PERIYAR MANIAMMAI INSTITUTE OF SCIENCE & TECHNOLOGY

PERIYAR MANIAMMAI
INSTITUTE OF SCIENCE & TECHNOLOGY
(Deemed to be University)
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Criterion 1 – Curricular Aspects

Key Indicator	1.1	Curriculum Design and Development
Metric	1.1.3	Average percentage of courses having focus on employability/ entrepreneurship/ skill development offered by the Department of Civil Engineering

DEPARTMENT OF CIVIL ENGINEERING

SYLLABUS COPY OF THE COURSES HIGHLIGHTING THE FOCUS ON EMPLOYABILITY/ ENTREPRENEURSHIP/ SKILL DEVELOPMENT

1. List of courses for the programmes in order of

S. No.	Programme name
1.	Bachelor of Technology (Civil Engineering) (Full Time)
2.	Bachelor of Technology (Civil Engineering) (Part Time)
3.	Master of Technology (Environmental Engineering) (Full Time)

2. Syllabus of the courses as per the list.

Legend : Words highlighted with **Blue Color** - Entrepreneurship
Words highlighted with **Red Color** - Employability
Words highlighted with **Green Color** - Skill Development

1. LIST OF COURSES

Name of the Course	Course Code	Year of Introduction	Activities/Content with direct bearing on Employability/ Entrepreneurship/ Skill development
Calculus and Linear Algebra	XMA101	2018-19	Skill Development
Electrical and Electronic Engineering Systems	XBE102	2018-19	Skill Development
Applied Physics for Engineers	XAP103	2018-19	Skill Development
Engineering Graphics and Design	XEG104	2018-19	Skill Development
Speech Communication	XGS105	2021-22	Skill Development
Constitution of India	XUM106	2017-18	Skill Development
Electrical and Electronic Engineering Systems Laboratory	XBE107	2021-22	Skill Development
Applied Physics for Engineers Laboratory	XAP108	2008-09	Skill Development
Transforms and Partial Differential Equations	XMA301	2008-09	*****
Mechanics of Solids-I	XCE302	2013-14	Skill Development
Fluid Mechanics and Machinery	XCE303	2015-16	Skill Development
Building Materials and Construction	XCE304	2014-15	Employability
Surveying – I	XCE305	2014-15	Employability
Entrepreneurship Development	XUM306	2016-17	Skill Development
Universal Human Values 2: Understanding Harmony and Gender	XUM307	2021-22	Skill Development
Strength of Materials Laboratory	XCE308	2016-17	Skill Development
Fluid Mechanics and Machinery Laboratory	XCE309	2014-15	Skill Development
In-plant Training-I	XCE310	2014-15	Skill Development
Structural Analysis	XCE501	2019-20	Employability
Transportation Engineering	XCE502	2019-20	Skill Development
Environmental Engineering	XCE503	2019-20	Employability
Geotechnical Engineering - II	XCE504	2019-20	Skill Development
Professional Elective -I	XCEE**	2019-20	*****
Open Elective Courses-I	XOE**	2019-20	*****
Environmental Engineering Laboratory	XCE507	2019-20	Skill Development
Concrete & Highway Laboratory	XCE508	2019-20	Skill Development
In-plant Training – II	XCE509	2019-20	Skill Development
Elective V	XCEE**	2021-22	*****
Elective-VI	XCEE**	2021-22	*****

Elective VII	XCEE**	2021-22	*****
Project Phase – I	XCE705	2021-22	Employability
In--plant Training - III	XCE706	2021-22	Skill Development
Minor Course	XCEM01	2019-20	Skill Development
Calculus, Ordinary Differential Equations and Complex Variable	XMA201	2018-19	Skill Development
Programming for Problem Solving	XCP202	2013-14	Employability
Applied Chemistry for Engineers	XAC203	2008-09	Skill Development
Technical Communication	XGS204	2021-22	Skill Development
Workshop Practices	XWP205	2008-09	Skill Development
Engineering Mechanics	XEM206	2008-09	Skill Development
Programming for Problem Solving Laboratory	XCP207	2013-14	Employability
Applied Chemistry for Engineers Laboratory	XAC208	2008-09	Skill Development
Probability distributions and statistical methods	XMA401	2013-14	*****
Mechanics of Solids-II	XCE402	2011-12	Skill Development
Surveying – II	XCE403	2008-09	Employability
Geotechnical Engineering - I	XCE404	2015-16	Skill Development
Concrete Technology	XCE405	2016-17	Skill Development
Economics for Engineers	XUM406	2013-14	Skill Development
Disaster Management	XUM407	2015-16	Skill Development
Computer Aided Civil Engineering Drawing	XCE408	2014-15	Employability
Surveying Laboratory	XCE409	2018-19	Employability
Geotechnical Engineering Laboratory	XCE410	2018-19	Skill Development
Design of RCC Structures	XCE601	2019-20	Employability
Design of Steel Structures	XCE602	2019-20	Employability
Construction Engineering and Management	XCE603	2019-20	Skill Development
Professional Elective -II	XCEE**	2019-20	*****
Open Elective Courses-II	XOE**	2019-20	*****
Professional Skills	XGS606	2019-20	Skill Development
Cyber Security	XUM607	2019-20	Skill Development
Construction Management Laboratory	XCE608	2014-15	Skill Development
Survey Camp	XCE609	2014-15	Employability
Elective VIII	XCEE**	2021-22	*****
Project Phase– II	XCE804	2021-22	Employability

Name of the Course	Course Code	Year of Introduction	Activities/Content with direct bearing on Employability/ Entrepreneurship/ Skill development
Design of Steel Structures	PCE501	2012-13	Employability
Professional Elective II	PCEE**	2012-13	*****
Environmental studies	PUM503	2012-13	Skill Development
Computer Aided Design & Drafting	PCE504	2012-13	Employability
Estimation, Costing and valuation	PCE505	2012-13	Skill Development
Finite Element Method	PCE601	2012-13	Skill Development
Professional Elective –III	PCEE**	2012-13	*****
Project Work (Phase-I)	PCE603	2012-13	Employability

Name of the Course	Course Code	Year of Introduction	Activities/Content with direct bearing on Employability/ Entrepreneurship/ Skill development
Environmental Chemistry	YEN101	2022-23	Skill Development
Environmental Microbiology	YEN102	2022-23	Skill Development
Principles and Design of Physico-Chemical Treatment Systems	YEN103	2022-23	Employability & Entrepreneurship
Elective - I	YEN104*	2014-15	Skill Development
Elective – II	YEN105*	2014-15	Skill Development
Environmental Quality Measurements Laboratory	YEN106	2014-15	Employability
Research Methodology and IPR	YRM107	2014-15	Skill Development
English for Research Paper Writing	YEGOE1	2018-19	Skill Development
Microbiology Laboratory	YEN109	2014-15	Employability
Transport of Water and Waste water	YEN201	2014-15	Skill Development
Biological Treatment of Wastewater	YEN202	2014-15	Skill Development
Environmental Impact Assessment	YEN203	2014-15	Employability & Entrepreneurship
Elective – III	YEN204*	2014-15	Skill Development
Elective – IV	YEN205*	2014-15	Skill Development
Environmental Engineering Processes Laboratory	YEN206	2014-15	Employability
Mini Project	YEN207	2014-15	Employability

Constitution of India	YPSOE1	2014-15	Skill Development
Elective -V	YEN301*	2018-19	Skill Development
Dissertation Phase – I	YEN302	2014-15	Entrepreneurship & Skill Development
Open Elective	YMEOE1	2018-19	Skill Development
Dissertation Phase – II	YEN401	2014-15	Skill Development

2. SYLLABUS

1. Bachelor of Technology (Civil Engineering) (Full Time)

Semester : I

Course Code : XMA101

Course Name : CALCULUS AND LINEAR ALGEBRA

Prerequisite : NIL

L	T	P	C
3	1	0	4

C	P	A
3.0	0.5	0.5

L	T	P	H
3	1	0	4

COURSE OBJECTIVES

Understand the application of calculus and linear algebra in engineering.

