Shirpur Education Society's

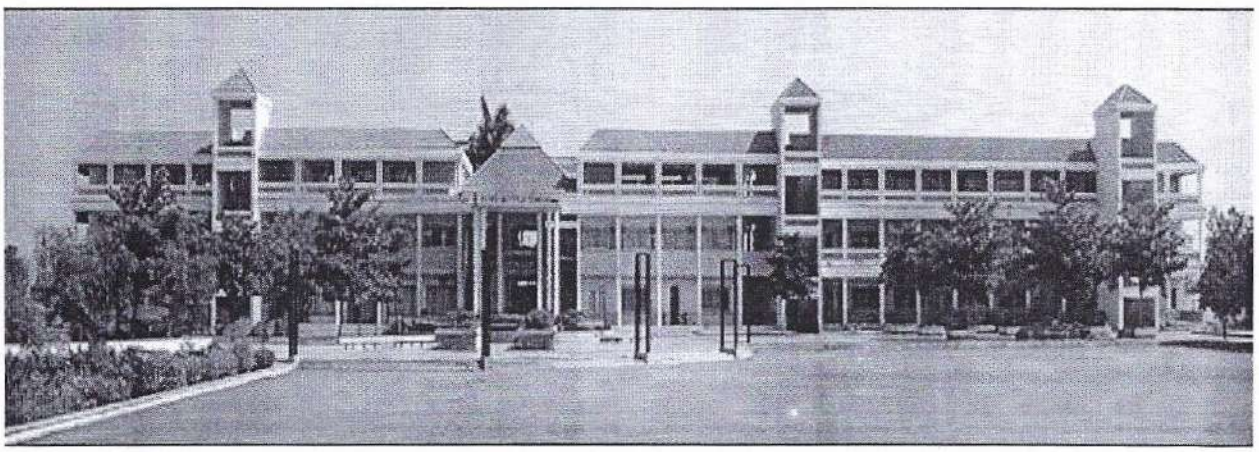
R. C. Patel Institute of Technology, Shirpur

(An Autonomous Institute)

Course Structure

Final Year B. Tech
(Department of Civil Engineering)

With effect from Year 2025-26 (Scheme-2022)



Shahada Road, Near Nimzari Naka Shirpur Maharashtra 425405 Ph: 02563 259 802, Web: www.rcpit.ac.in

Final Year B. Tech Civil Engineering - Semester-VII (w. e. f. 2025-26) Scheme-22

S. No.	Course Category	Course Code	Course Title	Teaching Scheme			Evaluation Scheme					Credit	Total
							Continuous Assessment			ESE [D]	Total [A+ Average(B,C)+D]		
				L	T	P	TA [A]	Term Test 1 [B]	Term Test 2 [C]				
							[A]			[C]	[A+B+C]		
1	PC	22PCCE7010T	Geotechnical Engineering	3	-	-	25	10	10	65	100	3	4
2	PCL	22PCCE7010L	Geotechnical Engineering Laboratory	-	-	2	25	-	-	25	50	1	
3	PC	22PCCE7020T	Public Health Engineering	3	-		25	10	10	65	100	3	4
4	PCL	22PCCE7020L	Public Health Engineering Laboratory	-	-	2	25	-	-	25	50	1	
5	PC	22PCCE7030T	Construction Safety & Quality control	3		-	25	10	10	65	100	3	3
# 6	PE	22PECE701__	Professional Elective Course -III	3	-	-	25	10	10	65	100	3	3
7	OE	22OECE7050T	Open Elective Course -I	3	-	-	25	10	10	65	100	3	3
8	PJ	22PJCE7060L	Project Stage-II	-	-	4	25	-	-	25	50	4	4
			Total	15	-	8	200	50	50	400	650	21	21

TA-Teacher Assessment, ESE- End Semester Examination

Semester VII Elective Course-III #					
S.No	Course code	Course Title	S.No	Course code	Course Title
1	22PECE7010T	Integrated Watershed Management	3	22PECE7030T	Planning for Sustainable development
2	22PECE7020T	Construction Economics & Finance	4	22PECE7040T	Numerical Method for Civil Engineering

Prepared by

Dean Academic/Dy. Director

Checked by

C.O.E

Office Seal — DEPT. R.C.P.I.T. CIVIL ENGINEERING SHIRPUR

BOS Chairman

Director

Final Year B. Tech Civil Engineering - Semester-VIII (w. e. f. 2025-26) Scheme-22

S. No.	Course Category	Course Code	Course Title	Teaching Scheme			Evaluation Scheme					Credit
							Continuous Assessment			ESE [D]	Total [A+ Average(B,C)+D]	
				L	T	P	TA [A]	Term Test 1 [B]	Term Test 2 [C]			
							[A]			[C]	[A+B+C]	
1	PE	22PECE8010T	Professional Elective Course – IV/ NPTEL Course	3	-	-	25	10	10	65	100	3
2	PE	22PECE8020T	Professional Elective Course - V	3	-	-	25	10	10	65	100	3
3	INT	INTCE8030L	Internship	-		20	150			150	300	10
			Total	06	-	20	200	20	20	280	500	16

Semester VIII Elective Course –IV &V					
S.No	**Course code**	**Elective –IV / NPTEL Course Title**	**S.No**	**Course code**	**Elective – V / NPTEL Course Title**
1	22PECE8010T	Structural Audit	1	22PECE 8020T	Metro Construction Technology
2	22PECE8011T	Introduction to Earthquake Engineering	2	22PECE 8021T	Air Pollution Control
3	22PECE8012T	Environmental Impact Assessment and Audit	3	22PECE 8022T	Software Application in Structural Engineering
4	22PECE8013T	Dams & Hydraulic structure	4	22PECE 8023T	Coastal Engineering
5	22PECE8014T	Solid Waste Management	5	22PECE 8024T	Data Analytics in Civil Engineering
6	22PECE8015T	NPTEL /Swayam Course	6	22PECE 8025T	NPTEL /Swayam Course

1. @ Any 1 Elective Course
2. * Professional Elective Course offered for the student doing internship at Institute Level
3. # Professional Elective Courses offered for the students doing Internship at Industry. These courses are to be studied in self Study mode using NPTEL/Swayam platform.
4. Students doing internship at industry shall submit certificate of NPTEL examination OR they have to appear examinations conducted by institute like TT1, TT2 and ESE.
5. Students undergoing internship have the option to appear for both the NPTEL examination and the End Semester Examination (ESE) Conducted by Institute for the respective course. In such case the better of the two scores (NPTEL or ESE) Shall be considered for final grading
6. List of NPTEL courses will be declared by concerned BOS at the beginning of semester.

Prepared by

Dean Academic/Dy. Director

Checked by

C.O.E

CIVIL ENGINEERING DEPT. R.C.P.I.T. Office Seal SHIRPUR

BOS Chairman

Director

Program : Civil Engineering	B Tech	Semester: VII
Geotechnical Engineering (22PCCE7010T)		
Geotechnical Engineering Laboratory (22PCCE7010L)		

Pre-requisite –
Engineering mechanics, strength of mechanic's fluid mechanics and engineering geology.

Course Objectives

1. To provide students with basic understanding of physical and mechanical properties of soil, together with knowledge of basic engineering procedures.
2. To identify factors controlling soil behavior and methods to determine soil properties.
3. Students will acquire basic knowledge in engineering design of geotechnical systems

COs	Course Outcomes	Blooms Level	Blooms Description
CO1	To apply the knowledge of science, mathematics and engineering with the context of applications in geotechnical engineering.	3	Learn
CO2	Explain origin and classification of the different soils and to determine engineering properties of soil.	4	Analyze and design
CO3	Compute geostatic stresses in soils and Describe compaction and soil stabilization.	3	Understand
CO4	Analyze consolidation using Terzaghi's theory.	2	Design
CO5	Measure shear resistance of soil and determine shear stress parameters. Analyze Earth pressure by Rankine's theory.		

Course Contents

Unit- I Introduction of Soil and Geotechnical Properties **08 Hrs**

Soil as engineering material, soils of India, geotechnical problems, three phase system, definitions and functional relationships.

Geotechnical properties, engineering properties, volume weight relationships. Atterberg's limits, sieve analysis, identification of soil, I.S. classification system

Unit-II Flow through Soil, Compaction and Consolidation **08 Hrs.**

Flow of water through soils, soil water, capillarity, Darcy's law laboratory measurement of permeability.

Soil compaction, M.D.D. and O.M.C., standard Proctors test heavy compaction test, concept of stabilization, different methods of stabilization

Consolidation Theory, Terzaghi theory, consolidation test, time fitting curves, rate of settlements, Normal consolidated and over consolidated deposits, Pre consolidation pressure.

Unit-III Shear Resistance and Shear Strength of soil **08 Hrs.**

Shear resistance in soil, pore pressure and effective stresses failure theories, Mohr - Coulomb's law of shear strength direct shear test, traxial test, unconfined compression test, vane shear test, drained loading, and factors affecting the shear strength.

Unit-IV Soil Investigation and Bearing Capacity of Soil **08 Hrs.**

Soil exploration, subsurface exploration, trail pits, representative and undisturbed samples, bore hole sampling, laboratory evaluation of foundation parameters, field testing, penetration tests, plate load test, bore hole tests.

Bearing capacity of soil, load settlement curve, local and general shear, Terzaghi's bearing capacity analysis, bearing capacity factors, Mayorhoff equations, rectangular, square and round footings, effects of water table and depth, bearing capacity of layered soils, effect of eccentricity.

