etc.), design thinking approach to problem solving, concept of ideation, prototyping and experimentation, feasibility

analysis: market feasibility, technical feasibility, financial feasibility.

Unit-III: Market Research and Business Model Canvas

04 Hours

Introduction to market research – primary vs. Secondary data, competitive analysis and market segmentation, understanding customer pain points and buying behavior, business model canvas and lean startup approach.

Unit-IV: Startup Finance and Funding

04 Hours

Introduction to startup funding (bootstrapping, angel investment, VC, IPO), revenue models and financial planning for startups, break-even analysis and risk management in startups.

Unit-V: Pitching and Business Prototyping

04 Hours

Essentials of a good startup pitch, how to develop a prototype or Minimum Viable Product (MVP), how to persuade investors and customers.

Learning Resources:

Text Books:

1. Entrepreneurship Development and Small Business Enterprises – Poornima M. Charantimath. Pearson Publication.
2. Innovation and Entrepreneurship – Peter F. Drucker, Harper Business.
3. Startup Success: The Indian Way – Prachi Garg, Bloomsbury India.
4. Entrepreneurship: New Venture Creation – David H. Holt, Prentice Hall India

Reference Books:

1. Entrepreneurship: Theory, Process, and Practice – Donald F. Kuratko and T.V. Rao, Cengage India.
2. Make in India: The Road Ahead – I.K. Menon, Rupa Publications.

Web link for MOOC / NPTEL Links:

1. Steve Jobs' Stanford Commencement Speech.
www.youtube.com/watch?v=Hd_ptbiPoXM.
2. How to Generate Business Ideas. www.onlinecourses.nptel.ac.in/noc21_mg63/preview
3. Business Model Canvas Explained. www.youtube.com/watch?v=z6-Ly8Bl4Hc
4. Basics of Startup Funding. www.razorpay.com/blog/business-banking/all-about-startup-funding/
5. How to Pitch a Startup Idea. www.onlinecourses.nptel.ac.in/noc25_ge11/preview..

List of Activities:

1. **Meet the Entrepreneur – Guest Lecture and Interview:** Arrange an interactive session with a local entrepreneur. Students will prepare interview questions, conduct discussions, and submit a report. Expected Outcome: Understanding real-world



entrepreneurial challenges and decision making. Case Study: Dhirubhai Ambani – The Entrepreneurial Journey.

2. **Idea Lab – Brainstorming and Idea Pitching:** Students will brainstorm ideas, assess feasibility, and pitch concepts. Expected Outcome: Enhanced creativity, ability to identify opportunities. Case Study: Airbnb's Pivot Story.
3. **Market Pulse – Conducting a Market Survey:** Students will conduct market surveys, analyse responses, and interpret insights. Expected Outcome: Understanding of market demand and consumer preferences. Case Study: Zomato's Market Entry Strategy
4. **Investor's Desk – Creating a Business Plan and Financial Projection:** Students draft a business plan with basic financial estimates. Expected Outcome: Understanding financial viability of a startup. Case Study: OYO Rooms – Funding Rounds
5. **Startup Shark Tank – Business Pitch Presentation:** Students prepare and present a business pitch to a jury. Expected Outcome: Confidence in pitching ideas and persuasive communication. Case Study: Shark Tank Success Stories.

Course Code: 172406	Course Name: Business Economics	
Teaching Scheme	Credit	Evaluation Scheme
Tutorial : 2 Hours/Week	2	TW : 50 Marks

Prerequisite Courses:

- Professional Communication Skills.

Course Objectives:

- To equip students to recognize the importance of economics and business decision-making.
- To assist students in applying demand, supply principles, and pricing strategies.
- To inculcate the understanding of cost–structure, profitability, and break–even points from the business perspective.
- To facilitate the students to understand the real-life business eco-system.

Course Outcomes:

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

CO1: Understand the role of economics in business decision-making and analyze real-world economic scenarios.

CO2: Apply demand and supply principles to determine market equilibrium and pricing strategies.

CO3: Analyze cost structures, profitability and break-even points in business operations.

CO4: Evaluate the impact of business cycles, inflation, and government economic policies on industries.

CO5: Develop pricing strategies based on competitive analysis and consumer demand.

Course Contents:

Unit-I: Basics of Business Economics

04 Hours

Introduction to micro and macro-economics, concept of scarcity, choice and opportunity cost, role of economics in business decision making, real-world applications in Indian industries.

Unit-II: Demand, Supply and Market Equilibrium

04 Hours

Law of demand and supply, elasticity of demand and its business implications, market equilibrium and price determination, case studies on demand forecasting.

Unit-III: Cost, Revenue and Profitability

04 Hours

Types of costs – fixed, variable, marginal costs, break-even analysis and profit maximization

strategies.

Unit-IV: Business Cycles and Economic Policies

04 Hours

Understanding inflation, recession, boom cycles, impact of govt. policies on business and economy.

Unit-V: Pricing Strategies and Competition

04 Hours

Pricing strategies – skimming, penetration, cost-based pricing, other pricing strategies, understanding market structures – monopoly, oligopoly and perfect competition.

Learning Resources:

Text Books:

1. Managerial Economics – D.N. Dwivedi, Vikas Publishing.
2. Business Economics – H.L. Ahuja, Publication by S. Chand.
3. Microeconomics for Business – Satya P. Das, Oxford University Press India.
4. Macroeconomics for Managers – Shankar Acharya, Sage Publications.

Reference Books:

1. Indian Economy – Ramesh Singh, McGraw Hill.
2. Economic Environment of Business – Veena Keshav Pailwar, PHI Learning.

Web link for MOOC / NPTEL Links:

1. Introduction to Business Economics – NPTEL Lecture by IIT Madras.
<https://nptel.ac.in/courses/130106118>.
2. How Economic Principles Shape India's Startup Ecosystem" – Published in the Economic Times. <https://economictimes.indiatimes.com/tech/startups/national-startup-day-2025-how-nine-years-of-policies-shaped-indias-startup-ecosystem/articleshow/117291674.cms?from=mdr>
3. Law of Demand and Supply Explained with Real-Life Examples" – Dr. Vivek Bindra.
<https://www.youtube.com/playlist?list=PLOxBmXq4mdMOd3RQ3bAWxz8siZ4pnOtiI>
4. How Patanjali Capitalized on Demand Elasticity to Dominate Indian FMCG Market" – Business Standard. https://www.business-standard.com/article/management/the-patanjali-effect-116020800204_1.html
5. Break-Even Analysis and Its Business Applications – Harvard Business Review.
<https://hbr.org/2014/07/a-quick-guide-to-breakeven-analysis>
6. How Indian Airlines Manage Costs and Profit Margins – The Hindu Business Line.
<https://www.thehindubusinessline.com/economy/logistics/will-indian-aviation-market-turn-profitable-as-it-heads-towards-duopoly/article67453093.ece>

7. Business Cycles Explained with Real-Life Examples – NPTEL Economics.
<https://www.investopedia.com/terms/b/businesscycle.asp>
8. Indian Government's Response to Economic Slowdowns: A Policy Review – Economic Survey of India. <https://www.indiabudget.gov.in/budget2024-25/economicsurvey/doc/echapter.pdf>
9. Types of Market Structures and Their Business Implications – Investopedia.
<https://www.investopedia.com/terms/m/market.asp>
10. Indian Government's Response to Economic Slowdowns: A Policy Review – Economic Survey of India. <https://www.indiabudget.gov.in/budget2024-25/economicsurvey/doc/echapter.pdf>.

List of Activities:

1. **Economic Detective – Identifying Economic Principles in Real Businesses:** Students analyze news reports to find economic applications. Expected Outcome: Understanding economic impact on business. Case Study: "How Amul Uses Economic Principles for Business Expansion" – Discusses pricing strategies, production decisions, and supply chain management.
2. **Local Market Analysis – Demand-Supply Survey:** Students visit local markets to analyse pricing and customer behavior. Expected Outcome: Real-world application of demand-supply principles. Case Study: "Why Uber Uses Surge Pricing: A Demand and Supply Analysis.
3. **Profit Calculator – Cost and Revenue Analysis:** Students analyze cost structures of local businesses. Expected Outcome: Practical understanding of business profitability. Case Study: How Swiggy and Zomato Optimize Costs and Pricing to Stay Profitable.
4. **Economic Trends Report – Analysing GDP and Policies:** Students analyse recent economic trends and policies. Expected Outcome: Awareness of macroeconomic factors affecting business. Case Study: "How the 2008 Global Financial Crisis Impacted Indian Startups.
5. **Competitive Pricing Challenge – Designing a Pricing Strategy:** Students set competitive prices for a product and justify pricing. Expected Outcome: Real-world pricing strategy application. Case Study: Why Jio's Pricing Strategy Disrupted the Indian Telecom Market.