Course Outcome: After the completion of the course, students will be able to		**Domain C or P or A**	**Level**
CO1	**Apply** orthogonal transformation to reduce quadratic form to canonical forms.	Cognitive	Remembering Applying
CO2	**Apply** power series to tests the convergence of the sequences and series. Half range Fourier sine and cosine series.	Cognitive Psychomotor	Applying Remembering Guided Response
CO3	**Find**the derivative of composite functions and implicit functions. Euler's theorem and Jacobian.	Cognitive Psychomotor	Remembering Guided Response
CO4	**Explain** the functions of two variables by Taylor's expansion, by finding maxima and minima with and without constraints using Lagrangian Method. Directional derivatives, Gradient, Curl and Divergence.	Cognitive Affective	Remembering Understanding Receiving
CO5	**Apply** Differential and Integral calculus to notions of Curvature and to improper integrals.	Cognitive	Applying

COURSE CONTENT

UNIT I MATRICES 9 + 3

Linear Transformation - Eigen values and Eigen vectors -Properties of Eigen values and Eigen vectors - Cayley-Hamilton Theorem – Diagonalisation of Matrices – Real Matrices: Symmetric - Skew-Symmetric and Orthogonal Quadratic form – canonical form - Nature of Quadratic form and Transformation of Quadratic form to Canonical form (Orthogonal only).

UNIT II SEQUENCES AND SERIES 9 + 3

Sequences: Definition and examples-Series: Types and convergence- Series of positive terms – Tests of convergence: comparison test, Integral test and D'Alembert's ratio test-Fourier series: Half range sine and cosine series- Parseval's Theorem.

UNIT III **MULTIVARIABLE CALCULUS: PARTIAL DIFFERENTIATION** **9 + 3**

Limits and continuity –Partial differentiation – Total Derivative – Partial differentiation of Composite Functions: Change of Variables – Differentiation of an Implicit Function - Euler's Theorem- Jacobian.

UNIT IV **MULTIVARIABLE CALCULUS: MAXIMA AND MINIMA AND VECTOR CALCULUS** **9 + 3**

Taylor's theorem for function of Two variables- Maxima, Minima of functions of two variables: with and without constraints - Lagrange's Method of Undetermined Multipliers – Directional Derivatives - Gradient, Divergence and Curl.

UNIT V **DIFFERENTIAL AND INTEGRAL CALCULUS** **9 + 3**

Evolutes and involutes; Evaluation of definite and improper integrals; Beta and Gamma functions and their properties; Applications of definite integrals to evaluate surface areas and volumes of revolutions.

L	T	P	Total
45	15	0	60

TEXT BOOKS

1. Ramana B.V., "Higher Engineering Mathematics", Tata McGraw Hill New Delhi, 11th Reprint, 2015**. (Unit-1, Unit-3 and Unit-4).**
2. N.P. Bali and Manish Goyal, "A text book of Engineering Mathematics", Laxmi Publications, Reprint, 2014. **(Unit-2).**
3. B.S. Grewal, "Higher Engineering Mathematics", Khanna Publishers, 40th Edition, 2010. **(Unit-5)**

REFERENCE BOOKS

1. G.B. Thomas and R.L. Finney, "Calculus and Analytic geometry", 9th Edition, Pearson, Reprint, 2002.
2. Veerarajan T., "Engineering Mathematics for first year", Tata McGraw-Hill, New Delhi, 2008.
3. D. Poole, "Linear Algebra: A Modern Introduction", 2nd Edition, Brooks/Cole, 2005.
4. Erwin kreyszig, "Advanced Engineering Mathematics", 9th Edition, John Wiley & Sons, 2006.

E –REFERENCES

1. http://nptel.ac.in/faq/110101010/Prof.IndrajitMukherjee,IIT,Bombay and Prof. Tapan P.Bagchi, IIT, Kharagpur.

Mapping of CO with PO's

	PO1	PO2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2
CO 1	3	2			2					1		2		1
CO 2	3	1								1		1		1
CO 3	3	1								1		1		1
CO 4	3	2			1					1		1		1
CO 5	3	2			3					1		2		1
Total	**15**	**8**	**0**	**0**	**6**	**0**	**0**	**0**	**0**	**5**	**0**	**7**	**0**	**5**
Scaled Value	**3**	**2**	**0**	**0**	**1**	**0**	**0**	**0**	**0**	**1**	**0**	**2**	**0**	**1**

Note:

Total	0	1-6	7-12	13-18
Scaled value	0	1	2	3
Relation	No	Low	Medium	High

Semester : I

Course Code : XBE102

Course Name : ELECTRICAL AND ELECTRONIC ENGINEERING SYSTEMS

Prerequisite : NIL

L	T	P	C
3	1	0	4

C	P	A
3	0	0

L	T	P	H
3	1	0	4

COURSE OBJECTIVES

Course Outcome: After the completion of the course, students will be able to		**Domain C or P or A**	**Level**
CO1	**Define and Relate** the fundamentals of electrical parameters and **build** and **explain** AC, DC circuits by Using measuring devices	Cognitive	Understand
CO2	**Define and Explain** the operation of DC and AC machines.	Cognitive	Understand
CO3	**Recall and Illustrate** various semiconductor devices and their applications and displays the input output characteristics of basic semiconductor devices.	Cognitive	Understand
CO4	**Relate and Explain** the number systems and logic gates. **Construc**t the different digital circuit.	Cognitive	Understand
CO5	**Label and Outline** the different types of microprocessors and their applications.	Cognitive	Understand

COURSE CONTENT

UNIT I FUNDAMENTALS OF DC AND AC CIRCUITS, MEASUREMENTS 9 + 3

Fundamentals of DC– Ohm's Law – Kirchhoff's Laws - Sources - Voltage and Current Relations –Star/Delta Transformation - Fundamentals of AC – Average Value, RMS Value, Form Factor - AC power and Power Factor, Phasor Representation of sinusoidal quantities, Simple Series, Parallel, Series Parallel Circuit - Operating Principles of Moving coil and Moving Iron Instruments (Ammeter, Voltmeter) and Dynamometer type meters (Watt meter and Energy meter).

UNIT II ELECTRICAL MACHINES 9 + 3

Construction, Principle of Operation, Basic Equations, Types and Application of DC Generators, DC motors - Basics of Single-Phase Induction Motor and Three Phase Induction Motor- Construction, Principle of Operation of Single-Phase Transformer, Three phase transformers, Auto transformer.

UNIT III SEMICONDUCTOR DEVICES 9 + 3

Classification of Semiconductors, Construction, Operation and Characteristics: PN Junction Diode – Zener Diode, PNP, NPN Transistors, Field Effect Transistors and Silicon Controlled Rectifier – Applications

UNIT IV DIGITAL ELECTRONICS 9 + 3

Basic of Concepts of Number Systems, Logic Gates, Boolean Algebra, Adders, Subtractors, multiplexer, demultiplexer, encoder, decoder, Flipflops, Up/Down counters, Shift Registers.

UNIT V MICROPROCESSORS 9 + 3

Architecture, 8085, pin diagram of 8085, ALU timing and control unit, registers, data and address bus, timing and control signals, Instruction types, classification of instructions, addressing modes, Interfacing Basics: Data transfer concepts – Simple Programming concepts.

L	T	P	Total
45	15	0	60

TEXT BOOKS

1. Metha V.K, Rohit Mehta, 2020. Principles of Electronics,12th ed, S Chand Publishing.
2. Albert Malvino, David J.Bates., 2017. Electronics Principles. 7th ed, Tata McGraw-Hill. New Delhi.
3. Rajakamal, 2014. Digital System-Principle & Design. 2nd ed. Pearson education.
4. Morris Mano, 2015. Digital Design. Prentice Hall of India.
5. Ramesh, S. Gaonkar, 2013, Microprocessor Architecture, Programming and its Applications with the 8085, 6th Edition , India: Penram International Publications.