Unit-V Elastic Settlement and Special Foundation. **07Hrs**

Elastic settlement, contact pressure, elastic stresses and strains, pressure bulb, elastic settlement, empirical relation for settlement of basses, total and differential settlement, tolerable settlement, I.S. criteria, effect of lowering water table.

Introduction of pile foundation, purpose of piles, pile classification, Foundation on black cotton soils, characteristics of black cotton soil, problems, swelling potential, under-reamed piles, design principles and construction techniques.

Text Books:

1. Basic and Applied Soil Mechanics by Gopal Ranjan and Rao, New Age International Publishers.
2. Principles of foundation engineering by B. M. Das, Cengage Learning (Thompson)
3. Soil Mechanics and foundation Engineering, Dr.K.R.Arora, Standard Publishers Distributors

Reference Books:

1. Soil Mechanics and Foundations, Muni Budhu, John Wiley and Sons Inc
2. Foundation Analysis and Design, J.E.Bowles, McGraw Hill International
3. Foundation Design Manual, DhanpatRai Publication, N. V. Nayak
4. Design aids in soil mechanics and foundation engineering, Kaniraj S.R., Tata McGraw Hill Publishing Company Ltd.
5. Foundation Design and Construction, M.J.Tomlinson, ELBS Publication

Geotechnical Engineering Laboratory (22PCCE7010L)

Lab course work shall consist of Following experiment complete any 07 from list

List of Experiments:

1. Field density by core cutter method, and Sand replacement method.
2. Sieve analysis and particle size determination or hydrometer analysis.
3. Specific gravity determination by voluminometer / pychnometer.
4. Determination of liquid limit and plastic limit.
5. Determination of shrinkage limit.
6. Determination of co-efficient of permeability by constant head or by variable head permeameter.
7. Direct shear test.
8. Unconfined compression test.
9. Vane shear test.
10. Standard Proctor's test (MDD / OMC)
11. Modified Proctor's test (MDD / OMC)

Program: Civil Engineering	B Tech	Semester: VII
Public Health Engineering (22PCCE7020T)		
Public Health Engineering Laboratory (22PCCE7020L)		

Course Objectives

1. To apply knowledge of mathematics, physics, chemistry, and microbiology to solve and analyze engineering problems related to water and wastewater collection, transport, quality and treatment.
2. To understand the sources, effects, prevention and control measures of water pollution and its legislative aspects.
3. Recognize public health and environmental objectives related to water supply and wastewater disposal.

COs	Course Outcomes	Blooms Level	Blooms Description
CO1	Relate the relations between the environment and ecology, estimating water requirement for public water supply scheme.	1, 2	Remember, Understand
CO2	Ascertain the quality of water as per BIS and select the appropriate treatment method required for the water source.	3, 4	Apply, Analyze
CO3	Learn how to characterize source water, and the best available technologies (BAT) for physical and chemical treatment of drinking water.	3, 5	Analyze, Evaluate
CO4	Learn how to characterize wastewater, and the BAT for physical, chemical and microbiological treatment of wastewater.	4	Analyze
CO5	Understand selected contemporary global water and wastewater issues such as water shortage, wastewater reuse and emerging contaminants.	2, 4	Understand, Analyze

Course Contents

Unit- I Introduction to Water quality **06 Hrs.**

a) Water quality parameters, Water quality standards; conventional contaminants and emerging contaminants; Water treatment: Source selection process, selection of treatment chain, plant siting, and Treatability studies. Water intake structures: intake structures, such as river intake, canal and reservoir intake

General considerations for source of drinking water; Water demand, Population forecasting: arithmetical increase method geometrical increases method, incremental increase method

Unit-II Introduction to Principles of Water Treatment process **06 Hrs.**

Principles of Water Treatment process: Historical overview of water treatment, Considerations for layout of treatment plant, Sedimentation, Coagulation & Flocculation processes, Disinfection/ Chlorination, Water Softening, Filtration, removal of Dissolved Solids, Fluoride, Iron and Manganese etc. Aeration tank, Sedimentation tank.

Unit-III Water Treatment process **08 Hrs.**

A. Filtration: theory of filtration, mechanism of filtration, filter materials, types of filters, rapid Sand Filter, Slow Sand Filter, multimedia and dual media filters, components- under drainage system, working and cleaning of filters. Operational troubles, design of filters-RSF and SSF. Design of under drainage system.

B: Disinfection- objectives, theory, types of disinfection, chlorination.

C: Water Softening - lime soda, zeolite, and ion exchange processes, Quantity estimation of lime soda process, re-carbonization. Demineralization methods

Unit-IV Sewage Treatment **08 Hrs.**

Definition of sewage, Necessity of sewage treatment, Requirement of a sewage management system. Composition of sewage, Characteristics of sewage – Physical (Colour, Odour, Solids and Temperature), Chemical (Organic - Carbohydrates, Fats, Oil and Grease, Pesticides, Phenols, Proteins, Surfactants. Inorganic – Alkalinity, Chlorides, Heavy Metal, Nitrogen, pH, Phosphorous, Sulphur, Toxic Compounds, Gases – Hydrogen Sulfide, Methane, Oxygen), Biological Characteristics

Unit-V Preliminary & Secondary Treatment of Sewage **8 Hrs**

Preliminary & Secondary Treatment of Sewage – Screening – Purpose, Classification, Types, Cleaning, Design Consideration & Management of screenings material Comminutors – Purpose and types Grit Removal – Purpose, Quality and quantity of grit, Types Biological Treatment of Sewage – Objective and classification.

Reference Books:

1. E W Steel and Terence J McGhee : Water supply and Sewerage" Tata McGraw Hill Publishing Co.
2. Water supply and Sanitary Engineering by J S Birdie, Dhanpat Rai and Sons Publication, New Delhi
3. Physici-chemical processes for water quality control by Walter J Weber, Wiley Inter-science Publications.
4. Manual on Water Supply & Treatment, Central Public Health & Environmental Engineering, Organization, Ministry of Urban Affairs, Government of India
5. Benergee & Jain, "Handbook of Technical Analysis", Jain Brothers New Delhi.
6. Laboratory Manual for Environmental Quality Testing, Environmental Protection Research Foundation, Sangli.

Text Books:

1. Environmental Modelling: Finding Simplicity in Complexity by John Wainwright and Mark Mulligan, John Wiley & Sons, Ltd.
2. Building Environmental Models: A Primer on Simplifying Complexity by Mulligan, M. and Wainwright, J., John Wiley & Sons, Ltd, Chichester.
3. Earth-system science, in Blackwell Companion to Environmental Geography by Wainwright, J.,

   Blackwell, Oxford.
4. Water and Wastewater Treatment by Schroeder E D., McGraw-Hill.

Lab course work shall consist of Following experiment complete any 05 from list

List of Experiments

Term work shall consist of performing experimental sets from the list below.

1. Determination of pH in given water & waste water samples.
2. Determination of turbidity and optimum dose of coagulant.
3. Determination of alkalinity and acidity of given sample (water & waste water samples)
4. Determination of carbonate and non-carbonate hardness of water waste water samples.
5. Determination of chlorine demand and residual chlorine of water
6. Determination of dissolved oxygen present in the given water samples
7. **A complete report on site visit to a Municipal Water & waste water Treatment Plant.**

Program: Civil Engineering	B Tech	Semester: VII
Construction Safety &Quality Control (PCCE7030T)		

Course Objectives

1. Introduce students to the importance of safety and hazard identification in construction sites
2. Understanding the importance of quality control and quality assurance principles in construction projects
3. To familiarize students with government safety policies, regulations, and compliance requirements in construction industry

COs	Course Outcomes	Blooms Level	Blooms Description
CO1	Students will understand construction site hazards and apply safety measures using Personal Protective Equipment (PPE) and emergency preparedness protocols	1,4	Understand, Apply
CO2	Students will apply safety practices during excavation, scaffolding, formwork, concreting, and demolition activities in construction projects	4,	Apply
CO3	Students will analyze quality control standards (ISO 9001, IS codes) and apply quality assurance procedures in construction project monitoring	3,4	Analyze, Apply

Course Contents

Unit 1 Introduction to Construction Safety Policy **6 Hours**

Basics of construction site hazards, include physical hazards (Material & Person falls,), health hazards (chemicals, noise), environmental hazards weather, and ergonomic hazards (heavy lifting) types of accidents, causes and prevention, and safety. Government policies include Building Workers Act 1996 and Factories Act 1948. Use of Personal Protective Equipment (PPE). Emergency preparedness and fire safety. Site awareness requires safety meetings, signage, training, and worker participation programs.

Unit 2 Safety in Construction & Demolition Practices **6 Hours**

Safety measures during excavation, scaffolding, formwork, concreting, working at heights, Demolition of different methods as per Structure and select suitable method for dismantling. Safety practices systematically protect workers across construction activities, ensuring compliance and productivity. Reuse of Demolished material, Environmental impacts.

Unit 3 Introduction to Quality Control and Assurance **7 Hours**

Define quality concepts, standards (ISO 9001,) and the difference between quality control (QC) and quality assurance (QA) in construction and Importance and stages of (QC) in construction projects. IS codes, quality policies, and documentation procedures and Quality Reports.