Course Code: 173307	Course Name: Universal Human Values	
Teaching Scheme	Credit	Evaluation Scheme
Practical : 2 Hours/Week Tutorial : 1 Hour/Week	2	TW : 50 Marks

Prerequisite Courses:

- UHV-I (Student Induction Program).

Course Objectives:

- To equip students to recognize the harmony between "VALUES" and "SKILLS" for success and long-term fulfillment.
- To assist students to initiate an internal dialogue process to determine their true goals for their lives and careers.
- To inculcate principles of harmonious living within the family and society and to apply effective strategies for fostering trust, respect, and ethical values in interpersonal relationships.
- To facilitate the students to understand harmony at all the levels of human existence.
- To prepare students for the natural acceptance of human values and transform towards value based life.

Course Outcomes:

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

CO1: Explore a holistic vision of life, including the self and surroundings.

CO2: Recognize the co-existence of self, realize harmony, and comprehend the true happiness.

CO3: Apply strategies that foster harmony in family and society through effective communication and relationship-building to cultivate social well-being.

CO4: Execute self-regulations to mutually fulfilling human behavior and enriching interaction with nature to realize harmony.

CO5: Emphasize the implications of a holistic approach in terms of ethical human conduct, and transit towards value based life.

Course Contents:**Unit-I: Introduction to Value Education****06 Hours**

Overview of UHV-I (SIP) to highlight basic Universal human values truth (satya), peace (shanti), love (prem), nonviolence (ahimsa), scientific temper, citizenship values, and also life-skills; character, seva/service (social), education to be ethical, rational, compassionate, and caring, gainful and fulfilling employment.

Right Understanding, Relationship and Physical Facility (Holistic Development and the Role of Education) Understanding Value Education, Self-exploration as the Process for Value Education, Continuous Happiness and Prosperity – the Basic Human Aspirations, Happiness and Prosperity – Current Scenario, Method to Fulfil the Basic Human Aspirations.

Practice Sessions (Any Two):

1. **Self-Reflection** – Writing daily reflections on happiness, prosperity, and relationships.
2. **Natural acceptance** – Exploring natural acceptance.
3. **Human consciousness** – Exploring human consciousness
4. **Case Study Analysis** – Analyzing real-life scenarios related to materialism, relationships, and inner happiness.

Unit-II: Harmony in the Human Being**06 Hours**

Human beings are more than just the body, harmony of the self with the body, understanding myself as co-existence of the self and the body, understanding needs of the self and the needs of the body, understanding the activities in the self and the activities in the body.

Practice Sessions (Any Two):

1. **Self-Introductory** – Introduce yourself in detail, your goals and plans to achieve goals in life.
2. **Group Discussion** – How do you differentiate right and wrong? What have been your achievements and shortcomings in your life? Observe and analyze them?
3. **Need of Self and Body** – Explore the difference in need of self and body.
4. **Harmony in Self and Body** – Exploring harmony of self with the body.

Unit-III: Harmony in the Family and in Society**06 Hours**

Family Harmony and Well-Being, Trust – The Core Foundation of Relationships, Respect – Proper Acknowledgment and Appreciation, Ethical Values in Interpersonal Relationships, Comprehending Social Harmony, Aspirations for a Universal Human Order, Key Aspects of the Human Order, The Five Pillars of Human Organization.

Practice Sessions (Any Two):

1. **Role-Playing** – Exercise on Family Communication & Conflict Resolution,
2. **Group Discussion** – Exploring the feeling of trust and respect, trust-building activities

in personal and professional relationships.

3. **Debate** – Debate on social harmony and universal human order.
4. **Human Goal** – Exploring Systems to fulfil Human Goal.

Unit-IV: Harmony in Nature/Existence

06 Hours

Understanding harmony in nature, self-regulation, and mutual fulfillment among the four orders of nature, realizing existence as coexistence, and holistic perception of harmony in existence.

Practice Sessions (Any Two):

1. **Orders of Nature** – Exploring the four orders of nature.
2. **Harmony in Nature** – Discussion on harmony in nature.
3. **Self-expression** – On Exploring co-existence in existence.
4. **Discussion** – Self-regulation and mutual fulfillment among the four orders of nature.

Unit-V: Implications of Holistic Understanding: A Look at Professional Ethics 06 Hours

Natural acceptance of human values, definitiveness of ethical human conduct, a basis for humanistic education, humanistic constitution and universal human order, competence in professional ethics, holistic technologies, production systems and management models-typical case studies, strategies for transition towards value-based life and profession.

Practice Sessions (Any Two):

1. **Discussion** – Exploring ethical human conduct.
2. **Humanistic Models** – in education.
3. **Case Studies** – Holistic technologies, production systems and management models.
4. **Transformation** – Steps of transition towards universal human order.

Learning Resources:

Text Books:

1. An Introduction to Indian Philosophy, Chatterjee, S.G. and Datta, D.M., University of Calcutta Press, 1960.
2. Manav Vyavahar Darshan, Nagraj A., Jeevan Vidya Prakashan, 3rd edition, 2003.
3. A Foundation Course in Human Values and Professional Ethics, R R Gaur, R Asthana, G P Bagaria, 2019 (2nd Revised Edition), ISBN 978-93-87034-47-1, Excel Books, New Delhi
4. Professional ethics and Human Values, R. S. Naagarazan, New age International publishers
5. The Textbook A Foundation Course in Human Values and Professional Ethics, R R Gaur, R Asthana, G P Bagaria, 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034- 47-1.

6. The Teacher's Manual for A Foundation Course in Human Values and Professional Ethics, R R Gaur, R Asthana, G.
7. Harmony in the House: A Family Values Model by David A. Stallman. ECHOES Press -David A. Stallman; 1st edition (7 June 2013)
8. Professional Ethics and Human Values, Premvir Kapoor, ISBN: 978-93-86173-652, Khanna Book Publishing Company, New Delhi, 2022.

Reference Books:

1. Human Values and Professional Ethics – R. R. Gaur, Rajeev Sangal, G.P. Bagaria, Excel Books, New Delhi
2. Vyavaharvadi Samajshastra, Nagraj, A., Jeevan Vidya Prakashan, 2nd edition, 2009.
3. Sociology & Economics for Engineers, Premvir Kapoor, Khanna Publishing House, New Delhi, 2018
4. Human Values, 2003, A. N. Tripathy, New age International Publishers
5. Jeevan Vidya: Ek Parichaya, A Nagaraj, Jeevan Vidya Prakashan, Amar kantik, 1999.
6. Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004.
7. The Story of Stuff by Annie Leonard, Publisher Simon and Schuster
8. The Story of My Experiments with Truth - by Mohandas Karamchand Gandhi Public Affairs Press of Washington, D.C.
9. Small is Beautiful - E. F Schumacher. Publisher Harper Collins
10. Slow is Beautiful - Cecile Andrews, New Society Publishers
11. Economy of Permanence - J C Kumarappa, Sarva Seva Sangh Prakashan
12. Bharat Mein Angreji Raj – Pandit Sunderla, Prabhat Prakashan, New Delhi
13. Rediscovering India - by Dharampal, SIDH, Mussoorie, 2003.
14. Hind Swaraj or Indian Home Rule - by Mohandas K. Gandhi, Navajivan Publishing House, Ahemdabad 380014, Gujarat, India
15. India Wins Freedom - Maulana Abdul Kalam Azad, published in 1988 by Orient BlackSwan
16. Vivekananda - Romain Rolland (English) Advaita Ashram, Calcutta
17. Gandhi - Romain Rolland (English) Shiva lal Agarwala & company, Agra.

Web link for MOOC / NPTEL Links:

1. <https://nptel.ac.in/courses/109104068>
2. https://onlinecourses.nptel.ac.in/noc24_hs169/preview
3. https://archive.nptel.ac.in/content/syllabus_pdf/109104068
4. <https://www.skillindiadigital.gov.in/courses/detail/d7db86f0-d2d8-42aa-a8c0-502467563b5a>
5. <https://uhv.org.in/>

Tutorial and Term Work:

Term work shall be consists of following 08 activities from PART-A and 10 short reports from PART-B.