REFERENCE BOOKS

1. Cotton, H.,2005 Electrical Technology. CBS Publishers & Distributors Pvt Ltd.
2. Syed, A. Nasar, 1998, Electrical Circuits. Schaum Series.
3. Jacob Millman and Christos, C. Halkias, 1967, Electronics Devices, New Delhi: Tata McGraw-Hill.
4. Millman, J. and Halkias, C. C., 1972. Integrated Electronics: Analog and Digital Circuits and Systems, Tokyo: McGraw-Hill, Kogakusha Ltd.
5. Mohammed Rafiquzzaman, 1999. Microprocessors - Theory and Applications: Intel and Motorola. Prentice Hall International.

E –REFERENCES

1. NTPEL, Basic Electrical Technology (Web Course), Prof. N. K. De, Prof. T. K. Bhattacharya and Prof. G.D. Roy, IIT Kharagpur.
2. Prof.L.Umanand,http://freevideolectures.com/Course/2335/Basic-Electrical-Technology#, IISc Bangalore.
3. http://nptel.ac.in/Onlinecourses/Nagendra/, Dr. Nagendra Krishnapura, IIT Madras.
4. Dr.L.Umanand, http://www.nptelvideos.in/2012/11/basic-electrical-technology.html, IISC Bangalore.

Mapping of CO with PO's

	GA1	GA 2	GA 3	GA 4	GA 5	GA 6	GA 7	GA 8	GA 9	GA 10	GA 11	GA 12
CO 1	3	3	1	1	1	1			1	1	1	
CO 2	3	3	1	1	1	1			1	1	1	
CO 3	2	2	2	1	2	2	1	1	1	1	1	
CO 4	2	2	1	1	1	1	1	1	1	1	1	
CO 5	2	2	1	1	1	1	1	1	1	1	1	
Total	12	12	6	5	6	6	3	3	5	5	5	
Scaled Value	3	3	2	1	2	2	1	1	1	1	1	

Note:	**Total**	0	1-6	7-12	13-18
	Scaled value	0	1	2	3
	Relation	No	Low	Medium	High

Semester	**:**	**I**
Course Code	**:**	**XAP103**
Course Name	**:**	**APPLIED PHYSICS FOR ENGINEERS**
Prerequisite	**:**	**BASIC PHYSICS IN HSC LEVEL**

L	T	P	C
3	1	0	4

C	P	A
2.8	0.8	0.4

L	T	P	H
3	1	0	4

Course Outcome: After the completion of the course, students will be able to		**Domain C or P or A**	**Level**
CO1	**Identify** the basics of mechanics, **explain** the principles of elasticity and **determine** its significance in engineering systems and technological advances.	Cognitive: Psychomotor:	Remember, Understand Mechanism
CO2	**Illustrate** the laws of electrostatics, magneto-statics and electromagnetic induction; **use** and **locate** basic applications of electromagnetic induction to technology.	Cognitive: Psychomotor: Affective:	Remember, Analyze, Mechanism Respond
CO3	**Understand** the fundamental phenomena in optics by measurement and **describe** the working principle and application of various lasers and fibre optics.	Cognitive: Psychomotor: Affective:	Understand, Apply Mechanism Receive
CO4	**Analyse** energy bands in solids, **discuss** and **use** physics principles of latest technology using semiconductor devices.	Cognitive: Psychomotor: Affective:	Understand, Analyze Mechanism Receive
CO5	**Develop** Knowledge on particle duality and **solve** Schrodinger equation for simple potential.	Cognitive:	Understand, Apply

COURSE CONTENT

UNIT I MECHANICS OF SOLIDS 9 + 3

Mechanics: Force - Newton's laws of motion - work and energy - impulse and momentum - torque - law of conservation of energy and momentum - Friction.

Elasticity: Stress - Strain - Hooke's law - Stress strain diagram - Classification of elastic modulus - Moment, couple and torque - Torsion pendulum - Applications of torsion pendulum - Bending of beams - Experimental determination of Young's modulus: Uniform bending and non-uniform bending.

UNIT II ELECTROMAGNETIC THEORY 9 + 3

Laws of electrostatics - Electrostatic field and potential of a dipole; Dielectric Polarisation, Dielectric constant, internal field - Clausius Mossotti Equation - Laws of magnetism - Ampere's Faraday's law; Lenz's law - Maxwell's equation - Plane electromagnetic waves; their transverse nature - expression for plane, circularly and elliptically polarized light - quarter and half wave plates - production and detection of plane, circularly and elliptically

polarized light.

UNIT III SEMICONDUCTOR DEVICES 9 + 3

Optics: Dispersion- Optical instrument: Spectrometer - Determination of refractive index and dispersive power of a prism- Interference of light in thin films: air wedge - Diffraction: grating.

LASER: Introduction - Population inversion -Pumping - Laser action - Nd-YAG laser - CO_2 laser - Applications

Fibre Optics: Principle and propagation of light in optical fibre - Numerical aperture and acceptance angle - Types of optical fibre - Fibre optic communication system (Block diagram).

UNIT IV SEMICONDUCTOR PHYSICS 9 + 3

Semiconductors: Energy bands in solids - Energy band diagram of good conductors, insulators and semiconductors - Concept of Fermi level - Intrinsic semiconductors - Concept of holes - doping - Extrinsic semiconductors - P type and N type semiconductors - Hall effect.

Diodes and Transistors: P-N junction diode - Forward bias and reverse bias - Rectification action of diode - Working of full wave rectifier using P N junction diodes - PNP and NPN transistors - Three different configurations - Advantages of common emitter configuration - working of NPN transistor as an amplifier in common emitter configuration.

UNIT V QUANTUM PHYSICS 9 + 3

Introduction to quantum physics, black body radiation, Compton effect, de Broglie hypothesis, wave – particle duality, uncertainty principle, Schrodinger wave equation (Time dependent and Time independent), particle in a box, Extension to three dimension - Degeneracy.

L	T	P	Total
45	15	0	60

TEXT BOOKS

1. Gaur R. K. and Gupta S. L., "Engineering Physics", Dhanpat Rai Publications, 2009.
2. Avadhanulu M. N. "Engineering Physics" (Volume I and II), S. Chand & Company Ltd., New Delhi, 2010.

REFERENCE BOOKS

1. Palanisamy P. K., "Engineering Physics", Scitech Publications (India) Pvt. Ltd, Chennai.
2. Arumugam M., "Engineering Physics" (Volume I and II), Anuradha Publishers, 2010.
3. Senthil Kumar G., " Engineering Physics", 2nd Enlarged Revised Edition, VRB Publishers, Chennai, 2011.
4. Mani P., "Engineering Physics", Dhanam Publications, Chennai, 2007.