Unit 4 Real time Monitoring of Important Construction Projects **7 Hours**

Introduction to Emerging trends in construction Project using AI & IOT Internet of Things based sensors and devices for continuous monitoring of construction quality parameters including temperature, humidity, and structural integrity its impact of technology in construction projects. Real-time data acquisition systems and wireless sensor networks for automated record keeping of quality control in construction sites.

Unit 5 Quality Audits **7 Hours**

Principles of Construction quality audits, checklists, and Third Party Technical Audit Importance, Case studies, and construction failures and lessons learned.

Reference Books:

1. 1.Griffith, A. and Howarth, T. 2001. Construction Health and Safety Management, Longman Scientific & Technical, London.
2. 2.Burke, R. 2013. Project Management Planning and Control Techniques, John Wiley & Sons, Chichester.
3. 3.Jha, K.N. 2011. Construction Project Management: Theory and Practice, Pearson Education India, New Delhi.
4. 4.Varghese, K. 2018. Construction Equipment Planning and Methods, PHI Learning Private Limited, Delhi

Text Books:

1. Construction safety and Management by Kumar neeraj Jha/Dilip patel Publisher Perason ISBN **978-9356060449**
2. Construction safety by R. K. Mishra Publisher AITBS India. ISBN **937473494X**
3. Quality control in Civil Engineering by A,K,Watal & Mahesh Sharma standard publication India
4. Quality assurance and quality control by VVN Prabhakar rao Mahi Publication India.

Program: Civil Engineering	B Tech	Semester: VII
Integrated Watershed Management (PECE7040T)		

Course Objectives

1. To learn the various management strategies through different soil and water conservation approaches.
2. To provide a comprehensive treatise on the engineering practices of watershed management for realizing the higher benefits of watershed management.
3. To understand land use classification and impact of land use changes on hydrological cycle parameters.

COs	Course Outcomes	Blooms Level	Blooms Description
CO1	Students will able to learn the different soil and water conservation approaches	3	Learn
CO2	Students will able to analyze degradation of soil and water resources	4	Analyze
CO3	Students will able to understand watershed Area	3	Understand
CO4	Students will have a thorough knowledge on watershed planning, development	2	Design
CO5	Students will able to Suggest drought control measures, water conservation structures	2	Prepare

Course Contents

Unit- I Introduction **06 Hrs.**

Watershed – Definition - concept - Objectives – watershed behavior, effects of land use and its change on hydrological cycle components, Land capability and suitability classification

Unit-II Watershed Planning **08 Hrs.**

Planning principles – collection of data – present land use - Preparation of watershed development plan - Estimation of costs and benefits - Financial plan – selection of implementation agency - Monitoring and evaluation system.

Unit-III Watershed management **06 Hrs.**

Participatory watershed Management - run off management - Factors affecting runoff - Temporary & Permanent gully control measures - Water conservation practices in irrigated lands - Soil and moisture conservation practices in dry lands, Erosion process. Control measures for soil erosion.

Unit-IV Water conservation practices **8 Hrs.**

In-situ & Ex-situ moisture conservation principle and practices - Afforestation principle - Micro catchment water harvesting - Ground water recharge – percolation ponds -Water harvesting - Farm pond - Supplemental irrigation - Evaporation suppression - Seepage reduction

Unit-V **Watershed Development Programme** **8 Hrs**

Drought and its management-causes and impacts, definition, management objectives and strategy-short term and long term measures. National Watershed Development Programme. Watershed based rural development – infrastructure development - Use of Aerial photography and remote sensing in watershed management - Role of NGOs in watershed development.

Reference Books:

1. Gurmel Singh et al. 2004. Manual of soil and water conservation practices. Oxford & IBH publishing Co. New Delhi.

2. Suresh, R. 2008. Land and water management principles, Standard Publishers & Distributors, New Delhi.

3. Tripathi R.P. and H.P.Singh 2002, Soil erosion and conservation, Willey Eastern Ltd., New Delhi

4. Murthy, V.V.N. 2005, Land and water management, Kalyani publishing, New Delhi.

5. Tideman, E.M., "Watershed Management", Omega Scientific Publishers, New Delhi, 1996.

6. Sharda V.N., Sikka A.K. and Juyal G.P. (2006) Participatory Integrated Watershed Management: A Field Manual, Central Soil and Water Conservation Research and Training Institute, 218, Kaulagarh Road, Dehradun.

7. Tideman E.M. (1999) Watershed Management–Guidelines for Indian Conditions, Omega Scientific Publishers, New Delhi.

Text Books:

1. Suresh, R. 2005. Soil and Water Conservation Engineering, Standard Publishers & Distributors, New Delhi.
2. Ghanashyam Das, "Hydrology and Soil Conservation Engineering", Prentice Hall of India Private Limited, New Delhi, 2000. Limit state theory and Design – Dr. V. L. Shah and Dr. S. R, Structures publications, Pune

Program: Civil Engineering	B Tech	Semester: VII
Construction Economics & Finance PECE7041T		

Course Objectives

1. Adopt as per principles of economics and financing
2. Analyze available alternatives and propose best suitable among them
3. Apply various models of financial management and accounting

COs	Course Outcomes	Blooms Level	Blooms Description
CO1	Students will able to learn the principles of economics and financing	3	Learn
CO2	Students will able to analyse available alternatives	4	Analyze
CO3	Students will able to Apply various models of financial management	3	Apply

Course Contents

Unit- I Engineering Economics **08 Hrs.**

Engineering Economics, Time Value of Money, Cash Flow diagram, Nominal and effective interest – continuous interest, Single Payment Compound Amount Factor, Uniform series of Payments, comparing alternatives, Present worth Analysis, Annual worth Analysis, Future worth Analysis, Rate of Return Analysis, Break Even Analysis, Benefit/Cost Analysis

Unit –II Economics of Project Parameters **08 Hrs.**

Economics of Project Parameters, Equipment Economics, Operating Costs, Buy, Rent and Lease Options, |Replacement Analysis, Cost Estimates, Type of Estimates, Parametric Estimate, Management Accounting, Financial accounting principles, basic concepts, Financial statements, accounting ratios

Unit –III Investment Evaluation **06 Hrs.**

Investment Evaluation and Financing Projects, Taxation, Depreciation, switching between different depreciation methods, Inflation, Sources of finance, equity, debit, securities, borrowings, debentures, Working capital requirement, financial institutes

Unit –IV Financial Management **06 Hrs.**

Financial Management, Introduction, Charts of Accounts, Balance Sheet, Financial Ratios, Working Capital Management, Budgeting and budgetary control, Performance budgeting. Profit & Loss, statement, Ratio analysis, Appraisal through financial statements, International finance forward

Unit –V Projects Public Private **06 Hrs.**

PPP in Projects Public Private Participation in Projects- PPP Models, BOOT, BOT, Joint Ventures, BOOT, BOT, Annuity, DBFO, External Commercial Borrowings, International Finance, FIDIC.

Text Books

1. Blank, L.T., and Tarquin, A. J., (1988). Engineering Economy, Mc-Graw Hill Book Co.
2. Collier C. and Gla Gola C. (1998). Engineering Economics & Cost Analysis, Addison Wesley Education Publishers,
3. Patel, B. M., (2000). Project management- strategic Financial Planning, Evaluation and Control, Vikas Publishing House Pvt. Ltd. New Delhi,
4. Shrivastava, U. K., (2000). Construction Planning and Management, Galgotia Publications Pvt. Ltd. New Delhi.

References

1. Van Horne, J.C. (1990). Financial Management and Policy, Prentice-Hall of India Ltd.
2. Taylor, G.A. (1968). Managerial and Engineering Economy. East-West Edition.
3. Thuesen, H.G. (1959). Engineering Economy, Prentice-Hall, Inc.
4. Brigham, E.F. (1978). Fundamentals of Financial Management, the Dryden Press, Hinsdale, Illinios,

Program: Civil Engineering	B Tech	Semester: VII
Planning for Sustainable Development PECE7042T		

Course Objectives

1. Understand the basic concept of Sustainable Development (SD), the environmental, social and economic dimensions
2. In depth learning and analysis of factors that support to achieve sustainability and resilience in an individual level and in a community
3. Develop an encompassing understanding of sustainability issues.
4. Understand the embedment of sustainability issues in environmental, societal, and economic systems, and the relevance of the conditions, interrelations, and dynamics of these systems.

COs	Course Outcomes	Blooms Level	Blooms Description
CO1	Students will able to learn the principles of Sustainable development	3	Learn
CO2	Students will able to analyse the available alternatives for SD	4	Analyse
CO3	Students will able to Understand the case study of village	3	Apply

Course Contents

Unit- I **06 Hrs.**

Sustainable Development-explains and critically evaluates the concept of sustainable development, Environmental degradation and poverty Sustainable development: its main principles, the evolution of ideas about sustainability,

Unit- II **06 Hrs.**

Dimensions to Sustainable Development - society, environment, culture and economy; current challenges - natural, political, socio-economic imbalance; sustainable development initiatives and policies of various countries: global, regional, national, local; needs of present and future generation - political, economic, environmental. Examine some important current issues and areas of debate in relation to sustainable development.

Unit-III **06 Hrs**

Innovation for sustainable development- Environmental management and innovation strategies.
Frameworks of Sustainability - Analytical frameworks in sustainability studies, sustainability Metrics: criteria and indicators; the significance of quantitative and qualitative assessments of sustainability; current metrics and limitations; metrics for mapping and measuring Sustainable development; application of the metrics in real scenarios Innovation for sustainable development- Environmental management and innovation strategies.