PART-A

1. **Digital Detox Experiment:** Avoiding social media and unnecessary digital distractions for a day and reflecting on mental clarity and happiness.
2. **Community Interaction Task:** Engaging with different social groups to understand diverse perspectives on happiness and prosperity.
3. **Health Awareness Program:** List down all your important desires. Observe whether the desire is related to Self (I) or the Body
4. **Role playing activity:** Make a chart to show the whole existence as co-existence. With the help of this chart try to identify the role and the scope of some of the courses of your study
5. **Family Dialogue Circle:** Participants engage in a structured conversation where they assume different family roles and practice active listening, empathy, and resolution strategies.
6. **Blindfold Trust Walk:** Participants pair up, with one guiding a blindfolded partner through obstacles to build trust and reliance.
7. **Reduce Waste:** Plastic / E-Waste / Medical/Hospital Waste/Pharmaceutical/Industrial Waste and its Management
8. **Value-based Life:** Strategies for Transition towards Value-based Life and Profession.

PART-B

Total 10 reports in brief, of practice session (02 from each unit).

Course Code: 173407	Course Name: Environmental Studies	
Teaching Scheme	Credit	Evaluation Scheme
Practical : 2 Hours/Week Tutorial : 1 Hour/Week	2	TW : 50 Marks

Prerequisite Courses:

- Basic Science.

Course Objectives:

- To describe the scope, importance and need for public awareness of environmental studies and natural resources.
- To explain the structure, function, and diversity of ecosystems and biodiversity, along with related case studies.
- To identify the causes, effects and control measures of various types of environmental pollution.
- To discuss major environmental and social issues, policies, and acts related to sustainable development.
- To observe and document environmental features, pollution sites, and ecosystems through field visits.

Course Outcomes:

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

CO1: Describe the importance of environmental studies and the sustainable use of natural resources.

CO2: Explain the structure and function of ecosystems and the significance of biodiversity.

CO3: Identify various types of environmental pollution and their control measures.

CO4: Discuss key environmental issues, policies and their impact on society.

CO5: Observe and report environmental conditions and features through field activities.

Course Contents:**Unit-I: Introduction to Environmental Studies****06 Hours**

Definition, scope and importance, components of environment, Need for Public awareness, Natural Resources: Renewable and non-renewable resources: Natural resources and associated problems a) Forest b) Water c) Mineral d) Food e) Land f) Energy. Role of an individual in conservation of natural resources, use of resources for sustainable lifestyle.

Unit-II: Ecosystems and Biodiversity**06 Hours**

Ecosystems: Concept of an ecosystem, structure and function of an ecosystem, producers,

consumers and decomposer, energy flow in the ecosystem, ecological succession, food chains, food webs and ecological pyramids, characteristic features, case study on forest ecosystem, aquatic ecosystem.

Biodiversity: Introduction – definition: genetic, species and ecosystem diversity, biogeographical classification of India, value of biodiversity: consumptive use, productive use, social, ethical, aesthetic values, biodiversity at global, national and local levels, India as a mega-diversity nation, hotspots of biodiversity, threats to biodiversity, conservation of biodiversity, case study on any one hotspot of biodiversity.

Unit-III: Environmental Pollution

06 Hours

Definition, cause, effects and control measures of different pollution: a) Air, b) Water, c) Soil, d) Noise, e) Thermal, f) Nuclear hazards, industrial pollution and control, solid waste management: control measures of urban and industrial waste, role of an individual in prevention of pollution. Case studies.

Unit-IV: Environment and Social Issues

06 Hours

Environment from unsustainable to sustainable development, urban problems related to energy water conservation, rainwater harvesting, watershed management, resettlement and rehabilitation of people: its problems and concerns, case studies, environmental ethics: issues and possible solutions, climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust, case studies, wasteland reclamation, consumerism and waste products. Environment (protection) act, air (prevention and control of pollution) act, water (prevention and control of pollution) act, wildlife (protection) act, forest (conservation) act, issues involved in enforcement of environmental legislation, public awareness.

Unit-V: Field Work

06 Hours

Visit to water treatment plant/Municipal solid waste treatment plant and detail report on it.

Visit to an area to document environmental assets; river/forest/flora/fauna, etc.

Visit to a local polluted site – Urban/Rural/Industrial/Agricultural.

Study of common plants, insects, birds and basic principles of identification.

Learning Resources:

Text Books:

1. Environmental Studies, Erach Bharucha, University Grants Commission, New Delhi
2. Environmental Science, Y. K. Singh, New Age International Publishers, 2006, .
3. Environmental Studies: From Crisis to Cure, Rajagopalan R., Oxford University Press, USA, ISBN:9780199459759, 0199459754.
4. A text book of Environmental Science, Shashi Chawla, Tata Mc Graw-Hill New Delhi

5. A Text Book of Environmental science, Arvind Kumar, APH Publishing New Delhi.

Web link for MOOC / NPTEL Links:

1. Challenges to Sustainable Development:
<https://www.un.org/en/development/desa/financial-crisis/sustainable-development.html>
2. NPTEL course on sustainable development: <https://nptel.ac.in/courses/109105190>
3. Swayam Course on Environmental studies (Natural Resources, Biodiversity and other topics): https://onlinecourses.swayam2.ac.in/cec19_bt03/preview
4. NPTEL course on environmental studies which encompasses SDGs, Pollution, Climate issues, Energy, Policies and legal framework:
https://onlinecourses.nptel.ac.in/noc23_hs155/preview
5. SWOT analysis of Biodiversity: <https://www.cbd.int/development>
6. India's Strategies to progress across the SDGs.:
<https://sustainabledevelopment.un.org/memberstates/india>
7. IGNOU's Initiative for online study material on Environmental studies:
<https://egyankosh.ac.in/handle/123456789/61136>
8. IGNOU's Initiative for online study material on sustainability:
<https://egyankosh.ac.in/handle/123456789/50898>
9. United Nation's website mentioning Sustainability goals:
<https://sdgs.un.org/goals>
10. Green Belt Movement's work on tree plantation, soil conservation and watershed management techniques:
<http://www.greenbeltmovement.org/what-we-do/tree-planting-for-watersheds>

List of Activities:

Part-A: Assignments

1. Study and report on the role of individuals in conserving natural resource or engineering material.
2. Research and write a case study on one biodiversity hotspot in India. Include location, species richness, threats, and conservation efforts.
3. Choose one type of pollution (e.g., air or water or soil) and illustrate/analyse its causes, effects, and possible control measures in your city or town.
4. Prepare a presentation on any one issue: global warming, climate change, acid rain, or ozone depletion. Include current data and case studies.

Part-B: Field Work

5. Visit a water treatment plant or municipal waste treatment plant. Submit a detailed report with process description and photos/diagrams.



6. Visit to an area to document environmental assets; river/forest/flora/fauna, etc.
7. Report on a local polluted site – Urban/Rural/Industrial/Agricultural.
8. Study of common plants, insects, birds and basic principles of identification.

Part-C: Project/Activity

9. Branch-specific environmental studies/sustainability related Project/Activity.

Part-D: Report

10. Document your active participation in an environmentally friendly or sustainability-related activity, highlighting your role, the engineering relevance, and the impact of the initiative on promoting sustainable practices.

Course Code: 105308	Course Name: Community Engagement / Field Projects	
Teaching Scheme	Credit	Evaluation Scheme
Practical : 4 Hours/Week	2	TW : 50 Marks

Prerequisite Courses:

- Professional Communication Skills, Programming and Problem Solving.

Course Objectives:

- To enhance the quality of teaching learning by bridging the gap between theory and practice through community engagement.
- To promote strong interactions between educational institutions and local communities for detection and solution of real-life problems.
- To create awareness about social responsibility to develop empathy for complex global challenges.
- To recognize the need for research and innovations in collaboration with society through community-based research methods.
- To catalyze the acquisition of values of public service and inculcate citizenship among the students.
- To involve educational institutions with local communities in order to make the curriculum, courses, and pedagogies more appropriate to achieve the goals of national development.

Course Outcomes:

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

CO1: Explore relevance between theory and practice through community-based problem learning.

CO2: Identify real-life socio-technical problems and develop the solution.

CO3: Implement a wisdom of empathy and social responsibility to meet complex global challenges.

CO4: Develop innovative ideas in collaboration with society through community-based research methods.

CO5: Analyze the need of research projects and develop a plan for betterment of public service values through active citizenship.