E –REFERENCES

1. NPTEL , Engineering Physics, Prof. M. K. Srivastava, Department of Physics, IIT, Roorkee.

Mapping of CO with PO's

	PO1	PO2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2
CO 1	3	2	2	2	1				1			1		
CO 2	3	0	1	0	1							1		
CO 3	3	2	2	2	1				1			1		
CO 4	3	2	2	2	1				1			1		
CO 5	3	0	2	0	0				1			1		
Total	**15**	**6**	**9**	**6**	**4**	**0**	**0**	**0**	**4**	**0**	**0**	**5**	**0**	**0**
Scaled Value	**3**	**2**	**2**	**2**	**1**	**0**	**0**	**0**	**1**	**0**	**0**	**1**	**0**	**0**

Note:	**Total**	0	1-5	6-10	11-15
	Scaled value	0	1	2	3
	Relation	No	Low	Medium	High

Semester : **I**

Course Code : **XEG104**

Course Name : **ENGINEERING GRAPHICS AND DESIGN**

Prerequisite : **NIL**

L	T	P	C
1	0	2	3

C	P	A
3	0	0

L	T	P	H
1	0	2	5

COURSE OBJECTIVES

- To prepare the student to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability
- To prepare the student to communicate effectively
- To prepare the student to use the techniques, skills, and modern engineering tools necessary for engineering practice

Course Outcome: After the completion of the course, students will be able to		**Domain C or P or A**	**Level**
CO1	**Apply** the national and international standards, **construct** and **practice** various curves	Cognitive Psychomotor Affective	Apply Guided response Respond
CO2	**Interpret, construct and practice** orthographic projections of points, straight lines and planes.	Cognitive Psychomotor Affective	Understand Mechanism Respond
CO3	**Construct Sketch and Practice** projection of solids in various positions and true shape of sectioned solids.	Cognitive Psychomotor Affective	Apply overt response Respond
CO4	**Interpret, Sketch and Practice** the development of lateral surfaces of simple and truncated solids, intersection of solids.	Cognitive Psychomotor Affective	Understand Overt response Respond
CO5	**Construct sketch and practice** isometric and perspective views of simple and truncated solids.	Cognitive Psychomotor Affective	Apply Overt response Respond

COURSE CONTENT

UNIT I **INTRODUCTION, FREE HAND SKETCHING OF ENGG OBJECTS AND CONSTRUCTION OF PLANE CURVE** **6 + 12**

Importance of graphics in engineering applications – use of drafting instruments – BIS specifications and conventions as per SP 46-2003

Pictorial representation of engineering objects – representation of three dimensional objects in two dimensional media – need for multiple views – developing visualization skills through free hand sketching of three dimensional objects

Polygons & curves used in engineering practice – methods of construction – construction of ellipse, parabola and hyperbola by eccentricity method – cycloidal and involute curves –

construction – drawing of tangents to the above curves. Practice on basic tools of CAD

UNIT II PROJECTION OF POINTS, LINES AND PLANE SURFACES 6 + 12

General principles of orthographic projection – first angle projection – layout of views – projections of points, straight lines located in the first quadrant – determination of true lengths of lines and their inclinations to the planes of projection – traces – projection of polygonal surfaces and circular lamina inclined to both the planes of projection-CAD practice on points and lines

UNIT III PROJECTION OF SOLIDS AND SECTIONS OF SOLIDS 6 + 12

Projection of simple solids like prism, pyramid, cylinder and cone when the axis is inclined to one plane of projection – change of position & auxiliary projection methods – sectioning of above solids in simple vertical positions by cutting plane inclined to one reference plane and perpendicular to the other and above solids in inclined position with cutting planes parallel to one reference plane – true shapes of sections-CAD practice on solid models

UNIT IV DEVELOPMENT OF SURFACES AND INTERSECTION OF SOLIDS 6 + 12

Need for development of surfaces – development of lateral surfaces of simple and truncated solids – prisms, pyramids, cylinders and cones – development of lateral surfaces of the above solids with square and circular cutouts perpendicular to their axes – intersection of solids and curves of intersection –prism with cylinder, cylinder & cylinder, cone & cylinder with normal intersection of axes and with no offset-CAD practice on intersection of solids

UNIT V ISOMETRIC AND PERSPECTIVE PROJECTIONS 6 + 12

Principles of isometric projection – isometric scale – isometric projections of simple solids, truncated prisms, pyramids, cylinders and cones – principles of perspective projections – projection of prisms, pyramids and cylinders by visual ray and vanishing point methods-CAD practice on isometric view

L	T	P	Total
15	0	30	45

TEXT BOOKS

1. Natarajan,K.V, " A Textbook of Engineering Graphics", Dhanalakshmi Publishers, Chennai, 2006.
2. Dr. P.K. Srividhya, P. Pandiyaraj, "Engineering Graphics", PMU Publications, Vallam, 2013.

REFERENCE BOOKS

1. Luzadder and Duff, "Fundamentals of Engineering Drawing" Prentice Hall of India PvtLtd, XI Edition- 2001.
2. Venugopal,K. and Prabhu Raja, V., "Engineering Graphics", New Age International(P) Ltd., 2008
3. Gopalakrishnan K.R. "Engineering Drawing I & II" Subhas Publications, 1998.
4. Shah. M.B and Rana B.C "Engineering Drawing" Pearson Education, 2005.

E –REFERENCES

1. http:// periyarnet/e-content
2. Http://nptel.ac.in/courses/112103019/

Mapping of CO with PO's

	PO1	PO2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2
CO 1	3	3	3	2	3	2	3	1	1	2	3	3		1
CO 2	3	3	3	1	3	1	3	1	1	1	2	3		1
CO 3	3	3	3	1	3	1	3	1	1	1	2	3		1
CO 4	3	3	3	1	3	1	3	1	1	1	2	3		1
CO 5	3	3	3	1	3	1	3	1	1	1	2	3		1
Total	**15**	**15**	**15**	**6**	**15**	**6**	**15**	**5**	**5**	**6**	**11**	**15**	**0**	**5**
Scaled Value	**3**	**3**	**3**	**2**	**3**	**2**	**3**	**1**	**1**	**2**	**3**	**3**	**0**	**1**

Note:	**Total**	0	1-5	6-10	11-15
	Scaled value	0	1	2	3
	Relation	No	Low	Medium	High

Semester : **I**

Course Code : **XGS105**

Course Name : **SPEECH COMMUNICATION**

Prerequisite : **NIL**

L	T	P	C
0	1	2	3

C	P	A
2.6	0.4	0

L	T	P	H
0	1	4	5

Course Outcome: After the completion of the course, students will be able to		Domain C or P or A	Level
CO1	**Ability** to recall the types of speeches	Cognitive	Remember
CO2	**Apply** the techniques in public speaking	Cognitive	Apply
CO3	**Identify** the common patterns in organizing a speech	Cognitive	Remember
CO4	**Construct** the nature and style of speaking	Cognitive	Create
CO5	**Practicing** the speaking skills	Psychomotor	Guided Response

COURSE CONTENT

UNIT I	**TYPES OF SPEECHES**	**9**
	1.1 – Four types of speeches 1.2 – Analyzing the audience 1.3 - Developing ideas and supporting materials	
UNIT II	**PUBLIC SPEAKING**	**9**
	2.1 - Introduction to Public Speaking 2.2 - Competencies Needed for successful speech making 2.3 – Speaking about everyday life situations	
UNIT III	**ORGANIZATION OF SPEECH**	**9**
	3.1 – Developing a speech out line 3.2 - Organizing the speech 3.3 – Introduction - development – conclusion	
UNIT IV	**PRESENTATION**	**9**
	4.1 - Tips for preparing the draft speech 4.2 – Presentation techniques using ICT tools 4.3 – Using examples from different sources	
UNIT V	**ACTIVITIES**	**9**
	5.1 – Reading activities 5.2 – Creative presentations 5.3 – Media presentation techniques	

L	T	P	Total
15	0	30	45

SUGGESTED READINGS

1. Michael Swan. Practical English Usage. OUP.1995
2. Sanjay Kumar and Pushp Lata. Communication Skills. Oxford University Press. 2011

Mapping of CO with PO's

	PO1	PO2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2
CO 1								1	3	**3**		2		
CO 2								1	3	**3**		2		
CO 3								1	2	**3**		2		
CO 4								1	2	**3**		2		
CO 5								1	2	**3**		2		
Total								**5**	**12**	**15**		**10**		
Scaled Value	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**2**	**3**	**0**	**2**	**0**	**0**

Note:	**Total**	0	1-6	7-12	13-18
	Scaled value	0	1	2	3
	Relation	No	Low	Medium	High

Semester : **I**

Course Code : **XUM106**

Course Name : **CONSTITUTION OF INDIA**

Prerequisite : **NIL**

L	T	P	C
0	0	0	0

C	P	A
3	0	0

L	T	P	H
3	0	0	3

Course Outcome: After the completion of the course, students will be able to		Domain C or P or A	Level
CO1	**Understand** the Constitutional History	Cognitive	Understanding
CO2	**Understand** the Powers and Functions	Cognitive	Understanding
CO3	**Understand** the Legislature	Affective	Remembering
CO4	**Understand** the Judiciary	Affective	Remembering
CO5	**Understand** the Centre State relations	Cognitive	Understanding

COURSE CONTENT

UNIT I **8**

Constitutional History- The Constitutional Rights- Preamble- Fundamental Rights- Fundamental Duties- Directive principles of State Policy.