Unit – IV **06 Hrs**

Critical Perspectives on Sustainable Development: Resource management and implications on sustainable development - implications for valuation, risk assessment; integrated decision-making processes: requirements of information, information flow, data analytics, learning from historical data, multicriteria decisions, multi-level decisions, participatory decisions ; translating impact chains to information flows - impact of governance and policies

Unit –V **06 Hrs**

Case Studies & Projects on Rural Sustainable Development (Indian village perspectives) - Village resources (broad perspectives); current challenges and thematic areas; village social hierarchy; village economy; needs of present and future generation; conflicts - sustainability and rural culture & tradition; road to achieving sustainable development goals. Governance for sustainable development. Policy responses to environmental degradation.

Text **Book**

1. Franco, I.B. and Tracey, J. (2019), "Community capacity-building for sustainable development: Effectively striving towards achieving local community sustainability targets", International Journal of Sustainability in Higher Education, Vol. 20 No. 4, pp. 691-725
2. Our Common Journey: A Transition Toward Sustainability. National Academy Press, Washington D.C. Soubbotina, T. P. 2004.
3. Elliott, Jennifer. 2012. An Introduction to Sustainable Development. 4th Ed. Routledge, London.
4. Rogers, Peter P., Kazi F. Jalal, and John A. Boyd. "An introduction to sustainable development." (2012).
5. Sachs, J. D. 2015. The Age of Sustainable Development. Columbia University Press, New York.
6. Soubbotina, Tatyana P. 2004. Beyond Economic Growth: An Introduction to Sustainable Development. WBI learning resources series. Washington DC ; World Bank.
7. Kerr, Julie. Introduction to energy and climate: Developing a sustainable environment. CRC Press, 2017.
8. Saito, Osamu. Sharing Ecosystem Services. Springer Singapore, 2020.
9. Nhamo, Godwell, and Vuyo Mjimba. Sustainable Development Goals and institutions of higher education. Springer, 2020
10. Hjorth, P. & A. Bagheri (2006), "Navigating towards Sustainable Development: A System Dynamics Approach", Futures 24 38: 74-92.

Program: Civil Engineering	B Tech	Semester: VII
Numerical Methods for Civil EngineeringPECE7043T		

Course Objectives

1. To develop a sound understanding of the various numerical techniques, principles and their application to Civil engineering problems.
2. To apply Numerical analysis which has enormous application in the field of Civil Engineering.
3. To calculate and interpret errors in numerical method.
4. To provide exposer to various numerical methods for performing task such as interpolation, differentiation, integration, solution of linear and nonlinear equations, solution of differential and integral equations
5. To facilitate numerical computing.

COs	Course Outcomes	Blooms Level	Blooms Description
CO1	To develop a sound understanding of the various numerical techniques, principles and their application to Civil engineering problems.	Level 2	Understanding
CO2	To apply Numerical analysis which has enormous application in the field of Civil Engineering.	Level 3	Applying
CO3	To calculate and interpret errors in numerical method	Level 5	Evaluating
CO4	To provide exposer to various numerical methods for performing task such as interpolation, differentiation, integration, solution of linear and nonlinear equations, solution of differential and integral equations	Level 4	Analyzing
CO5	To facilitate numerical computing.	Level 4	Analyzing

Course Contents

Unit- I **08 Hrs.**

Basis of Computations, Errors in Numerical Computation, Matrix Operations on Computer, Multiplication and Inversion, Solution of Simultaneous Equations, Gauss Elimination Method, Jordan and Gauss Seidal Methods.

UNIT-II **06 Hrs.**

Roots of Equation by Bisection, False Position Method, Newton Rapson Method, Linear Programming Problem (L.P.P.) - Introduction, Assumptions, Applications, Limitations, General mathematical model, formulation, Simplex method.

Unit-III **06 Hrs.**

Interpolation with Lagrange's Polynomial, Newton's Divided Differences, Forward and Backward Differences, Least Square Method, Regression Analysis: Linear, Parabolic, Curve Fitting

Unit-IV **06 Hrs.**

Numerical Integration: Trapezoidal Rule, Simpon's Rules, Gauss Quadrature Rules. Introduction to initial value and boundary value problem, Finite Difference Method for solution of one dimensional wave equation, two dimensional equation. (Parabolic and Elliptic)

Unit –V **06 Hrs.**

Solution of Ordinary Differential Equation, Euler's Method, Modified Euler's Method and Runga Kutta Methods, Predictor Corrector Method.

Reference Books:

1. Balaguruswami E., "Numerical Methods", Tata Mc-Graw Hill
2. Scheid F, "Numerical Analysis (Schaum's series)", Tata Mc-Graw Hill
3. Chapra. S. C. and Canale R. P., "Numerical Methods for Engineers", by, Tata Mc-Graw Hill
4. Shantha Kumar M , "Computer Based Numerical Analysis", Khanna Publication
5. Grewal B.S. and Grewal J.S., "Numerical Methods in Engineering and Science", Khanna Publication, N. Delhi
6. Sastry, S.S., "Introductory Methods of Numerical Analysis", Printice Hall of India, New Delhi
7. Jain, Aryengon, "Numerical Methods for Scientific and Engineering Applications", Wiley Eastern Publication
8. Numerical Recipe , Oxford Publishing
9. Manuals for the Commercial Computer Programmes

Program: Civil Engineering	B Tech	Semester: VII
Ground water Engineering PECE7044T		

Course Objectives

1. To understanding the concept of ground water management.
2. To introduce the student to the principles of Groundwater governing Equations and Characteristics of different aquifers,
3. To understand the techniques of development and management of groundwater.

COs	Course Outcomes	Blooms Level	Blooms Description
CO1	Understand aquifer properties and its dynamics	Level 2	Understanding
CO2	Get an exposure towards well design and practical problems	Level 3	Applying
CO3	Develop a model for groundwater management.	Level 5	Evaluating
CO4	Students will be able to understand the importance of artificial recharge and groundwater quality concepts	Level 4	Analyzing
CO5	Gain knowledge on conservation of groundwater.	Level 4	Analyzing

Course Contents

Unit- I Hydrogeological Parameters **08 Hrs.**

Introduction – Water bearing Properties of Rock – Type of aquifers - Aquifer properties – permeability, specific yield, transmissivity and storage coefficient – Methods of Estimation - Steady state flow - Darcy's Law - Groundwater Velocity –- Dupuit Forchheimer assumption – Steady Radial Flow into a Well

UNIT II Well Hydraulic **08 Hrs**

Unsteady state flow - Theis method - Jacob method – Chow's method – Law of Times – Theis Recovery – Bailer method –- Image well theory – Partial penetrations of wells – Well losses – Specific Capacity and Safe yield - Collector well and Infiltration gallery

UNIT III Groundwater Management **08 Hrs**

Need for Management Model – Database for Groundwater Management – Groundwater balance study – Introduction to Mathematical model – Model Conceptualization – Initial and Boundary Condition – Calibration – Validation – Future Prediction – Sensitivity Analysis – Uncertainty – Development of a model

UNIT IV Groundwater Quality **06 Hrs**

Ground water chemistry - Origin, movement and quality - Water quality standards – Drinking water – Industrial water – Irrigation water - Ground water Pollution and legislation - Environmental Regulatory requirements.

UNIT V Groundwater Conservation **06 Hrs**

Artificial recharge techniques – Reclaimed wastewater recharge – Soil aquifer treatment (SAT) – Aquifer Storage and Recovery (ASR) Seawater Intrusion and Remediation – Ground water Basin management and Conjunctive use – Protection zone delineation, Contamination source inventory and remediation schemes

TEXT BOOKS:

1. Raghunath H.M., "Ground Water Hydrology", New Age International (P) Limited, New Delhi, 2010.
2. Todd D.K., "Ground Water Hydrology", John Wiley and Sons, New York, 2000.

REFERENCES

1. Fitts R Charles, "Groundwater Science". Elsevier, Academic Press, 2002.
2. Ramakrishnan, S, Ground Water, K.J. Graph arts, Chennai, 1998.