Course Contents:

A community engagement / field project is essential for second-year engineering students as it



bridges the gap between theoretical knowledge and real-world application. At this stage, students have gained foundational technical skills, and engaging with the community allows them to apply these skills to address practical challenges faced by society. It fosters a sense of social responsibility, encouraging students to consider the human and environmental impact of engineering solutions. Moreover, such projects help develop vital soft skills like communication, teamwork, and problem-solving, as students interact with diverse groups and learn to explain complex ideas in simple terms. By working on real-life issues, students also enhance their creativity and innovation, preparing them for future professional roles while contributing positively to their communities.

Guidelines for Conduction:

1. Formation of groups: 4 to 5 students /group.
2. Identification of one student representative for each class (if required).
3. Identification of communities (sectors / villages / nearby vicinity) as per the students' skills under respective departments.
4. Collection of different ideas or real-world problem statements from students through any open platform (Google forms / spreadsheets / handwritten applications).
5. Allocation of groups to an identified community (sectors / villages / nearby vicinity).
6. Allocating a faculty / mentor to a group. It is expected that a mentor can get assigned to a maximum three groups.
7. Students will be allowed to visit communities (sectors / villages / nearby vicinity) once in a week with prior permission.
8. Mentors can monitor field work and progress of projects through worksheets circulated by the coordinator.
9. Coordinator will keep a record of spreadsheets / reports / evaluation sheets.
10. Mentors are expected to approve the real-world problem and to encourage students to provide some solution / representation of a problem / volunteer-ship to any activity conducted by government / responsible authorities.
11. Mentors will collect all the project reports submitted by each group.

Guidelines for Evaluations:

1. Evaluation to be done based on the active participation of the student and marks could be awarded. For the community engagement project each student must get engaged and the coordinator / mentor must evaluate the projects / groups as well as the individual student twice in a semester. Mid-term evaluation must be done internally while end semester evaluation will be done by domain experts in specific domains or any other

expert in the field. The average of these two evaluations will be considered as final evaluation.

2. Students must represent a problem through power point presentations / posters / reels / short movies or any other effective media.
3. Project report shall be submitted by each group. Other than these, any required innovative process to make CEP effective and easy learning for students should be incorporated.

Guidelines for Students:

1. Community Engagement / Field Project is an opportunity for students to step out of their comfort zone, use knowledge, energy and creativity to contribute meaningfully to society.
2. It is an opportunity to discover the human side of engineering. Project reports shall be submitted by each student/group of students. All the students are expected to follow the phase wise instructions given by their CEP Coordinator / mentor.

Learning Resources:

Reference Books:

1. James Jacob W., Stewart E. Sutin, John C. Weidman, John L. Yeager, 2015, A Community Engagement in Higher Education: Policy Reforms and Practice, Sense publisher.
2. Jane Krauss, Suzanne K. Boss, Thinking Through Project-Based Learning: Guiding Deeper Inquiry.
3. John Larmer and Suzie Boss, Project Based Teaching: How to Create Rigorous and Engaging Learning Experiences.
4. John Larmer, John R. Mergendoller, and Suzie Boss, 2013, Setting the Standard for Project Based Learning, Corwin Press.
5. Suzie Boss, Jane Krauss, Leslie Conery, Reinventing Project-Based Learning: Your Field Guide to Real-World Projects in the Digital Age, 2007, Int'l Society for Tech. in Education.
6. Judyth Sachs, Lindie Clark, 2017, Learning Through Community Engagement Vision and Practice in Higher Education, Springer Singapore.

Web link for MOOC / NPTEL Links:

1. https://onlinecourses.swayam2.ac.in/ugc25_ge01/preview.
2. https://www.uvm.edu/sites/default/files/community_engagement_handout.pdf



Semester - IV

Course Code: 105401	Course Name: Geotechnical Engineering	
Teaching Scheme	Credit	Evaluation Scheme
Theory : 2 Hours/Week Practical : 2 Hours/Week	2 1	CCE : 40 Marks ESE : 60 Marks TW : 25 Marks PR + OR : 25 Marks

Prerequisite Courses:

- Engineering Physics, Mathematics, Engineering Mechanics, Fluid Mechanics.

Course Objectives:

- To describe soil properties, classification and its behavior under stress.
- To learn methods for measurements and determination of index and engineering properties of soil.
- To study the interaction between water and soil and the effects of static vs flowing water on soil strength.

Course Outcomes:

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

CO1: Classify the soil, on the basis of index properties and formation process.

CO2: Describe the permeability and seepage characteristics of soil.

CO3: Demonstrate the effects of compaction on soil behavior and stress distribution.

CO4: Determine the shear strength of soil under various drainage conditions.

CO5: Explain the process of subsurface investigation and the various types of foundations.

Course Contents:

Unit-I: Introduction and Index Properties

06 Hours

Geotechnical engineering and its applications to civil engineering. Types of soil structure, major soil deposits of India, subsurface soil investigation, disturbed and undisturbed samples, machinery for the same. Field identification of soils. Introduction to soil exploration: objective and purpose. Three phase soil system weight – volume relationships, index properties of soil: methods of determination and their significance. IS and unified soil classification systems.

Unit-II: Permeability and Seepage

06 Hours

Soil Water: permeability definition and necessity of its study, Darcy's law, factors affecting permeability. Laboratory measurement of permeability: Constant head method and Falling head method as per IS 2720. Field test for determination of permeability- Pumping in test and Pumping out test as per IS 5529 Part-I. Permeability of stratified soil deposits.

Seepage: Seepage Pressure, quick sand phenomenon, critical hydraulic gradient, General flow equation for 2-D flow (Laplace equation). Flow Net, properties and application, Flow Net



construction for flow under sheet pile and earthen dam.

Unit-III: Compaction and Stress Distribution

06 Hours

Compaction: Introduction, Comparison between compaction and consolidation. Compaction tests- Standard Proctor test, Modified Proctor test. Zero air void line. Factors affecting compaction. Effect of compaction on soil properties. Field compaction methods and compaction equipment for different types of soil, Placement water content, Field compaction control- use of compaction test result. Proctor needle in field compaction control.

Stress Distribution in Soils: Geostatic stress, Boussinesq's theory with assumptions for point load and circular load (with numerical), Pressure Distribution diagram on a horizontal and vertical plane, Pressure bulb and its significance. Westergaard's theory, equivalent point load method. Approximate stress distribution method.

Unit-IV: Shear Strength & Earth Pressure

06 Hours

Shear strength an engineering property. Mohr's stress circle, Mohr- Coulomb failure theory. Effective stress principle-Total stress, effective stress and neutral stress / pore water pressure. Peak and residual shear strength, Factors affecting shear strength. Stress-strain behaviour of sands and clays.

Measurement of Shear Strength: Direct shear test, triaxial compression test, unconfined compression test, vane shear test. Their suitability for different types of soils, advantages and disadvantages. Different drainage conditions for shear tests. (Sensitivity and thixotropi of cohesive soils.

Earth Pressure: Introduction, Rankine's state of plastic equilibrium in soils- Active and passive states due to wall movement, Earth pressure at rest. Rankine's Theory: Earth pressure on retaining wall due to submerged backfill. Backfill with uniform surcharge, backfill with sloping surface, layered backfill. Coulomb's Wedge theory. Rebhann's and Culmann's graphical method of determination of earth pressure.

Unit-V: Fundamentals of Foundation Engineering

06 Hours

Sub-surface Investigations: Drilling bore holes, sampling, plate load test, standard penetration and cone penetration tests; Stability of slopes-Finite and infinite slopes, Bishop's method;

Shallow Foundations: Terzaghi's and Meyerhoff's bearing capacity theories, effect of water table; Combined footing and raft foundation; Contact pressure; Settlement analysis in sands and clays;

Deep Foundations: Dynamic and static formulae, Axial load capacity of piles in sands and clays, pile load test, pile under lateral loading, pile group efficiency, negative skin friction.

Learning Resources:

Text Books:



1. Soil Mechanics and Foundation Engineering by Dr. B. C. Punmia, Laxmi Publications.
2. Geotechnical Engineering by Shashi K. Gulati & Manoj Datta, Tata McGrawHill.
3. Geotechnical Engineering by T N Ramamurthy & T G Sitharam, S Chand Publications.

Reference Books:

1. Geotechnical Engineering by C. Venkatramaiah, New Age International Publishers.
2. Principles of Geotechnical Engineering by Braj M. Das, Cengage Learning.
3. Geotechnical Engineering by P. Purushothma Raj, Tata McGrawHill.
4. Geotechnical Engineering by Principles & Practices by Donald. P. Coduto, Pearson Education.
5. Basic and Applied Soil Mechanics by Gopal Ranjan and A. S. R. Rao, New Age International.
6. Physical and Geotechnical Properties of Soils by Joseph E. Bowles, International Students Edition.