UNIT II **9**

The Union Executive- The President of India (powers and functions)- Vice-President of India-The Council of Ministers-Prime Minister- Powers and Functions.

UNIT III **10**

Union Legislature- Structure and Functions of Lok Sabha- Structure and Functions of Rajya Sabha- Legislative Procedure in India- Important Committes of Lok Sabha- Speaker of the Lok Sabha.

UNIT IV **9**

The Union Judiciary- Powers of the Supreme Court- Original Jurisdiction- Appelete jurisdictions- Advisory Jurisdiction- Judicial review.

UNIT V **9**

Centre State relations- Political Parties- Role of governor, powers and functions of Chief Minister-Legislative Assembly- State Judiciary- Powers and Functions of the High Courts.

L	T	P	Total
45	0	0	45

REFERENCE BOOKS

1. W.H.Morris Shores- Government and politics of India, NewDelhi,B.1.Publishers,1974.
2. M.V.Pylee- Constitutional Government in India, Bombay, Asia Publishing House, 1977.
3. R.Thanker- The Government and politics of India, London: Macmillon, 1995.
4. A.C.Kapur- Select Constitutions S,Chand & Co.,NewDelhi, 1995
5. V.D.Mahajan- Select Modern Governments, S, Chand &Co, NewDelhi,1995.
6. B.C.Rout- Democractic Constitution of India.
7. Gopal K.Puri- Constitution of India, India 2005.

Mapping of CO with PO's

	PO1	**PO2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO1**	**PSO2**
CO 1	2			1										
CO 2	2			1										
CO 3	2			1					1					
CO 4	2			1				1	1					
CO 5	2	2		1				1	1					
Total	**10**	**2**		**5**				**2**	**3**					
Scaled Value	2	1	0	1	0	0	0	1	1	3	0	2	0	0

Note:	**Total**	0	1-5	6-10	11-15
	Scaled value	0	1	2	3
	Relation	No	Low	Medium	High

Semester	**:**	**I**
Course Code	**:**	**XBE107**
Course Name	**:**	**ELECTRICAL AND ELECTRONIC ENGINEERING SYSTEMS LAB**
Prerequisite	**:**	**BASIC PHYSICS IN HSC LEVEL**

L	T	P	C
0	0	1	1

C	P	A
1.5	1	0.5

L	T	P	H
0	0	2	2

COURSE OBJECTIVES

The course helps to

a. Learn the basic concepts of electrical and electronics components.

b. Understand the basic wiring methods and connection.

c. Study the characteristics of diodes, Zener diodes, NPN transistors.

d. Verify the working of simple logic gates, adders and subtractors.

Course Outcome: After the completion of the course, students will be able to	**Domain C or P or A**	**Level**
CO1 **Apply** the fundamental electrical concepts and **differentiate** the various electronic components.	Cognitive	Understand
	Psychomotor	Set
	Affective	Valuing
CO2 **Implement** and **execute** the different types of wiring connections.	Cognitive	Understand
	Psychomotor	Set
	Affective	Valuing
CO3 **Demonstrate** the Fluorescent lamp connection with choke.	Cognitive	Understand
	Psychomotor	Set
	Affective	Valuing
CO4 **Characterize** and **display** the basic knowledge on the working of PN junction and Zener diode.	Cognitive	Understand
	Psychomotor	Set
	Affective	Valuing
CO5 **Implement** and **execute** the various digital electronic circuits such as Adders and Subtractors.	Cognitive	Understand
	Psychomotor	Set
	Affective	Valuing

COURSE CONTENT

Ex. No	Experiments
1.	Study of Electrical Symbols, Tools and Safety Precautions, Power Supplies.
2.	Study of Active and Passive elements – Resistors, Inductors and Capacitors, Bread Board.
3.	Testing of DC Voltage and Current in series and parallel resistors which are connected in breadboard by using Voltmeter, Ammeter and Multimeter.
4.	Fluorescent lamp connection with choke.

5. Staircase Wiring
6. Forward and Reverse bias characteristics of PN junction diode.
7. Forward and Reverse bias characteristics of zener diode.
8. Input and Output Characteristics of NPN transistor.
9. Construction and verification of simple logic gates.
10. Construction and verification of adders and subtractors.

L	T	P	Total
0	0	30	30

TEXT BOOKS

1. Laboratory Manual "Electrical and Electronic Engineering SystemsLab", Department of Electrical and Electronics Engineering, PMIST, Thanjavur.

Mapping of CO with PO's

	GA1	GA 2	GA 3	GA 4	GA 5	GA 6	GA 7	GA 8	GA 9	GA 10	GA 11	GA 12
CO 1	3	3	1	1	1	1			1	1	1	
CO 2	3	3	1	1	1	1			1	1	1	
CO 3	2	2	2	1	2	2	1	1	1	1	1	
CO 4	2	2	1	1	1	1	1	1	1	1	1	
CO 5	2	2	1	1	1	1	1	1	1	1	1	
Total	**12**	**12**	**6**	**5**	**6**	**6**	**3**	**3**	**5**	**5**	**5**	
Scaled Value	3	3	2	1	2	2	1	1	1	1	1	

Semester	**:**	**I**
Course Code	**:**	**XAP108**
Course Name	**:**	**APPLIED PHYSICS FOR ENGINEERS LAB**
Prerequisite	**:**	**BASIC PHYSICS IN HSC LEVEL**

L	T	P	C
0	0	1	1

C	P	A
1.5	1	0.5

L	T	P	H
0	0	2	2

Course Outcome: After the completion of the course, students will be able to		Domain C or P or A	Level
CO1	**Identify** the basics of mechanics, and **determine** its significance in engineering systems and technological advances.	Psychomotor:	Mechanism
CO2	**use** and **locate** basic applications of electromagnetic induction to technology.	Psychomotor: Affective:	Analyze, Mechanism Respond
CO3	**describe** the working principle and application of various lasers and fibre optics.	Psychomotor: Affective:	Apply Mechanism Receive
CO4	**Analyse** energy bands in solids, **discuss** and **use** physics principles of latest technology using semiconductor devices.	Psychomotor: Affective:	Analyze Mechanism Receive

COURSE CONTENT

Ex. No	Experiments
1.	Torsional Pendulum - determination of moment of inertia and rigidity modulus of the given material of the wire.
2.	Uniform Bending - Determination of the Young's Modulus of the material of the beam.
3.	Non-Uniform Bending - Determination of the Young's Modulus of the material of the beam.
4.	Meter Bridge - Determination of specific resistance of the material of the wire.
5.	Spectrometer - Determination of dispersive power of the give prism.
6.	Spectrometer - Determination of wavelength of various colours in Hg source using grating.
7.	Air wedge - Determination of thickness of a given thin wire.
8.	Laser - Determination of wavelength of given laser source and size of the given micro particle using Laser grating.
9.	Post office Box - Determination of band gap of a given semiconductor.
10.	PN Junction Diode - Determination of V-I characteristics of the given diode.