Program: Civil Engineering	B Tech	Semester: VII
Product Lifecycle Management (OECE7050T		

Course Objectives

1. To familiarize the students with the need, benefits and components of PLM
2. To acquaint students with Product Data Management & PLM strategies
3. To give insights into new product development program and guidelines for designing and developing a product
4. To familiarize the students with Virtual Product Development

COs	Course Outcomes	Blooms Level	Blooms Description
CO1	Gain knowledge about phases of PLM, PLM strategies and methodology for PLM feasibility study and PDM implementation	2	Learn
CO2	Illustrate various approaches and techniques for designing and developing products.	4	Analyze
CO3	Apply product engineering guidelines / thumb rules in designing products for molding, machining, sheet metal working etc.	2	Understand
CO4	Acquire knowledge in applying virtual product development tools for components, machining and manufacturing plant	3	Design

Course Contents

Unit- I Introduction to Product Lifecycle Management **10 Hrs.**

Introduction to Product Lifecycle Management (PLM): Product Lifecycle Management (PLM), Need for PLM, Product Lifecycle Phases, Opportunities of Globalization, Pre-PLM Environment, PLM Paradigm, Importance & Benefits of PLM, Widespread Impact of PLM, Focus and Application, A PLM Project, Starting the PLM Initiative, PLM Applications
PLM Strategies: Industrial strategies, Strategy elements, its identification, selection and implementation, Developing PLM Vision and PLM Strategy, Change management for
PLM

Unit-II **08 Hrs.**

Product Design: Product Design and Development Process, Engineering Design, Organization and Decomposition in Product Design, Typologies of Design Process Models, Reference Model, Product Design in the Context of the Product Development Process, Relation with the Development Process Planning Phase, Relation with the Post design Planning Phase, Methodological Evolution in Product Design, Concurrent Engineering, Characteristic Features of Concurrent Engineering, Concurrent Engineering and Life Cycle Approach, New Product Development (NPD) and Strategies, Product Configuration and Variant Management, The Design for X System, Objective Properties and Design for X Tools, Choice of Design for X Tools and Their Use in the Design Process

Unit-III Theory of Meteorology **06 Hrs.**

Product Data Management (PDM): Product and Product Data, PDM systems and importance, Components of PDM, Reason for implementing a PDM system, financial justification of PDM, barriers to PDM implementation

Virtual Product Development Tools: For components, machines, and manufacturing plants, 3D CAD systems and realistic rendering techniques, Digital mock-up, Model building, Model analysis, Modelling and simulations in Product Design, Examples/Case studies.

Unit-IV Air Pollution **8 Hrs.**

Integration of Environmental Aspects in Product Design: Sustainable Development Design for Environment, Need for Life Cycle Environmental Strategies, Useful Life Extension Strategies, End-of-Life Strategies, Introduction of Environmental Strategies into the Design Process, Life Cycle Environmental Strategies and Considerations for Product Design.

Unit-V Analysis and Design of Columns and Column footings **8 Hrs.**

Life Cycle Assessment and Life Cycle Cost Analysis: Properties, and Framework of Life Cycle Assessment, Phases of LCA in ISO Standards, Fields of Application and Limitations of Life Cycle Assessment, Cost Analysis and the Life Cycle Approach, General Framework for LCCA, Evolution of Models for Product Life Cycle Cost Analysis

Reference Books:

1. Product Life Cycle Managementl, Saaksvuori Antti, Immonen Anselmie, Springer, Dreamtech.
2. Product Lifecycle Management: Driving the next generation of lean thinking, Michael Grieve, Tata McGraw Hill, 2006.
3. Product Life-Cycle Management: Geometric Variations, François Villeneuve, Luc Mathieu, Max Giordano, Wiley, 2010.

Text Books:

1. Product Lifecycle Management: Paradigm for 21st Century Product Realization, John Stark, Springer-Verlag, 2004.
2. Product Design for the environment-A life cycle approach, Fabio Giudice, Guido La Rosa, Antonino Risitano, Taylor & Francis 2006.

Program: Civil Engineering	B Tech	Semester: VII
Management Information System (OECE7051T)		

Course Objectives

1. The course is blend of Management and Technical field.
2. Discuss the roles played by information technology in today's business and define various technology architectures on which information systems are built
3. Define and analyze typical functional information systems and identify how they meet the needs of the firm to deliver efficiency and competitive advantage
4. Identify the basic steps in systems development.

COs	Course Outcomes	Blooms Level	Blooms Description
CO1	Explain how information systems Transform Business	2	Understand
CO2	Identify the impact information systems have on an organization	4	Learn
CO3	Describe IT infrastructure and its components and its current trends	2	Understand
CO4	Understand the principal tools and technologies for accessing information from databases to improve business performance and decision making	2	Understand
CO5	Identify the types of systems used for enterprise-wide knowledge management and how they provide value for businesses	4	Learn

Course Contents

Unit- I **06 Hrs.**

Foundation Concepts: Information Systems in Business, Functional Area Information System, The Components of Information Systems, Impact of IT on organizations and society, Organizational Strategy, Information systems for strategic advantage

Unit- II **06 Hrs**

Information Technologies: Hardware and Software Computer Systems: End User and Enterprise Computing Computer Peripherals: Input, Output, and Storage Technologies Application Software: End User Applications System Software: Computer System Management Data Resource Management: Technical Foundations of Database Management, Managing Data Resources, Big data, Data warehouse and Data Marts, Knowledge Management Networks: The Networked Enterprise (Wired and wireless), Pervasive computing, Cloud Computing models

Unit- III **06 Hrs.**

MIS Tools and applications for Decision making: ERP and ERP support of Business Process Reengineering,
Business intelligence (BI): Managers and Decision Making, BI for Data analysis and Visualization
Artificial Intelligence Technologies in Business

Unit- IV **06 Hrs.**

Security and Ethical Challenges: Security, Ethical, and Societal Challenges of IT
Security Management of Information Technology

Unit- V **06 Hrs.**

Social Computing (SC): Web 2.0 and 3.0, SC in business-shopping, Marketing, Operational and Analytic CRM, E-business and E-commerce – B2B B2C, Mobile
Commerce.

Unit- VI **06 Hrs.**

Information System within Organization: Acquiring Information Systems and Applications: Various System development life cycle models.
Enterprise and Global Management of Information Technology: Managing Information Technology, Managing Global IT.

Reference Books

1. Management Information Systems, 11th edition by James A O'Brien, George M., Ramesh Behl.
2. Kelly Rainer, Brad Prince, Management Information Systems, Wiley.
3. K.C. Laudon and J.P. Laudon, Management Information Systems: Managing the Digital Firm, 10th Ed., Prentice Hall, 2007.
4. D. Boddy, A. Boonstra, Managing Information Systems: Strategy and Organization, Prentice Hall, 2008

Evaluation Scheme:

Continuous Assessment (A):

Subject teacher will declare Teacher Assessment criteria at the start of Semester.

Continuous Assessment (B):

1. Two term tests of 15 marks each will be conducted during the semester.
2. Total duration allotted for writing each of the paper is 1 hr.
3. Best of the marks scored in both the two tests will be considered for final grading.

End Semester Examination (C):

1. Question Paper will be based on entire syllabus summing up to 65 marks
2. Total duration allotted for writing the paper is 3 hr.

Program: Civil Engineering	B Tech	Semester: VII
Operations Research (OECE7052T)		

Course **Objectives**

1. To formulate a real-world decision problem as a mathematical programming model.
2. To learn the mathematical tools that are employed to solve mathematical programming models

COs	Course Outcomes	Blooms Level	Blooms Description
CO1	Convert a real-world problem in to a Linear Programming Problem and analyse the solution obtained using Simplex method or other algorithms.	3	Learn
CO2	**Identify** the decision situations which vary with time and **analyse** them using principle of dynamic programming to real life situations	4	Analyze
CO3	Describe concept of simulation and apply Monte Carlo Simulation technique to systems such as inventory, queuing and recommend solutions for them.	3	Understand
CO4	Understand need for right replacement policy and determine optimal replacement age.	2	Understand

Course Contents

Unit- I **10 Hrs.**

Introduction to Operations Research: Concept of decision making. Definition of OR. Formulation of decision problem as OR model, Concept of Optimization,
Linear Programming Problem: Mathematical Formulation. Finding optimal solution - Graphical method, Simplex Method, Big M-method, Two Phase Method.
Duality, Primal – Dual construction, Symmetric and Asymmetric Dual. Dual Simplex Method.

Unit-II **08 Hrs.**

Assignment Problems: Mathematical Formulation, Finding optimal solution - Hungarian Method
Transportation problem: Mathematical Formulation, Finding initial basic feasible solution – Northwest corner rule, row minima, column minima, least cost method and Vogel's approximation method.
Optimality test: the stepping stone method and MODI method.
Improving the solution.

Unit-III **06 Hrs.**

Dynamic Programming: Bellman's Principle of optimality - Applications of dynamic programming- Employment smoothening problem, capital budgeting problem, shortest path problem, cargo loading problem

Unit-IV **10 Hrs.**

Queuing Models: Characteristics of queuing models. Single Channel – Single and multi-phase servers, Poisson arrivals, and exponential service time - with infinite population and finite population models – with infinite and finite capacity. Multichannel – Single phase server - Poisson arrivals, exponential service time with infinite population. Game Theory: Introduction. Minimax & Maxim in Criterion and optimal strategy. Solution of games with saddle points, rectangular games without saddle points - 2 x 2 games, dominance principle. Approximate methods - Iterative method, m x 2 & 2 x n games -Graphical method and method of sub-games. Expressing game as LPP.

Unit-V **8 Hrs**

Simulation: Definition. Types of simulation models. Monte Carlo simulation technique. Applications of simulation - Inventory and queuing problems. Simulation Languages. Replacement Models:
Replacement of items that deteriorate with time - when money value is not counted and counted,
Replacement of items that fail suddenly – individual and group replacement policy.