Web link for MOOC / NPTEL Links:

1. <http://ascelibrary.org/page/books/s-gsp>
2. <http://accessengineeringlibrary.com/browse/geotechnical-engineersportable-handbook-secondedition>
3. <http://nptel.ac.in/courses/105101084/>
4. <http://nptel.ac.in/courses/105106142/>

List of Practicals (Any 10):

1. Water content determination by any two methods
 - a. Oven drying method
 - b. Infrared moisture method
 - c. calcium carbide method
2. Specific gravity determination by Pycnometer / density bottle.
3. Sieve analysis, particle size determination and IS classification as per I.S. Codes.
4. Determination of Consistency limits and their use in soil classification as per I.S. Codes.
5. Field density test by
 - a. Core cutter
 - b. Sand Replacement and
 - c. Clod method
6. Determination of coefficient of permeability by
 - a. Constant head and
 - b. Variable head method.
7. Direct shear test.
8. Unconfined compression test.



9. Vane Shear test.
10. Triaxial test
11. Standard Proctor test / Modified Proctor test.
12. Differential free swell test.
13. Assignments on the following topics (Any 2):
 - a. Solution of problems on shear strength parameters using graph.
 - b. Collection of sample soil investigation report (Bore log) for any construction project.
 - c. Find out bearing capacity of soil sample using Terzhaghi / IS code method.

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Course Code: 105402	Course Name: Surveying and Geomatics	
Teaching Scheme	Credit	Evaluation Scheme
Theory : 2 Hours/Week Practical: 2 Hours/Week	2 1	CCE : 40 Marks ESE : 60 Marks TW : 25 Marks PR + OR : 25 Marks

Prerequisite Courses:

- --.

Course Objectives:

- To learn the fundamental concepts and instruments used for plane surveying.
- To study concepts of levelling, methods of levelling and contouring.
- To learn the essentials of theodolite, theodolite traversing, tachometry and contouring.
- To study the construction survey and curves.
- To study geodetic survey, hydrograph survey & aerial photogrammetry.
- To study the modern instruments and techniques including GIS, GPS, EDM, total station and DGPS for civil engineering projects.

Course Outcomes:

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

CO1: Demonstrate concept of compass surveying, plane table surveying and leveling on field measurements

CO2: Demonstrate concept of theodolite surveying on field measurements.

CO3: Apply concept of tachometry and contouring.

CO4: Apply concept construction survey and curves.

CO5: Describe geodetic survey, hydrograph survey and aerial photogrammetry and apply modern techniques on field measurements

Course Contents:

Unit-I: Compass Surveying, Plane Table Surveying and Leveling	06 Hours
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Definition, Objective, Principles and Importance of Surveying, Plane and Geodetic Surveying, Concept of Scale, Ranging, Chaining, Offsetting, Traversing.

Compass Surveying: Prismatic and Surveyors Compass, Bearing, Meridian, Local Attraction, Dip, Declination and Numerical on compass traversing.

Plane Table Surveying: Equipment, Advantages, Disadvantages, Errors and Methods Leveling – Types, Benchmarks, Study of Auto Level, Digital Level and Laser Level, Testing and Adjustments, Curvature and Refraction Corrections, Distance to the Visible Horizon, Numericals.

Unit-II: Theodolite Surveying**06 Hours**

Theodolite: Types, Uses, Measurement of Horizontal Angles (by Repetition and Reiteration), Vertical Angles, Deflection Angles, Magnetic Bearing, Prolonging a Line, Lining In and Setting Out an Angle, Fundamental Axes, Testing and Permanent Adjustments.

Theodolite Traversing: Computation of Consecutive and Independent Co-ordinates, Adjustment of Closed Traverse by Transit Rule and Bowditch's rule, Gales Traverse Table, Checks, Omitted Measurements, Area Calculation by Independent Co-ordinates.

Unit-III: Tacheometry and Contouring**06 Hours**

Tacheometry: Applications, Limitations, Principle of Stadia Tacheometry, Determination of Horizontal Distances and Elevations of Points by Fixed Hair Method and Numericals, Tacheometric Contouring.

Contouring: Definition, Characteristics, Patterns for Various Natural Features, Methods of Contouring (Direct and Indirect), Contour Maps, Topo-Sheets, Profile Leveling and Cross-Sectioning and their Applications.

Unit-IV: Construction Survey and Curves**06 Hours**

Construction Survey: Introduction, Establishing of Horizontal and Vertical Controls, Setting Out and Maintaining Verticality of Tall Buildings, Open Traverse Survey (Roadway, Railways, Drainage Lines, Water Lines, Canals), Setting out, Length determination of the Central Line and the Location of Piers of Bridge, Setting out of a Tunnel – Surface Setting out and Transferring the Alignment Underground.

Curves: Types, Applications, Elements and Setting out by Linear Methods (Radial and Perpendicular Offsets, Offsets from Long Chord, Successive Bisection of Chord and Offsets from Chords Produced), Angular Methods (Rankine's Method of Deflection Angles), Numerical and Transition Curves.

Unit-V: Geodetic Survey, Hydrograph Survey, Aerial Photogrammetry & Modern Techniques**06 Hours**

Geodetic Survey: Objects, Methods, Triangulation and Trilateration - Objective, Surveys, Classification, Figures and Strength of Figure.

Hydrographic Survey - Objects, Applications, Shore Line Survey, Sounding - Equipment, Methods, Stream Gauging and Three Point Problem.

Aerial Photogrammetry: Objects, Classification - Qualitative & Quantitative, Applications, Comparison of Map and Aerial Photographs, Flight Planning and Calculation of no. of Photographs.

Modern Techniques: EDM, Electronic Total Station - Application, Components and Use., Space Based Positioning System (SBPS) - Features, Segments, Applications, DGPS – Application, Components and Use.

**Learning Resources:****Text Books:**

1. T. P. Kanetkar and S.V.Kulkarni, “Surveying and Levelling Vol. I and Vol. II”, Pune Vidyarthi Griha Prakashan.
2. Subramaniam R., “Surveying and Levelling”, Oxford University Press.
3. Dr. B. C. Punmia, Ashok K. Jain, Arun K. Jain, “Surveying” Vol. I, Laxmi Publications.
4. S. K. Duggal, “Surveying”, Vol. I & II, TataMc-Graw Hill.

Reference Books:

1. A. M. Chandra, “Plane Surveying”, New Age International, Publishers.
2. N. N. Basak, “Surveying and Levelling”, Tata McGraw Hill.
3. Dr. K. R. Arora, “Surveying”, Vol. I & II, Standard Book House.

Weblink for MOOC / NPTEL Links:

1. <https://archive.nptel.ac.in/courses/105/104/105104101/>

List of Practicals:**Part-A: List of Practicals (Any 7)**

1. Measurement of Magnetic Bearings of Sides of a Triangle or Quadrilateral, Correction for Local Attraction and Calculations of True Bearings using Prismatic Compass.
2. Plane Table Survey Consisting of both Radiation and Intersection Method. Actual Mapping of Small Structure like an Area Map from Central Commanding Area / Small Building using Combination of Both Methods.
3. Measurement of Horizontal Angles (By Repetition Method) and Vertical Angles Using 10” or 20” Vernier Transit Theodolite. Setting the Required Horizontal and Vertical Angles and Finding Horizontal Distance and Vertical Elevation using a Tacheometer.
4. Simple and Differential Levelling with at Least Three Change Points using Digital Level.
5. Setting Out a Circular Curve by Rankine’s Method of Deflection Angles.
6. Setting Out a Building from a Given Foundation Plan (Minimum Six Co-Ordinates)
7. Study of the Instruments used in Hydrographic Surveying.
8. Practical Based on Various Special Functions Available in a Total Station such as Remote Elevation Measurements, Remote Distance Measurements and Co-ordinate Stakeout.
9. Practical Based on Various Special Functions Available in a DGPS such as Remote Elevation Measurements, Remote Distance Measurements and Co-ordinate Stakeout.

**Part-B: List of Projects (Any 2)**

1. Road project using auto level for a minimum length of 100 m including fixing of alignment, profile levelling, cross-sectioning, plotting of 1 section and cross section. (One full imperial sheet including plan, l-section and any three typical cross-sections.
2. Tachometric contouring project on hilly area with at least two instrument stations about 60m to 100m apart using tachometer or DGPS and generating contours using both methods, manual as well as using any suitable software such as Autodesk land desktop, auto-civil, foresight etc. (Minimum contour interval 1 meter).
3. Total station traversing.