L	T	P	Total
0	0	30	30

TEXT BOOKS

1. Laboratory Manual "PhysicsLab", Department of Physics, PMIST, Thanjavur.

REFERENCE BOOKS

1. Samir Kumar Ghosh, "A text book of Advanced Practical Physics", New Central Agency (P) Ltd, 2008.
2. Arora C.L., "Practical Physics", S. Chand & Company Ltd., New Delhi, 2013.
3. Umayal Sundari AR., "Applied Physics Laboratory Manual", PMU Press, Thanjavur, 2012.

Mapping of CO with PO's

	PO1	PO2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2
CO 1	3	2	2	2	1	0	0	0	1	0	0	1	0	0
CO 2	3	0	1	0	1	0	0	0	0	0	0	1	0	0
CO 3	3	2	2	2	1	0	0	0	1	0	0	1	0	0
CO 4	3	2	2	2	1	0	0	0	1	0	0	1	0	0
CO 5	3	0	2	0	0	0	0	0	0	0	0	1	0	0
Total	**15**	**6**	**9**	**6**	**4**	**0**	**0**	**0**	**3**	**0**	**0**	**5**	**0**	**0**
Scaled Value	3	2	2	2	1	0	0	0	1	0	0	1	0	0

Note:	**Total**	0	1-5	6-10	11-15
	Scaled value	0	1	2	3
	Relation	No	Low	Medium	High

Semester	**:**	**II**
Course Code	**:**	**XMA201**
Course Name	**:**	**CALCULUS, ORDINARY DIFFERENTIAL EQUATIONS AND COMPLEX VARIABLE**
Prerequisite	**:**	**NIL**

L	T	P	C
3	1	0	4

C	P	A
3.0	0.5	0.5

L	T	P	H
3	1	0	4

COURSE OBJECTIVES

- Understand the application of Calculus, Ordinary Differential Equations and Complex Variable in engineering.

Course Outcome: After the completion of the course, students will be able to		**Domain C or P or A**	**Level**
CO1	**Find** double and triple integrals and to find line, surface and volume of an integral by **Applying** Greens, Gauss divergence and Stokes theorem.	Cognitive	Remember, Apply
CO2	**Solve** first order differential equations of different types which are solvable for p, y, x and Clairaut's type.	Cognitive	Apply
CO3	**Solve** Second order ordinary differential equations with variable coefficients using various methods.	Cognitive	Apply
CO4	**Use** CR equations to verify analytic functions and to find harmonic functions and harmonic conjugate. Conformal mapping of translation and rotation. Mobius transformation.	Cognitive Psychomotor	Remember, Apply Guided Response
CO5	**Apply** Cauchy residue theorem to evaluate contour integrals involving sine and cosine function and to state Cauchy integral formula, Liouvilles theorem. Taylor's series, zeros of analytic functions, singularities, Laurent's series.	Cognitive Affective	Apply Receiving

COURSE CONTENT

UNIT I	**MULTIVARIABLE CALCULUS (INTEGRATION)**	**9 + 3**

Multiple Integration: Double integrals (Cartesian) - change of order of integration in double integrals - Change of variables (Cartesian to polar) - Triple integrals (Cartesian), Scalar line integrals - vector line integrals - scalar surface integrals - vector surface integrals - Theorems of Green, Gauss and Stokes.

UNIT II	**FIRST ORDER ORDINARY DIFFERENTIAL EQUATIONS**	**9 + 3**

Exact - linear and Bernoulli's equations - Euler's equations - Equations not of first degree: equations solvable for p - equations solvable for y- equations solvable for x and Clairaut's type.

UNIT III	**ORDINARY DIFFERENTIAL EQUATIONS OF HIGHER ORDERS**	**9 + 3**

Second order linear differential equations with variable coefficients- method of variation of parameters - Cauchy-Euler equation- Power series solutions- Legendre polynomials- Bessel

functions of the first kind and their properties.

UNIT IV COMPLEX VARIABLE – DIFFERENTIATION 9 + 3

Differentiation-Cauchy-Riemann equations- analytic functions-harmonic functions-finding harmonic conjugate- Elementary analytic functions (exponential, trigonometric, logarithm) and their properties- Conformal mappings- Mobius transformations and their properties.

UNIT V COMPLEX VARIABLE – INTEGRATION 9 + 3

Contour integrals - Cauchy-Goursat theorem (without proof) - Cauchy Integral formula (without proof)-Liouville's theorem (without proof)- Taylor's series- zeros of analytic functions- singularities- Laurent's series – Residues- Cauchy Residue theorem (without proof)- Evaluation of definite integral involving sine and cosine- Evaluation of certain improper integrals using the Bromwich contour.

L	T	P	Total
45	15	0	60

TEXT BOOKS

1. B.S. Grewal, "Higher Engineering Mathematics", Khanna Publishers, 40thth Edition, 2008.

Mapping of CO with PO's

	PO1	PO2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2
CO 1	3	2	0	0	2	0	0	0	0	1	0	2	0	0
CO 2	3	1	0	0	0	0	0	0	0	1	0	1	0	0
CO 3	3	1	0	0	0	0	0	0	0	1	0	1	0	0
CO 4	3	2	0	0	0	0	0	0	0	1	0	1	0	0
CO 5	3	2	0	0	1	0	0	0	0	1	0	2	0	0
Total	**15**	**8**	**0**	**0**	**3**	**0**	**0**	**0**	**0**	**5**	**0**	**7**	**0**	**0**
Scaled Value	3	2	0	0	1	0	0	0	0	1	0	2	0	0

Note:	**Total**	0	1-5	6-10	11-15
	Scaled value	0	1	2	3
	Relation	No	Low	Medium	High

Semester	**:**	**II**
Course Code	**:**	**XCP202**
Course Name	**:**	**PROGRAMMING FOR PROBLEM SOLVING**
Prerequisite	**:**	**BASIC UNDERSTANDING SKILLS**

L	T	P	C
3	0	0	4

C	P	A
3	0	0

L	T	P	H
3	0	0	3

COURSE OBJECTIVES

- To learn programming language basics and syntax
- To ignite logical thinking
- To understand structured programming approach
- To deal with user defined data types
- To know about data storage in secondary memory

Course Outcome: After the completion of the course, students will be able to		**Domain C or P or A**	**Level**
CO1	**Define** programming fundamentals and **Solve** simple programs using I/O statements	Cognitive	Remember Understand Apply
CO2	**Define** syntax and **write simple programs** using control structures and arrays	Cognitive	Remember Understand Apply
CO3	**Explain** and **write simple programs** using functions and pointers	Cognitive	Remember Understand Apply
CO4	**Explain** and **write simple programs** using structures and unions	Cognitive	Remember Understand Apply
CO5	**Explain** and **write simple programs** using files and **Build** simple projects	Cognitive	Remember Understand Apply

COURSE CONTENT

UNIT I PROGRAMMING FUNDAMENTALS AND I/O STATEMENTS **9**

Introduction to components of a computer system, Program – Flowchart – Pseudo code – Software – Introduction to C language – Character set – Tokens: Identifiers, Keywords, Constants, and Operators – sample program structure -Header files – Data Types- Variables - Output statements – Input statements.

UNIT II CONTROL STRUCTURES AND ARRAYS **9**

Control Structures – Conditional Control statements: Branching, Looping - Unconditional control structures: switch, break, continue, goto statements – Arrays: One Dimensional Array – Declaration – Initialization – Accessing Array Elements – Searching – Sorting – Two Dimensional arrays - Declaration – Initialization – Matrix Operations – Multi Dimensional Arrays - Declaration – Initialization. Storage classes: auto – extern – static. Strings: Basic operations on strings.

UNIT III FUNCTIONS AND POINTERS **9**

Functions: Built in functions – User Defined Functions - Parameter passing methods - Passing

arrays to functions – Recursion - Programs using arrays and functions. Pointers - Pointer declaration - Address operator - Pointer expressions & pointer arithmetic - Pointers and function - Call by value - Call by Reference - Pointer to arrays - Use of Pointers in self-referential structures-Notion of linked list.