Text books:

1. Operations Research, Sharma J. K., Trinity Press
2. Operations Research, Gupta P. K., Hira D. S., S. Chand Limited

Reference Books:

1. Operations Research - An Introduction; Taha, H.A.; Prentice Hall

Program: Civil Engineering	B Tech	Semester: VII
Cyber Security and Laws OECE7053T		

Course Objectives

1. To understand and identify different types cybercrime and cyber offences.
2. To recognized Indian IT Act 2008 and its latest amendments
3. To learn various types of security standards compliances

COs	Course Outcomes	Blooms Level	Blooms Description
CO1	Understand the different types of cybercrime and security issues E Business.	3	Understand
CO2	Analyses different types of cyber threats and techniques for security management	4	Analyze
CO3	Explore the legal requirements and standards for cyber security in various countries to regulate cyberspace.	3	Understand
CO4	Impart the knowledge of Information Technology Act and legal frame work of right to privacy, data security and data protection	2	Learn

Course Contents

Unit- I **12 Hrs.**

Introduction to Cybercrime:
Cyber Crime, Cyber Law, Cyber Security, History of Cyber Crime, Hacking, Data Theft, Cyber Terrorism, Virus & Worm's, Email Bombing, Pornography, online gambling, Forgery, Web Defacements, Web Jacking, Illegal online Selling, Cyber Defamation, Software Piracy, Electronics/ Digital Signature, Phishing, Password Cracking, Key loggers and Spywares, Steganography, DoS and DDoS attacks, SQL Injection, Buffer Over Flow, Attacks on Wireless Networks, Phishing Identity Theft (ID Theft)
Cyber offenses: How criminal plan the attacks, Social Engineering, Cyber stalking, Cyber café and Cybercrimes, Botnets, Attack vector

Unit- II **08 Hrs.**
Cyber Threats Analysis
Knowledge of Dynamic and Deliberate Targeting Knowledge of Indications and Warning
Knowledge of Internal Tactics to Anticipate and/or, Emulate Threat Capabilities and Actions
Knowledge of Key Cyber Threat Actors and their Equities Knowledge of Specific Target Identifiers and Their Usage **Cyber Security Management**
Knowledge of Emerging Security Issues, Risks, and Vulnerabilities

Unit- III **06 Hrs.**
Electronic Business and legal issues
Evolution and development in Ecommerce, Policy Frameworks for Secure Electronic Business, paper vs paper less contracts, E-Commerce models- B2B, B2C, E security. E- Payment Mechanism; Payment through card system, E-Cheque, E-Cash, E-Payment Threats & Protections, Security for E-Commerce.

Unit- VI **08 Hrs.**

Indian IT Act
Cyber Crime and Criminal Justice, Penalties, Adjudication and Appeals Under the IT Act, 2000, IT Act. 2008 and its Amendments
Security aspect in cyber Law
The Contract Aspects in Cyber Law , The Security Aspect of Cyber Law, The Intellectual Property Aspect in Cyber Law ,The Evidence Aspect in Cyber Law ,The Criminal Aspect in Cyber Law

Unit- V **08 Hrs.**
Security Industries Standard Compliances
IT Security v/s IT Compliance, Cyber Security Standards, critical security controls for cyber security, GRC (Governance, Risk Management, and Compliance), SOX, GLBA, HIPAA, ISO/IEC 27001, NIST Cyber Security Framework (CSF), PCI-DSS.
OWASP Top Ten Project, GDPR (General Data Protection Regulation), NIST (National Institute of Standards and Technology), CIS Controls (Center for Internet Security Controls)

Reference Books and Material:

1. Nina Godbole, Sunit Belapure, Cyber Security, Wiley India, New Delhi
2. The Indian Cyber Law by Suresh T. Vishwanathan; Bharat Law House New Delhi
3. The Information Technology Act, 2000; Bare Act- Professional Book Publishers, New Delhi.
4. E-Commerce Security and Privacy", Anup K. Ghosh, Springer Science and Business Media, 2012
5. Izzat Alsmadi , The NICE Cyber Security Framework Cyber Security Intelligence and Analytics, Springer
6. Cyber Law & Cyber Crimes, Advocate Prashant Mali; Snow White Publications, Mumbai
7. Nina Godbole, Information Systems Security, Wiley India, New Delhi
8. Kennetch J. Knapp, Cyber Security &Global Information Assurance Information Science Publishing.
9. William Stallings, Cryptography and Network Security, Pearson Publication
10. Websites for more information is available on : The Information Technology ACT, 2008- TIFR : https://www.tifrh.res.in
11. Website for more information, A Compliance Primer for IT professional: https://www.sans.org/reading-room/whitepapers/compliance/compliance-primer- professionals-33538

Evaluation Scheme:

Continuous Assessment (A):

Subject teacher will declare Teacher Assessment criteria at the start of Semester.

Continuous Assessment (B):

1. Two term tests of 15 marks each will be conducted during the semester.
2. Total duration allotted for writing each of the paper is 1 hr.
3. Best of the marks scored in both the two tests will be considered for final grading.

End Semester Examination (C):

1. Question Paper will be based on entire syllabus summing up to 65 marks
2. Total duration allotted for writing the paper is 3 hr.

Program: Civil Engineering	B Tech	Semester: VII
Energy Audit and Management (OECE7055T)		

Course Objectives

1. To understand the importance of energy security for sustainable development and the fundamentals of energy conservation.
2. To identify and describe the basic principles and methodologies adopted in energy audit of a utility
3. To introduce performance evaluation criteria of various electrical and thermal installations to facilitate the energy management.
4. To relate the data collected during performance evaluation of systems for identification of energy saving opportunities.

COs	Course Outcomes	Blooms Level	Blooms Description
CO1	To identify and describe present state of energy security and its importance.	3	Learn
CO2	To identify and describe the basic principles and methodologies adopted in energy audit of a utility.	3	Learn
CO3	To describe the energy performance evaluation of some common electrical installations and identify the energy saving opportunities.	4	Apply
CO4	To describe the energy performance evaluation of some common thermal installations and identify the energy saving opportunities.	4	Evaluate
CO5	To analyze the data collected during performance evaluation and recommend energy saving measures.	2	Analyze

Course Contents

Unit- I **07Hrs**

Energy Scenario: Present Energy Scenario, Energy Pricing, Energy Sector Reforms, Energy Security, Energy Conservation and its Importance, Energy Conservation Act- 2001 and its Features. Basics of Energy and its various forms, Material and Energy balance.

Unit- II **08Hrs**

Energy Audit: Definition, Energy audit- need, Types of energy audit, Energy management (audit) approach-understanding energy costs, Bench marking, Energy performance, matching energy use to requirement, Maximizing system efficiencies, Optimizing the input energy requirements, Fuel and energy substitution. Elements of monitoring & targeting, Energy audit instruments. Technical and economic feasibility, Classification of energy conservation measures. Safety considerations during energy audit.
Financial analysis techniques: Simple payback period, NPV, Return on investment
(ROI) Internal rate of return (IRR).

Unit- III **08Hrs**

Energy Management and Energy Conservation in Electrical System: Electricity billing, Electrical load management and maximum demand Control; Power factor improvement, Energy efficient equipment's and appliances, star ratings. Energy efficiency measures in lighting system, lighting control: Occupancy sensors, daylight integration, and use of intelligent controllers. Energy conservation opportunities in water pumps, compressor, fan and blower. Industrial drives, induction motors, motor retrofitting, soft starters, variable speed drives.

Unit- VI **06Hrs**

Energy Management and Energy Conservation in Thermal Systems: Review of different thermal loads; Energy conservation opportunities in: Steam distribution system, Steam leakages, Steam trapping, Condensate and flash steam
Recovery system. Waste heat recovery, use of insulation- types and application. Energy conservation opportunities in: Boiler system. Refrigeration system and HVAC system.

Unit- V **06Hrs**

Energy conservation in Buildings: Energy Conservation Building Codes (ECBC): Green Building, LEED rating, Application of Non-Conventional and Renewable Energy Sources, Energy sources and energy management in electric vehicles.

Reference Books:

1. Handbook of Electrical Installation Practice, Geofry Stokes, Blackwell Science.
2. Designing with light: Lighting Handbook, By Anil Valia, Lighting System.
3. Energy Management Handbook, By W.C. Turner, John Wiley and Sons.
4. Handbook on Energy Audits and Management, edited by A. K. Tyagi, Tata Energy Research Institute (TERI).
5. Energy Management Principles, C.B. Smith, Pergamon Press.
6. Energy Conservation Guidebook, Dale R. Patrick, S. Fardo, Ray E. Richardson, Fairmont Press.
7. Handbook of Energy Audits, Albert Thumann, W. J. Younger, T. Niehus, CRC Press.
8. www.energymanagertraining.com
9. www.bee-india.nic.in

Program: Civil Engineering	B Tech	Semester: VII
Disaster Management and Mitigation Measures (OECE7056T)		

Course Objectives

1. To provide basic understanding hazards, disaster and various types and categories of disaster occurring around the world.
2. To identify extent and damaging capacity of a disaster.
3. To study and understand the means of losses and methods to overcome /minimize it.
4. To understand roles and responsibilities of individual and various organization during and after disaster.
5. To appreciate the significance of GIS, GPS in the field of disaster management.
6. To understand the emergency government response structures before, during and after disaster.

COs	Course Outcomes	Blooms Level	Blooms Description
CO1	Know natural as well as manmade disaster and their extent and possible effects on the economy.	2	Understand
CO2	Know the institutional framework and organization structure in India for disaster management and get acquainted with government policies, acts and various emergency laws.	3	Apply
CO3	Get to know the simple dos and don'ts in such extreme events and build skills to respond accordingly	3	Learn
CO4	Understand the importance of disaster prevention and various mitigation measure with the exposure to disasters hotspots across the globe.	2	Understand

Course Contents

Unit- I **07Hrs**

General Information about Disaster:
Brief concept of Hazards, definition and types of Disasters – Natural, Man-made, and hybrid, Groups of Disasters- Natural and Technological, global Scenario, Significance of studying various aspects of disasters, effects of disasters, India's vulnerability to disasters, Impact of disaster on National development. Study of Natural disasters:
Flood, drought, cloud burst, Earthquake, Landslides, Avalanches, Volcanic eruptions, Mudflow, Cyclone, Storm, Storm Surge, climate change, global warming, sea level rise, ozone depletion etc.
Study of Human/Technology Induced Disasters:
Chemical, Industrial and Nuclear disasters, Internally displaced persons, road and train accidents Fire Hazards, terrorism, militancy, Role of growing population and subsequent industrialization, urbanization and changing lifestyle of human beings in frequent occurrences of manmade disasters.