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Course Code: 105403	Course Name: Structural Analysis	
Teaching Scheme	Credit	Evaluation Scheme
Theory : 2 Hours/Week	2	CCE : 40 Marks ESE : 60 Marks

Prerequisite Courses:

- Engineering Mechanics, Strength of Materials, Mathematics.

Course Objectives:

- To build concepts from engineering mechanics and mechanics of structures required to analyze the structures.
- To create a foundation for analyzing real life structures by imparting knowledge about various methods involved in the analysis of indeterminate structures.

Course Outcomes:

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

CO1: Explain the basic concept and able to analyze redundant structure.

CO2: Analyze beams and portal frames using Slope and deflection method.

CO3: Analyze beams and portal frames using moment distribution method.

CO4: Analyze the structure using stiffness matrix method.

CO5: Apply the concepts of plastic analysis in the analysis of steel structures.

Course Contents:

Unit-I: Fundamental of Structure and Analysis	07 Hours
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Types and classification of structures based on structural forms, concept of indeterminacy, static and kinematics degree of indeterminacy.

Analysis of propped cantilever, fixed beam and continuous beams with indeterminacy up to second degree by strain energy method.

Analysis of redundant trusses by unit load method for external loading, lack of fit, sinking of support and temperature changes (indeterminacy up to second degree).

Unit-II: Slope-Deflection Method	06 Hours
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Slope-deflection equations, equilibrium equation of Slope-deflection method, application of Slope deflection method to beams with and without joint translation and rotation, yielding of support, application to non-sway rigid jointed rectangular portal frames, shear force and bending moment diagram.

Sway analysis of rigid joint rectangular single bay single storey portal frames using Slope



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deflection method. (Involving not more than three unknowns).

Unit-III: Moment Distribution Method

06 Hours

Stiffness factor, carry over factor, distribution factor, application of Moment distribution method of analysis to beams with and without joint translation and yielding of support, application to non-sway rigid jointed rectangular portal frames, shear force and bending moment diagram.

Sway analysis of rigid jointed rectangular single bay single storey portal frames using Moment distribution method (Involving not more than three unknowns).

Unit-IV: Stiffness Method

06 Hours

Fundamental concepts of flexibility and stiffness, relation between them. Stiffness method of analysis- Structure approach only. Application to beams (Involving not more than three unknowns).

Application of Stiffness structure approach to rigid jointed rectangular portal frames (Involving not more than three unknowns).

Unit-V: Plastic Analysis of Structure

06 Hours

True and idealized stress-strain curve for mild steel in tension, stress distribution in elastic, elastoplastic and plastic stage, concept of plastic hinge and collapse mechanism, static and kinematic methods of analysis, upper bound, lower bound and uniqueness theorem. Plastic modulus of section, Plastic moment, shape factor. Plastic analysis of determinate and indeterminate beams, single bay single storied portal frame.

Learning Resources:

Text Books:

1. Mechanics of Structures Vol. I & II by S. B. Junnarkar and Dr. H. J. Shah, Twenty second edition, Charotar Publishing House Pvt Ltd.
2. Strength of Materials by R. Subramanian, Oxford University Press.
3. Strength of Materials by S. S. Ratan, Tata McGraw Hill publications .
4. Structural analysis : A matrix approach by G S Pandit and S O Gupta, Tata McGraw Hill publication.

Reference Books:

1. Intermediate Structural Analysis by C. K. Wang, Tata McGraw Hill Education Pvt. Ltd.
2. Mechanics of Structures Vol. II (Theory and Analysis of Structures) by Dr. H. J. Shah and S. B. Junnarkar, Charotar Publishing House Pvt. Ltd.
3. Basic Structural Analysis by C. S. Reddy, Tata McGraw Hill Education Pvt. Ltd.
4. Structural Analysis by R. C. Hibbler, Pearson Education.
5. The Plastic Methods of Structural Analysis by B. G. Neal, Chapman & Hall.



MOOC / NPTEL/YouTube Links:

1. <https://archive.nptel.ac.in/courses/105/105/105105166/>
2. <https://archive.nptel.ac.in/courses/105/105/105105109/>
3. <https://archive.nptel.ac.in/courses/105/106/105106050/>
4. <https://archive.nptel.ac.in/courses/105/105/105105180/>

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Course Code: 171405A	Course Name: Introduction to Cyber Security	
Teaching Scheme	Credit	Evaluation Scheme
Theory : 3 Hours/Week Practical : 2 Hours/Week	3 1	CCE : 40 Marks ESE : 60 Marks TW : 25 Marks PR + OR : 25 Marks

Prerequisite Courses:

- Fundamentals of Computer & Programming, Operating System, Basic concept of Networks.

Course Objectives:

- To develop an understanding of the fundamental concepts, issues, and challenges in the field of cyber security.
- To create awareness about various types of cyber offenses, their legal remedies, and the procedures for reporting such crimes.
- To sensitize students to privacy and security concerns on social media and promote responsible usage through knowledge of legal aspects and best practices.
- To familiarize students with e-commerce and digital payment systems, including RBI guidelines and preventive measures against online frauds.
- To enable students to understand and apply basic security practices and tools for safeguarding computers and mobile devices.

Course Outcomes:

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

- CO1:** Explain the architecture, communication and governance of cyberspace and web technologies.
- CO2:** Identify and relate specific cybercrime incidents to relevant provisions of the IT Act 2000.
- CO3:** Apply basic practices to ensure privacy and security on social media platforms.
- CO4:** Apply security practices and legal guidelines to ensure safe E-Commerce and digital payment systems.
- CO5:** Demonstrate configuration and management of secure digital devices and tools.

Course Contents:**Unit-I: Introduction to Cyber Security****08 Hours**

Defining Cyberspace and Overview of Computer and Web-technology, Architecture of cyberspace, Communication and web technology, Internet, World wide web, Internet

infrastructure for data transfer and governance, Internet society, Regulation of cyberspace, Concept of cyber security, Issues and challenges of cyber security.

Unit-II: Cyber Crimes and Cyber Law**08 Hours**

Cybercrime- Classification, Common Cybercrimes, Cybercriminals modus-operandi, reporting of cybercrimes, Remedial and mitigation measures, Legal perspective of Cybercrime, IT Act 2000 and its amendments, Cybercrime and offences, Organisations dealing with Cybercrime and Cyber security in India.

Case Study: WannaCry Ransomware Attack- A Global Wake-Up Call.

Unit-III: Social Media Overview and Security**08 Hours**

Introduction to social networks, social media: Types, platforms, monitoring, hashtag, viral content, marketing, privacy, challenges, opportunities and pitfalls in online social networks, security issues related to social media, flagging and reporting of inappropriate content, laws regarding posting of inappropriate content, best practices for the use of social media.

Case Study: WhatsApp Spyware incident, Facebook–Cambridge Analytica Data Harvesting Scandal.

Unit-IV: E-Commerce and Digital Payments**08 Hours**

Commerce Basics: Definition, components, security elements, and threats, E-commerce security best practices. **Digital payments:** Introduction, components and stake holders, modes of digital payments, digital payments related common frauds and prevention. RBI Guidelines on digital payments and customer protection. Relevant provisions of Payment Settlement Act, 2007. **Case Study:** Cosmos Bank Cyber Attack.

Unit-V: Digital Devices Security, Tools and Technologies**08 Hours**

End Point device and mobile security, password policy, security patch management, data backup, management of third-party software, device security policy, cyber security best practices, host firewall and Antivirus - Significance & management, Wi-Fi security, configuration of basic security policy and permissions. **Case Study:** The Pegasus Airlines.

List of Practical / Assignments: (Guidelines for course teacher)

- The course instructor should design assignments that reflect essential cyber security principles and consider students' level of familiarity with digital tools and platforms.
- Assignments must reflect current cyber threats, technologies, laws and best practices followed in the industry.
- Assignments should be based on real-life cyber incidents, case studies and practical security problems.
- Practical demonstration tasks such as identifying vulnerabilities, analyzing cybercrime scenarios, or applying security controls in digital payment system. Study of social media platforms, should be included to improve readiness for future projects / professional roles.

Learning Resources:**Text Books:**

1. Cyber Security: Understanding Cyber Crimes, Computer Forensics and Legal Perspectives Sumit Belapure & Nina Godbole, Wiley India Pvt. Ltd.
2. Cyber Crime and Laws Dr. Santosh Kumar & Dr. Gagandeep Kaur, Whitesmann Publishing.
3. Cyber Crime Impact in the New Millennium R. C. Mishra, Authors Press.
4. Fundamentals of Network Security E. Maiwald, McGraw Hill.