UNIT IV STRUCTURES AND UNIONS 9

Structures and Unions - Giving values to members - Initializing structure - Functions and structures - Passing structure to elements to functions - Passing entire function to functions - Arrays of structure - Structure within a structure and Union.

UNIT V FILES 9

File management in C - File operation functions in C - Defining and opening a file - Closing a file - The getw and putw functions - The fprintf & fscanf functions - fseek function – Files and Structures.

L	T	P	Total
45	0	0	45

TEXT BOOKS

1. Byron Gottfried, "Programming with C", III Edition, (Indian Adapted Edition), TMH publications, 2010
2. Yeshwant Kanethker, “Let us C”, BPB Publications, 2008

REFERENCE BOOKS

1. E. Balaguruswamy, Programming in ANSI C, Tata McGraw-Hill, 7th edition 2017.
2. Brian W. Kernighan and Dennis M. Ritchie, "The C Programming Language", Pearson Education Inc. 2005
3. Johnson baugh R. and Kalin M., “Applications Programming in ANSI C”, III Edition, Pearson Education India, 2003

E –REFERENCES

1. https://www.indiabix.com/c-programming/questions-and-answers/
2. https://www.javatpoint.com/c-programming-language-tutorial
3. https://www.w3schools.in/c-tutorial/

Mapping of CO with PO’s

	PO1	PO2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2
CO 1	3	2	0	0	3	0	0	0	0	0	2	3	2	0
CO 2	3	2	0	0	2	0	0	0	0	0	2	3	2	0
CO 3	2	2	1	2	2	0	0	0	0	0	2	2	2	0
CO 4	2	2	1	2	2	0	0	0	0	0	2	2	2	0
CO 5	2	2	1	0	2	0	0	1	0	2	2	2	2	0
Total	**12**	**10**	**3**	**4**	**11**	**0**	**0**	**1**	**0**	**2**	**10**	**12**	**10**	**0**
Scaled Value	3	2	1	1	3	0	0	1	0	1	2	3	2	0

Note:	**Total**	0	1-5	6-10	11-15
	Scaled value	0	1	2	3
	Relation	No	Low	Medium	High

Semester : II
Course Code : XAC203
Course Name : APPLIED CHEMISTRY FOR ENGINEERS
Prerequisite : NIL

L	T	P	C
3	1	0	4

C	P	A
2.5	1.0	0.5

L	T	P	H
3	1	0	4

COURSE OBJECTIVES

- Understand the application of chemistry in engineering.

Course Outcome: After the completion of the course, students will be able to		**Domain C or P or A**	**Level**
CO1	**Identify** the periodic properties such as ionization energy, electron affinity, oxidation states and electro negativity. **Describe** the various water quality parameters like hardness and alkalinity.	Cognitive Psychomotor	Remembering Perception
CO2	**Explain** and **Measure** microscopic chemistry in terms of atomic, molecular orbitals and intermolecular forces.	Cognitive Psychomotor	Understanding Set
CO3	**Interpret** bulk properties and processes using thermodynamic and kinetic considerations.	Cognitive Psychomotor Affective	Applying Mechanism Receive
CO4	**Describe, Illustrate** and **Discuss** the chemical reactions that are used in the synthesis of molecules.	Cognitive Psychomotor Affective	Remembering Analyzing Perception Responding
CO5	**Apply, Measure** and **Distinguish** the ranges of the electromagnetic spectrum used for exciting different molecular energy levels in various spectroscopic techniques	Cognitive Psychomotor	Remembering, Applying Mechanism

COURSE CONTENT

UNIT I PERIODIC PROPERTIES AND WATER CHEMISTRY 8 + 3

Effective nuclear charge, penetration of orbitals, variations of s, p, d and f orbital energies of atoms in the periodic table, electronic configurations, atomic and ionic sizes, ionization energies, electron affinity and electronegativity, polarizability, oxidation states, coordination numbers and geometries, hard soft acids and bases, molecular geometries. **Water Chemistry**-Water quality parameters-Definition and explanation of hardness, determination of hardness by EDTA method-Introduction to alkalinity.

UNIT II USE OF FREE ENERGY IN CHEMICAL EQUILIBRIA 12 + 3

Thermodynamic functions: energy, entropy and free energy. Estimations of entropy and free energies. Free energy and emf. Cell potentials, the Nernst equation and applications. Acid base, oxidation reduction and solubility equilibria. Corrosion-Types, factors affecting corrosion rate and Control methods. Use of free energy considerations in metallurgy through Ellingham diagrams. Advantages of electroless plating, electroless plating of nickel and copper on Printed Circuit Board (PCB).

UNIT III ATOMIC AND MOLECULAR STRUCTURE 10 + 3

Schrodinger equation. Particle in a box solution and their applications for conjugated molecules and nanoparticles.. Molecular orbitals of diatomic molecules and plots of the multicenter orbitals. Equations for atomic and molecular orbitals. Energy level diagrams of diatomic molecules. Crystal field theory and the energy level diagrams for transition metal ions and their magnetic properties. Band structure of solids and the role of doping on band structures.

Intermolecular forces and potential energy surfaces

Ionic, dipolar and Vander waals interactions. Equations of state of real gases and critical phenomena. Potential energy surfaces of H_3, H_2F and HCN and trajectories on these surfaces.

UNIT IV SPECTROSCOPIC TECHNIQUES AND APPLICATIONS 7 + 3

Principles of spectroscopy and selection rules. Electronic spectroscopy-chromophore, auxochromes, types of electronic transition and application. Fluorescence and its applications in medicine. Vibrational spectroscopy-types of vibrations, Instrumentation and applications. Rotational spectroscopy of diatomic molecules. Nuclear magnetic resonance spectroscopy-concept of chemical shift and applications-magnetic resonance imaging. Diffraction and scattering.

UNIT V STEREOCHEMISTRY AND ORGANIC REACTIONS 8 + 3

Representations of 3 dimensional structures, structural isomers and stereoisomers, configurations and symmetry and chirality, enantiomers, diastereomers, optical activity, absolute configurations and conformational analysis. Isomerism in transitional metal compounds

Organic reactions and synthesis of a drug molecule

Introduction to reactions involving substitution, addition, elimination, oxidation, reduction, cyclization reactions and ring opening reactions. Synthesis of a commonly used drug molecule-Aspirin and paracetamol.

L	T	P	Total
45	15	0	60

TEXT BOOKS

1. Puri B.R. Sharma, L.R., Kalia K.K. Principles of Inorganic Chemistry, (23rd edition), New Delhi, Shoban Lal Nagin Chand & Co., 1993.
2. Lee. J.D. Concise Inorganic Chemistry, UK, Black well science, 2006.
3. Trapp. C, Cady, M. Giunta. C, Atkins's Physical Chemistry, 10th Edition, Oxford publishers, 2014.
4. Glasstone S., Lewis D., Elements of Physical Chemistry, London, Mac Millan & Co. Ltd, 1983.
5. Morrison R.T. and Boyd R.N. Organic Chemistry (6th edition), New York, Allyn & Bacon Ltd., 1976.
6. Banwell. C.N, Fundamentals of Molecular Spectroscopy, (3th Edition), McGraw-Hill Book Company, Europe 1983.
7. Bahl B.S. and Arun Bahl, Advanced Organic Chemistry, (4th edition), S./ Chand & Company Ltd. New Delhi, 1977.
8. P. S. Kalsi, Stereochemistry: Conformation and mechanism, (9th Edition), New Age International Publishers, 2017.

REFERENCE BOOKS

1. Puri B R Sharma L R and Madan S Pathania, "Principles of Physical Chemistry", Vishal publishing Co., Edition 2004.
2. Kuriocose, J C and Rajaram, J, "Engineering Chemistry", Volume I/II, Tata McGraw-Hill Publishing

Co. Ltd. New Delhi, 2000.