Unit- II **08Hrs**

Disaster Management:
Brief Introduction, Disaster management cycle, Evolution of Disaster and Disaster management in India, Disaster management acts, policies and guidelines, laws of emergencies etc.
Prior, during and Post disaster management activities: (Preparedness, strengthening emergency centers, Logistics, optimum resource management, emergency response and relief, Training, Public awareness, Research, Reconstruction of essential services and livelihood restoration.

Unit- III **08Hrs**

Institutional framework and Mechanism for disaster management in India: Institutions in India for dealing with various disasters, Organizational structure, functions and responsibilities of National Institute of Disaster Management (NIDM) and National disaster management authority (NDMA) in India, roles and responsibilities of central and state government during and after disaster, NGO's involved in disasters and their task, Jobs carried out by armed forces.
Financial Relief During disaster (State, National and International Disaster Assistance)

Unit- VI **06Hrs**

Disaster risk reduction and Mitigation Measures:
Need of disaster prevention and mitigation, mitigation guiding principles, challenging areas, structural and non-structural measures for disaster risk reduction. Mitigation measures for flood, earthquake, cyclone monitoring, air quality, water quality, climate change, land use, winter storms and aquatic biology etc. Use of information management, GIS, GPS and remote sensing Mitigation measure. Do's and don'ts in case of disasters and effective implementation of relief aids.

Unit- V **06Hrs**

Case studies on disaster (National /International): Case study discussion of Hiroshima – Nagasaki (Japan), India – Tsunami (2004) , Bhopal gas tragedy, Kerala and Uttarakhand flood disaster, Cyclone Phailin (2013), Fukushima Daiichi nuclear disaster (2011), 26th July 2005 Mumbai flood, Chernobyl meltdown and so on. (Discuss case studies on disaster with respect to reason for the disaster, incidents, and effects of disaster, present scenario and safety measures taken)

Reference Books and Reports:

1. Disaster Management, by Harsh K.Gupta, Universities Press Publications (2003).

2. Disaster Management: An Appraisal of Institutional Mechanisms in India, by O.S.Dagur, published by Centre for land warfare studies, New Delhi, 2011.

3. Introduction to International Disaster Management, by Damon Copolla, Butterworth Heinemann Elsevier Publications (2015).

4. Disaster Management Handbook, by Jack Pinkowski, CRC Press, Taylor and Francis group (2008).

5. Disaster management & rehabilitation, by Rajdeep Dasgupta, Mittal Publications, New Delhi (2007).

6. Natural Hazards and Disaster Management, Vulnerability and Mitigation, by R B Singh, Rawat Publications (2006).

7. Concepts and Techniques of GIS, by C.P.Lo Albert, K.W. Yonng, Prentice Hall (India) Publications (2006).

8. Risk management of natural disasters, by Claudia G. Flores Gonzales, KIT Scientific Publishing (2010).

9. Disaster Management – a disaster manger's handbook, by W. Nick Carter, Asian Development Bank (2008).

10. Disaster Management in India, by R. K. Srivastava, Ministry of Home Affairs, GoI, New Delhi (2011)

11. The Chernobyl Disaster: Legacy and Impact on the Future of Nuclear Energy, by Wil Mara, Marshall Cavendish Corporation, New York, 2011.

12. The Fukushima 2011 Disaster, by Ronald Eisler, Taylor & Francis, Florida, 2013.

(Learners are expected to refer reports published at national and international level and updated information available on authentic web sites)

Program: Civil Engineering	B Tech	Semester: VII
Disaster Management and Mitigation Measures (OECE7056T)		

Course Objectives

1. To create consciousness about importance of holistic health and physical as well as mental well-being.
2. To make learners aware of the concepts of Happiness, Gratitude, Self-Compassion, Empathy etc.
3. To introduce the learners to the means of mental and physical well-being, ill effects of mal- practices like alcoholism, smoking etc.
4. To equip the learners to manage and cope up with stress in their daily living.

COs	Course Outcomes	Blooms Level	Blooms Description
CO1	Describe concepts of holistic health and well-being, differentiate between its true meaning and misconceptions and understand the benefits of well-being.	2	Understand
CO2	Recognize meaning of happiness, practice gratitude and self-compassion and analyze incidents from one's own life.	3	Apply
CO3	Understand the causes and effects of stress, identify reasons for stress in one's own surrounding and self.	2	Learn
CO4	Recognize the importance of physical health and fitness, assess their life style and come up with limitations or effectiveness.	3	Understand
CO5	Inspect one's own coping mechanism, assess its effectiveness, develop and strategize for betterment and execute it.	4	Analyze

Course Contents

Unit- I **07Hrs**

Health and well-being: The concept of health, dimensions of health, the notion of well- being, various facets of well-being, relation between health and well-being. Concept of holistic health, its principles and importance, concept and benefits of holistic care, misconceptions about holistic health approach, the application of a true holistic approach to our well-being.

Unit- II **08Hrs**

Concepts of happiness:
Happiness: what is it and how do we measure it? Philosophical perspectives on happiness, Happiness: Nature or Nurture? Happiness in the modern world: impediments and accelerators, Narrow vs. Broad Band Approaches to Happiness, Benefits of Happiness, Self-Compassion and Gratitude. Misconceptions of happiness.

Unit- III **08Hrs**

Stress and mental health/well-being: Nature and concept of stress, meaning and definitions of stress, types of stress, meaning of stressors, types of stressors, symptoms of stress, effects of stress, different models of stress. Sources of stress and how does stress cause illness, various sources of stress, delineate between external and internal sources of stress, differentiate between continuous and discrete stressors, the effects of these stressors on health and well-being, diversity of stressors and their health consequences, relation between stress and illness from different perspectives association between stress related physiological mechanisms and different illnesses.

Unit- VI **06Hrs**

Physical Well-being / Health management: concept of health behaviours, dimensions of health behaviours. Health enhancing behaviors: Exercise and Weight control, application and importance of these health enhancing behaviours. Health protective behaviors and illness management: concept of illness management, effectiveness of illness management. Concept of Nutrition, Role of Nutrition, Components of Nutrition, concept of Malnutrition, Health compromising behaviours: Alcoholism, Smoking and its effects on health.

Unit- V **06Hrs**

Dealing with Difficult Times / Coping mechanisms: The concept of chronic stress, Health and safety risks of chronic stress, Forms and Treatment of chronic stress, Coping with Acute and Chronic stress, theories of the stress-illness link, role of stress in mental disorders.
Concept of coping, Ways of coping and stress management, basic knowledge about stress management, various techniques of stress management, stress management programs.
Mental strengths and virtues, Hope, Optimism, Resilience – concept, pathways and models, Meditation and Self-introspection.

Textbooks:

1. The Science of well-being by Felicia Huppert, Nick Baylis, Barry Keverne; Oxford University Press
2. Health and Well-Being: Emerging Trends by S. Ojha, U. Rani Srivastava, Shobhna Joshi, Global Vision Publishing House
3. Positive psychology: The scientific and practical explorations of human strengths by Shane J. Lopez, Jennifer Teramoto Pedrotti, Charles Richard Snyder; Sage Publications.

Reference Books:

1. The pursuit of happiness and the realization of sympathy: Cultural patterns of self, social relations, and well-being by Kitayama, S., & Markus, H. R, Culture and subjective well-being, The MIT Press.
2. Man Adapting by Dubos, R; New Haven: Yale University Press.
3. Happiness a history by McMahon D. M., Atlantic Monthly Press.
4. Well-being: The foundations of hedonic psychology by D. Kahneman & E. Diener & N. Schwarz, New York: Russell Sage
5. Selye H. The Stress of Life. New York; McGraw-Hill; 1984.

Program: Civil Engineering	B Tech	Semester: VII
Research Methodology (OECE7058T)		

Course Objectives

1. To understand Research and Research Process
2. To acquaint learners with identifying problems for research and develop research strategies
3. To familiarize learners with the techniques of data collection, analysis of data and interpretation

COs	Course Outcomes	Blooms Level	Blooms Description
CO1	Prepare a preliminary research design for projects in their subject matter areas	2	Understand
CO2	Accurately collect, analyze and report data	2	Understand
CO3	Present complex data or situations clearly	4	Analyze
CO4	Review and analyze research findings	3	Learn
CO5	Write report about findings of research carried out.	3	Apply

Course Contents

Unit- I **07Hrs**

Basic Research Concepts
Meaning of research, Objectives of research, Types of research, Significance of research process

Unit- II **08Hrs**

Research Methodology:

Identification of research problem, Literature review, Formulation of hypothesis, Formulation of Research design.

Unit- III **08Hrs**

Research and Sample Design:
Meaning of research and sample design, Need of research design, Features of good research design, important concepts, Different research designs, Types of sampling designs.