Reference Books:

1. Network Security Bible (2nd Edition) Eric Cole, Ronald Krutz, James W. Conley, Wiley India Pvt. Ltd.
2. Security in the Digital Age: Social Media Security Threats and Vulnerabilities Henry A. Oliver- Pearson.
3. Electronic Commerce Elias M. Awasd, Prentice Hall of India Pvt Ltd.
4. Cyber Laws: Intellectual Property & E-Commerce Security by Kumar K, Dominant Pub.
5. Cryptography and Network security, Atul Kahate, The McGraw Hill, second Edition.

Web link for MOOC / NPTEL Links:

1. Cyber Security and Privacy by Prof. Saji K Mathew, IIT Madras
https://onlinecourses.nptel.ac.in/noc23_cs127/preview
2. Practical Cyber Security for Practitioners by Prof. Sandeep K. Shukla, IIT Kanpur
https://onlinecourses.nptel.ac.in/noc25_cs120/preview
3. Introduction To Cyber Security by Dr. Jeetendra Pande, Uttarakhand OU, Haldwani.
https://onlinecourses.swayam2.ac.in/nou24_cs04/preview
4. Cyber Laws by Dr Vishal Goyal, Professor in Computer Science, Department of Computer Science, Punjabi University, Patiala.
https://onlinecourses.swayam2.ac.in/cec24_cs14/preview

Important DOs and DON'Ts in Cyber Security:**DOs**

- Use strong passwords and enable two-factor authentication on all accounts.
- Keep your devices, apps, and antivirus updated regularly.
- Verify sources before clicking links or downloading files; report phishing emails.
- Backup important data and secure your devices.
- Follow ethical and legal practices; understand IT Act and cyber laws.

DON'Ts

- Never share passwords, OTPs, or sensitive banking information.
- Do not click on suspicious links or open unknown attachments.
- Never attempt hacking or bypass security without permission.
- Do not overshare personal information on social media or online platforms.
- Do not ignore suspicious activity - report it through official channels.

Course Code: 174408	Course Name: Foreign Languages	
Teaching Scheme	Credit	Evaluation Scheme
Tutorial : 2 Hours/Week	2	TW : 50 Marks

Prerequisite Courses:

- Professional Communication Skills.

Course Objectives:

- To develop Foundational Language Skills, Enhance Communication Competence, Promote Multilingual Proficiency, Support Career and Academic Opportunities, Boost Confidence and Motivation in Language Learning.

Course Outcomes:

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

CO1: Learn the basic phonetics, alphabets and sounds of the selected foreign language.

CO2: Interpret and use everyday vocabulary to manage simple social interaction.

CO3: Form simple sentences using basic grammatical structures and sentence patterns.

CO4: Participate in simple conversations and everyday communication situations relevant to academic, social and professional contexts.

CO5: Demonstrate cultural awareness and appropriate language behaviour to facilitate global and cross-cultural interactions.

Course Guidelines:

- Course Selection:** Students will choose one foreign language course from the provided basket, based on their interest and career aspirations.
- Course Allocation:** Each student will be allotted their selected language course, ensuring dedicated participation and meaningful learning.
- Expert Instruction:** Courses will be taught by qualified language instructors using an engaging mix of activities, group discussions, cultural presentations, and lectures, either in-person or online.
- Activity Documentation:** Students must prepare and submit a hard copy report of the language-learning activities they participated in, along with a certificate of participation from the instructor or institution.
- Evaluation Criteria:** Assessment will focus on the completeness, quality, and reflection demonstrated in the submitted activity report.
- Mentorship:** Faculty mentors will be assigned to each student to guide them in the

learning process, assist with linguistic challenges, and support their overall progress in the selected language.

7. **Activity Framework:** Faculty members, in consultation with language experts, will design a set of language-related activities (e.g., vocabulary building, basic conversations, and cultural immersion tasks) that align with the objectives of each course.
8. **Personal Growth:** Emphasis is placed on selecting a language that aligns with the student's personal interests, academic goals, or global career opportunities, fostering long-term motivation and growth.
9. **Balance and Engagement:** Students are encouraged to choose a course that they are genuinely curious or passionate about, ensuring consistent engagement and maximum benefit from the learning experience.

Baskets for Language Courses:

1. 174408A: Basic English Language

Unit-I: Basic of Communication

06 Hours

An introduction to phonetics and phonology.

Unit-II: Vocabulary for Communication

06 Hours

Basic vocabulary and sentence construction, idioms and phrases, antonyms, synonyms.

Part of speech: Noun, pronoun, verb, adjective, adverb, preposition, conjunction, interjection.

Unit-III: Grammar for Communication

06 Hours

Articles, tense, change the voice, direct- indirect speech, degree, punctuation.

Grammar usage in sentences, sentence structure error, grammar error.

Unit-IV: English for the Real World

06 Hours

Everyday communication: Introduction, shopping, meeting friends, travelling, telephonic communication, negotiation, etc.

Unit-V: Language Skills for Functional Communication

06 Hours

Reading skill, listening skills, speaking skills, writing skills. Email correspondence, dialogue writing. Spell check and writing presentation.

2. 174408B: Basic Sanskrit Language

Unit-I: Characteristics of Sanskrit

06 Hours

Introduction: Some unique characteristics of Sanskrit. Basic introduction of oneself, simple



verbs daily vocabulary. Introducing different declensions and tenses - 1.

Unit-II: Sentence Structure and Vocabulary for Communication**06 Hours**

Basic vocabulary and sentence construction.

Introducing different declensions and tenses – 2.

Practice with various verbs in different moods and tenses summary of the sentence structure with different questions.

Unit-III: Grammar for Communication**06 Hours**

Revision of the main features of part 1 of introduction to basic spoken Sanskrit, different verb forms, daily vocabulary.

Introduction of different declensions in the plural and tenses – 1, daily vocabulary, poetic verses, conversations and stories.

Unit-IV: Daily Conversation**06 Hours**

Practice with various verbs in different moods and tenses, summary of the sentence structures using the plural with different questions.

Introduction of a few more words ending with consonants and their declensions, an alternative conjugation of verbs, daily vocabulary, poetic verses, conversations and stories.

Introduction to their different declensions in singular, dual and plural, new verb forms, daily vocabulary, poetic verses, conversations and stories.

Unit-V: Comprehension and Conversations**06 Hours**

Introduction to Sandhi, vowel with vowel / vowel with consonant / consonant with consonant / aspirant with vowel or consonant, poetic verse, reading and comprehension, conversations.

Practice with a variety of word endings, various verbs in different moods and tenses, summary of the sentence structures using the plural with different questions.

3. 174408C: Basic German Language**Unit-I: Introduction to the Alphabet Articulation****06 Hours**

Introduction, greetings and alphabet articulation.

Introducing oneself and others; Grammar: W questions, personal pronouns, simple sentence, verb conjugation.

Themes: Hobbies, the week, numbers, the alphabet, months, seasons / **Grammar:** Articles, plural, the verbs to have and to be.

Unit-II: Word and Sentence Structure**06 Hours**

Theme: In the city / naming places and buildings, means of transport, basic directions / **Grammar:** definite and indefinite articles; negation - kein and nicht; imperative.

Themes: food, drink, family / groceries and meals / **Grammar:** the accusative.

Unit-III: Daily Conversation**06 Hours**

Theme: Everyday life, telling time, making appointments / **Grammar:** prepositions am, um, von, bis; modal verbs, possessive articles: leisure activity, celebrations.

Unit-IV: Writing Skills**06 Hours**

My apartment, rooms, furniture, colours / Grammar: changing prepositions.

Professions / Grammar: perfect tense.

Clothes / Grammar: perfect tense and dative.

Grammar: separable verbs, the accusative, past tense of to have and to be.

Contacts, writing letters / Grammar: dative.

Unit-V: Basic of communication in German Language**06 Hours**

Health and the body / Grammar: imperative and modal verbs.

Holiday and weather.

4. 174408D: Basic French Language

Unit-I: Introduction to Alphabets Articulation

06 Hours

Introduction, greetings and alphabet articulation.

Unit-II: Grammar of French-I

06 Hours

Indefinite articles and numbers, family vocabulary, colours and numbers.

Unit-III: Grammar of French-II

06 Hours

Words of politeness, pronouns and conversation.

Unit-IV: Daily Conversation

06 Hours

6 points to self-introduction, simple propositions and verbs.

Unit-V: Basic of Communication in French Language

06 Hours

Pieces of communication.