Unit- VI **06Hrs**

Data Collection and Data Analysis:
Types of data, Methods for collecting data: Experiments and surveys, Collection of primary and secondary data, Hypothesis testing and interpretation of Data.

Unit- V **06Hrs**

Interpretation and Report Writing:
Interpretation and drawing conclusions on the research, Preparation of the report, Ethical Issues

Reference Books:
1. Dawson, Catherine, 2002, Practical Research Methods, New Delhi, UBS Publishers Distributors.
2. Kothari, C.R.,1985, Research Methodology-Methods and Techniques, New Delhi, Wiley Eastern Limited.
3. Kumar, Ranjit, 2005, Research Methodology-A Step-by-Step Guide for Beginners, (2nd Edition), Singapore, Pearson Education

Evaluation Scheme:
Continuous Assessment (A):

Subject teacher will declare Teacher Assessment criteria at the start of Semester.

Continuous Assessment (B):

1. Two term tests of 15 marks each will be conducted during the semester.
2. Total duration allotted for writing each of the paper is 1 hr.
3. Best of the marks scored in both the two tests will be considered for final grading.

End Semester Examination (C):

1. Question Paper will be based on entire syllabus summing up to 65 marks
2. Total duration allotted for writing the paper is 3 hr.

Program: Civil Engineering	B Tech	Semester: VII
Public Systems and Policies (OECE7059T)		

Course Objectives

1. To analyze the transformations in public systems with emphasis on current initiatives and emerging challenges in the field.
2. To understand public systems in a fast-changing environment in the global context.
3. To provide an in-depth understanding of the ills prevailing in the society and aids to identify the solutions for them.
4. To explain public policy and its operations with special focus on policy relating to Government finance.
5. To analyze and evaluate the impact of the public policy on firms and economy at large.

COs	Course Outcomes	Blooms Level	Blooms Description
CO1	Understand the importance of public systems in a fast-changing environment in the global context.	2	Understand
CO2	Analyze the transformations in public systems with emphasis on current initiatives and emerging challenges in the field.	2	Analyze
CO3	Explain public policy and its operations with special focus on policy relating to Government finance.	3	Learn
CO4	Make policies and know about the happenings in the world, in the nation and those in their locality.	3	Learn
CO5	Analyze and evaluate the impact of the public policy on firms and economy at large and work under various fields as policymakers	2	Analyze

Course Contents

Unit- I **07Hrs**

Introduction and Overview of Public Systems: Ideology of Public Systems; Mechanistic and Organic view of Society and Individuals, The Legal Framework; Federal Government; State and Local Governments, Government growth; The size of Government.

Unit- II **08Hrs**

Public Sector in the Economics Accounts: Public Sector in the circular flow; Public Sector in the National Income Accounts.

Unit- III **08Hrs**

Public Choice and Fiscal Politics: Direct Democracy; Representative Democracy; The Allocation Function; The Distribution Function; The Stabilization Function; Coordination of Budget Functions; The Leviathan Hypothesis.

Unit- VI **06Hrs**

Introduction and Overview of Public Policy: Markets and Government; Social goods and Market failure, Public expenditure and its evaluation; Cost Benefit Analysis, Public policy and Externalities, Taxation Policy and its impact, Income distribution, redistribution and social security issues Fiscal & Budgetary Policy, Fiscal Federalism in India.

Unit- V **06Hrs**

Case Studies in Expenditure Policy: Public Services
A) National Defense B) Highways C) Outdoor Recreation D) Education.

Reference Books:

1. Introduction to Public Policy by Charles Wheelan, W.W. Norton & Company.
2. Understanding Public Policy by Thomas R. Dye, Prentice Hall.
3. Public Policy-Making: An Introduction by Anderson J.E., Boston, Houghton.
4. Public Administration by Avasthi & Maheshwari, Lakshminarayan Agarwal, Agra.
5. New Horizons of Public Administration by Bhattacharya, Mohit, Jawahar Publishers, New Delhi.
6. Public Administration and Public Affairs by Henry, Nicholas, Prentice Hall of India, New Delhi.
7. Public Finance 10th Edition by Harvey S Rosen and Ted Gayer, McGraw-Hill Education, 2013.
8. Public Finance in Theory and Practice by Musgrave and Musgrave.

Evaluation Scheme:

Continuous Assessment (A):

Subject teacher will declare Teacher Assessment criteria at the start of Semester.

Continuous Assessment (B):

1. Two term tests of 15 marks each will be conducted during the semester.
2. Total duration allotted for writing each of the paper is 1 hr.
3. Best of the marks scored in both the two tests will be considered for final grading.

End Semester Examination (C):

1. Question Paper will be based on entire syllabus summing up to 65 marks
2. Total duration allotted for writing the paper is 3 hr

Program: Civil Engineering	B Tech	Semester: VII
Project Stage –II (PJCE7060L)		

Course Objectives

- To implement the solution as per the problem statement.
- To develop the team building, writing, logical reasoning and management skills.
- To provide the connections between the designs and concepts across different disciplinary Boundaries.
- To encourage students to become independent personnel, critical thinkers and lifelong learners

COs	Course Outcomes	Blooms Level	Blooms Description
CO1	Apply engineering knowledge to produce solution of a problem considering cultural, social, environmental, and economic factors using appropriate tool and method.	L4	Analyze
CO2	Demonstrate project based learning that allows students to transfer existing ideas into new applications.	L2	Understand
CO3	Develop an ability to work in teams and manage the conduct of the research study.	L3	Apply
CO4	Integrate different perspectives from relevant disciplines which help them to get internships, jobs and admission for higher studies.	L3	Apply
CO5	Present the research in the form of technical writing, understand what constitutes to plagiarism and how to use proper referencing styles.	L2	Understand

Syllabus:

- Project-I work done in VI semester shall be continued as Project-II in semester VII.
- Students should complete remaining implementation of ideas given in synopsis/Abstract of Semester VII.
- Students / group must plan their execution of project, so that project work should be completed Before end of semester.
- Project-II involves fabrication, design, experimentation, data analysis within realistic constraints
- such as economic, environmental, social, ethical, health and safety, manufacturability, and Sustainability. The stage also includes testing, possible results and report writing.
- Each project group is required to maintain log book for documenting various activities of Project-II and submit group project report at the end of Semester-VII in the form of Hard bound.
- Domain knowledge (any beyond) needed from the following areas for the effective Implementation of the project:

Experimental design / Theoretical Analysis/ software analysis / Fabrication of model, structural design, Hydraulic design , construction management , Environmental studies, sustainable development, Smart city planning , Advanced Transportation system, Structural audit, comparative study, case study, filed/ market survey, Smart material , Economical study etc.

Guidelines:

The main purpose of this activity is to improve the students' technical skills, communication skills by Integrating writing, presentation and teamwork opportunities.

Each group will be reviewed twice in a semester and marks will be allotted based on the various Points mentioned in the evaluation scheme.

-In the first review of this semester, each group is expected to complete 70 % of project. (May Consist theoretical design of project, block diagram and components required for design, Experimental work, using software, comparative study/analysis/ filed work etc.

-In the second review of this semester, each group is expected to complete 100 % of project. (May consist theoretical design of project, block diagram and components required for design, Experimental work, using software, comparative study/analysis/ filed work etc.

The students may use this opportunity to learn different computational techniques towards Development of a product.

Interaction with alumni mentor will also be appreciated for the improvement of project.

Assessment Criteria:

- At the end of the semester, after confirmation by the project guide, each project group will Submit project completion report in prescribed format for assessment to the departmental Committee (including project guide).
- Assessment of the project stage (at the end of the semester) will be done by the departmental Committee (including project guide).
- The candidate must bring the project part- I report and the final report completed in all respect while appearing for End Semester Examination.
- Oral examination should be conducted by Internal and External examiners. Students have to give presentation and demonstration based on their project.
-

Prescribed project report guidelines:

Every group should prepare hard bound report (preferable Latex/ word file format) of about minimum 40pages on the work carried out by a batch of students in respect of the project work done during

Semester-VII. Project Report should include appropriate content for:

- Title
- Abstract
- Introduction
- Problem identification and project objectives
- Literature Survey
- Related Theory
- Project design and Implementation details
- Case study/Analysis/Design Methodology
- Project Outcomes
- Result and Conclusion
- Future scope
- References

Assessment criteria for the departmental committee (including project guide) for Continuous Assessment:

Assessment criteria for the departmental committee (including project guide) for End Semester Exam:

Each group will be reviewed twice in a semester by faculty guide and faculty coordinator based on the following criteria:

Project progress

- Documentation/Technical paper writing
- Key findings
- Validation of results
- Product development

Each review consists of 25 marks. Average of the marks scored in both the two reviews will be Considered for final grading. The final certification and acceptance of TW ensures the satisfactory Performance on the above aspects.

Table -1 Log Book Format

S. No.	Week (Start date : End date	Work done	Sign of Guide	Sign of Coordinator
1				
2				

Table -2 Continuous Assessment Sheet

S. No.	Exam Seat	Name of Student	Student Attendance	Log book Maintain	Literature Review	Depth of Understanding	Report	Total
			5	5	5	5	5	25

Table -3 Evaluation Sheet

S. No.	Exam Seat	Name of Student	Project Selection	Design simulation/ Logic	Hardware programing/ Experimental work	Result verification	Presentation	Total
			5	5	5	5	5	25

Office Seal