5. 174408E: Basic Japanese Language

Unit-I: Japanese Scripts

06 Hours

Japanese Scripts: Hiragana, Katakana, Kanji, Ideograms and Pictograms.

Unit-II: Language and Grammar

06 Hours

Language and Grammar: Particles, sentence construction, demonstratives, interrogatives, conjunctions, vocabulary, nouns, verbs conjugations, adverbs, other parts of speech, verbs and tense, requests and commands, comparisons, expressions and phrases, idioms, etc.

Unit-III: Daily Conversation

06 Hours

Introduction, time, daily conversation, usage of interrogatives, asking direction, conversation on phone, giving and receiving, making requests and commands, likes and dislikes, potential, permission, conditionals, direct in direct speech, learning to make speeches, writing mails, polite Japanese.

Unit-IV: Japanese Culture, Festivals and Lifestyle

06 Hours

Japanese culture, festivals and lifestyle: Japanese lifestyle, learning about culture, customs and festivals, idioms and phrases.

Unit-V: Basic of Communication in Japanese Language

06 Hours

Audio and pictures: Association and meaning. |

Guidelines for Evaluation:

1. Self-Introduction on different occasions (Formal and informal).
2. Public speaking exercises.
3. Common grammar errors/ Sentence structure errors.
4. Writing articles.
5. Vocabulary level test.

Learning Resources:

Text / Reference Books / Web Links:

Basic English Language Course

1. Raymond Murphy's English Grammar in Use Cambridge University Press. 2019
2. A Practical English Grammar, Thomson and Martinet. New Delhi: Oxford University Press, 1986.
3. Study Skills in English: A Course in Reading Skills for Academic Purposes, Michael J. Wallace, Cambridge University Press, 2004.
4. Cambridge English Pronouncing Dictionary (17thEdn.), Cambridge University Press, 2006

Basic Sanskrit Language Course

1. Kumari, S. (1993) Sanskrita Chitrapadakoshah, Mysuru: Bharatiya Bhasha Sansthanam.
2. Samkrita-vyavahaara-saahasree(Sanskrit-English, New Delhi: Sanskrita Bharati.
3. Sampad, & Vijay. (2005). The Wonder that is Sanskrit. Pondicherry: Sri Aurobindo Society.
4. Satvlekar, S. D. (2013). Sanskrit Swayam Shikshak. Delhi: Rajpal & Sons (Rajpal Publishing).
5. Shastri, V K. (2012). Teach Yourself Sanskrit, Prathama Diksha. Delhi: Rashtryia Sanskrita Samsthana.
6. Vishwasa (2014). Abhyāsa-pustakam, New Delhi: Sanskrita Bharati

Basic German Language Course

1. NETZWERK Deutsch als Fremdsprache A1 (Goyal, New Delhi, 2015).
2. Schulz-Griesbach: Deutsch als Fremdsprache. Grundstufe in einem Band (for Grammar).

Web Resources:

1. Facts about Germany: <https://www.tatsachen-ueber-deutschland.de/en>

2. Online German-English dictionary www.leo.org.

Practice materials:

1. <https://www.goethe.de/en/spr/kup/prf/prf/sd1/ueb.html>
2. https://www.deutschkurse-passau.de/JM/images/stories/SKRIPTEN/a1_skript_gr.pdf
3. https://www.schubert-verlag.de/aufgaben/arbeitsblaetter_a1_z/a1_arbeitsblaetter_index_z.htm

Basic French Language Course

1. Saisons 1 Méthode de français
2. <https://www.frenchcircles.ca/>
3. <https://blog.rosettastone.com/french-accent-marks/>

Basic Japanese Language Course

1. Minna no Nihongo Textbook 1 & II (3 A Network).
2. Japanese for Busy people. (Association for Japanese Language Teaching).
3. Nihongo Dekimasu (Japan Foundation).
4. Shin Nihongo no Kiso (Association for Overseas Technical scholarship).
5. First steps in Japanese (3 A Corporation).
6. Kanji and Kana by Wolfgang Hadamitzky and Mark Spahn.
7. 250 Essential Kanji for everyday use Vol. I & 2 by Kanji Research group University of Tokyo.

Course Code: 105409	Course Name: Software and Techniques in Civil Engineering (AutoCAD)	
Teaching Scheme	Credit	Evaluation Scheme
Practical : 4 Hours/Week	2	TW : 50 Marks

Prerequisite Courses:

- Engineering Drawing, Basic Computer Knowledge.

Course Objectives:

- To remember the AutoCAD commands
- To create engineering models and interpreted results using AutoCAD software.

Course Outcomes:

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

CO1: Demonstrate the operation of the software

CO2: Create engineering drawings using AutoCAD software

CO3: Analyze the results of the model using AutoCAD software

Course Contents**UNIT-I 06 Hours**

AutoCAD Interface: Sketch Entities & Sketch Tools including Block, W-, X-attach & X-Ref, Smart Dimensions, Fully Define Sketch and Blocks: Dimensions & Dimension, Styles including Geometry and dimensional Constraints

UNIT-II 06 Hours

Wireframe & Transformation tools: Inquiry tools & Parametric Drafting including Surface Creation & Modification tools

UNIT-III 06 Hours

Layer & Object Properties: Sketch Visualization & Sketch Analysis including Drafting Settings, Cutting, Stamping, Folding & Unfolding: Creating & Editing Text. Also, Equations, Design Table & Configurations

UNIT-IV 06 Hours

Isometric Views: 3D sketch and Boolean operations including 3D parts, UCS, Boolean operation, Solid Editing, etc.

Practical Assignment

1. Draw basic line using coordinate system.
2. Draw basic drawing using Angular and Linear measurement
3. Draw Engineering tools four using circle, ellipse, Arch ect.
4. Draw figure using circle, radius, use modified commands.
5. Draw line plan of building and give dimension and nomenclature to the rooms.
6. Draw Plan elevation and Section Isometric figure using 2D commands.

Learning Resources:

Text Books:

1. Computer Graphics Including Cad, Autocad And C , Kuthe A.M. Z.Chand And Company Ltd
2. Engineering Drawing And Graphics Using Autocad 2000 ,Jeyapoovan T., Vikas Publishing House
3. Engineering Drawing With A Primer On Autocad, Siddiquee A.N. ; Khan Z.A. ,Prentice Hall Of India Private Limited
4. Engineering Graphics- With Autocad 2006 ,Bethune J.D. ,Prentice-Hall Of India Private Limited
5. Xercise Workbook For Advanced Autocad ,Shrock C.R. New Age Int(P) Lim Pub
6. Expert Cad Management: The Complete Guide ,Green R. ,John Wiley And Sons, Inc
7. Fundamentals Of Engineering Drawing And Autocad ,Parvez M., Galgotia Publications Pvt Ltd.

Reference Books:

1. Auto Cad 2006 And Auto Cad Lt 2006, Finkelstein E., Willy.
2. Auto Cad 2006 For Engineers And Designers Tickoo M.,Willy.
3. Auto Cad 14, George O., Bpb Publication.
4. Autocad 2000, Omura G., Bpb Publication.
5. Autocad 2007, Maidasani D., Firewall Media
6. Autocad 2007 And Auto Cad Lt 2007 Bible, Finkelstein E.,Willy.
7. Autocad: The Complete Reference, David S., Tata Mc Graw-Hill Publishing Comp Ltd.

Web link for MOOC / NPTEL Links:

1. <https://nptel.ac.in/courses/112102101>
2. <https://nptel.ac.in/courses/112104031>
3. https://onlinecourses.nptel.ac.in/noc20_me79/preview
4. <https://nptel.ac.in/courses/112102102>
5. https://onlinecourses.nptel.ac.in/noc24_ee50/preview
6. <https://www.udemy.com/course/autocad-2018-course/?couponCode=BFCPSALE24>
7. <https://www.udemy.com/course/complete-autocad-course/?couponCode=BFCPSALE24>
8. <https://www.udemy.com/course/complete-autocad-course/?couponCode=BFCPSALE24>

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Dr. P. D. Nemade	Dr. D. D. Sarode
Dr. Shrikant Charhate	Dr. Sunil B. Thakare
Dr. Ratnakar Mahajan	Mr. Sagar Gangurde
Dr. S. G. Wagh	

Course Design Team Members	
Ms. V. A. Tamboli	Dr. S. A. Talekar
Dr. S. B. Sonawane	Dr. S. P. Awate
Mr. P. D. Aher	Mr. S. R. Pandit
Dr. N. J. Salunke	Dr. K. T. Patil
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