E –REFERENCES

1. http://www.mooc-list.com/course/chemistry-minor-saylororg
2. https://www.canvas.net/courses/exploring-chemistry
3. http://freevideolectures.com/Course/2263/Engineering-Chemistry-I
4. http://freevideolectures.com/Course/3001/Chemistry-I
5. http://freevideolectures.com/Course/3167/Chemistry-II
6. http://ocw.mit.edu/courses/chemistry/

Mapping of CO with PO's

	PO1	PO2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2
CO 1	3	0	0	0	0	0	2	3	3	0	0	0	0	0
CO 2	2	0	0	0	0	0	1	2	2	0	0	0	0	0
CO 3	3	0	0	0	0	0	2	3	3	0	0	0	0	0
CO 4	3	0	0	0	0	0	3	3	3	0	0	0	0	0
CO 5	3	0	0	0	0	0	2	2	3	0	0	0	0	0
Total	**14**	**0**	**0**	**0**	**0**	**0**	**10**	**13**	**14**	**0**	**0**	**0**	**0**	**0**
Scaled Value	3	0	0	0	0	0	2	2	2	0	0	0	0	0

Note:	**Total**	0	1-5	6-10	11-15
	Scaled value	0	1	2	3
	Relation	No	Low	Medium	High

Semester : **I**

Course Code : **XGS204**

Course Name : **TECHNICAL COMMUNICATION**

Prerequisite : **NIL**

L	T	P	C
2	0	0	2

C	P	A
3	0	0

L	T	P	H
2	0	0	2

Course Outcome: After the completion of the course, students will be able to		Domain C or P or A	Level
CO1	**Ability** to understand the basic principles	Cognitive	Remember
CO2	**Apply** the techniques in writing	Cognitive	Apply
CO3	**Identify** communicative styles	Cognitive	Remember
CO4	**Construct** the nature of writing	Cognitive	Create

COURSE CONTENT

UNIT I	**Basic Principles**	**9**
	1.1 – Basic Principles of Technical Writing	
	1.2 – Styles used in Technical Writing	
	1.3 – Language and Tone	
UNIT II	**Techniques**	**9**
	2.1 – Special Techniques used in writing	
	2.2 – Definition & Description of mechanism	
	2.3 – Description- Classification-Interpretation	
UNIT III	**Communication**	**9**
	3.1 – Modern development in style of writing	
	3.2 - New letter writing formats	
UNIT IV	**Report Writing**	**9**
	4.1 - Tips for preparing the draft speech	
	4.2 – Presentation techniques using ICT tools	
	4.3 – Using examples from different sources	

L	T	P	Total
30	0	0	30

SUGGESTED READINGS

1. John Sealy, Writing and Speaking Author; Oxford University Press, New Delhi, 2009
2. Williams K.S, Communicating Business. Engage Learning India Pvt Ltd, 2012

Mapping of CO with PO's

	PO1	PO2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2
CO 1								1	3	**3**		2		
CO 2								1	3	**3**		2		
CO 3								1	2	**3**		2		
CO 4								1	2	**3**		2		
CO 5								1	2	**3**		2		
Total								**5**	**12**	**15**		**10**		
Scaled Value	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**2**	**3**	**0**	**2**	**0**	**0**

Note:	**Total**	0	1-6	7-12	13-18
	Scaled value	0	1	2	3
	Relation	No	Low	Medium	High

Semester : I

Course Code : XWP205

Course Name : WORKSHOP PRACTICES

Prerequisite : NIL

L	T	P	C
1	0	2	3

C	P	A
1	2	0

L	T	P	H
1	0	4	5

COURSE OBJECTIVES

- To obtain skills in machining methods, casting process, moulding methods and welding etc.

Course Outcome: After the completion of the course, students will be able to		**Domain C or P or A**	**Level**
CO1	**Summarize** the machining methods and **practice** machining operation.	Cognitive Psychomotor	Remember Guided Response
CO2	**Define** metal casting process, moulding methods and **relate** Casting and Smithy applications.	Cognitive Psychomotor	Remember Guided Response
CO3	**Plan** basic carpentry operations and **practice** carpentry operations.	Cognitive Psychomotor	Remember Guided Response
CO4	**Plan** basic fitting operations and **practice** fitting operations.	Cognitive Psychomotor	Remember Guided Response
CO5	**Summarize** metal joining operation and **practice** welding operation.	Cognitive Psychomotor	Remember Guided Response
CO6	**Illustrate** the basics of sheet metal work and **make** appropriate models**.**	Cognitive Psychomotor	Remember Guided Response

COURSE CONTENT

EXP.NO	TITLE	COs
1	Introduction to machining process	CO1
2	Plain turning using lathe operation	CO1
3	Introduction to CNC	CO1
4	Demonstration of plain turning using CNC	CO1
5	Study of metal casting operation	CO2
6	Demonstration of moulding process	CO2
7	Study of smithy operation	CO2
8	Study of carpentry tools	CO3
9	Half lap joint – Carpentry	CO3
10	Mortise and Tenon joint – Carpentry	CO3
11	Study of fitting tools	CO4
12	Square fitting	CO4
13	Triangular fitting	CO4

14	Study of welding tools	CO5
15	Square butt joint – welding	CO5
16	Tee joint – Welding	CO5
17	Study of sheet metal working	CO6
18	Rectangular open type Tray - Sheet metal working	CO6
19	Hollow Cylinder – Sheet metal working	CO6
20	Cone –– Sheet metal working	CO6

L	T	P	Total
15	0	30	45

TEXT BOOKS

1. Workshop Technology I,II,III, by S K Hajra, Choudhary and A K Chaoudhary. Media Promoters and Publishers Pvt. Ltd., Bombay
2. Workshop Technology by Manchanda Vol. I,II,III India Publishing House, Jalandhar.

REFERENCE BOOKS

1. Manual on Workshop Practice by K Venkata Reddy, KL Narayana etal; MacMillan India Ltd.
2. Basic Workshop Practice Manual by T Jeyapoovan; Vikas Publishing House (P) Ltd.,New Delhi
3. Workshop Technology by B.S. Raghuwanshi, Dhanpat Rai and Co., New Delhi.
4. Workshop Technology by HS Bawa, Tata McGraw Hill Publishers, New Delhi.

E –REFERENCES

1. http://nptel.ac.in/courses/112107145/

Mapping of CO with PO's

	PO1	PO2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2
CO 1	2	1	2	2	1	0	0	1	1	0	1	2	3	0
CO 2	2	1	2	2	1	0	0	1	1	0	1	2	3	0
CO 3	2	1	2	2	1	0	0	1	1	0	1	2	3	0
CO 4	2	1	2	2	1	0	0	1	1	0	1	2	3	0
CO 5	2	1	2	2	1	0	0	1	1	0	1	2	3	0
CO 6	2	1	2	2	1	0	0	1	1	0	1	2	3	0
Total	**12**	**6**	**12**	**12**	**6**	**0**	**0**	**6**	**6**	**0**	**6**	**12**	**18**	**0**
Scaled Value	2	1	2	2	1	0	0	1	1	0	1	2	3	0

Note:	**Total**	0	1-6	7-12	13-18
	Scaled value	0	1	2	3
	Relation	No	Low	Medium	High

Semester : **II**

Course Code : **XEM206**

Course Name : **ENGINEERING MECHANICS**

Prerequisite : **NIL**

L	T	P	C
3	0	0	3

C	P	A
3	0	0

L	T	P	H
3	0	0	3

COURSE OBJECTIVES

Upon successful completion of the course, student will have:

- Ability to apply knowledge of mathematics, science, and engineering.
- Ability to design as well as to analyse and interpret data.
- Ability to identify, formulate, and solve engineering problems.
- Ability to apply techniques and resources to solve complex mechanical engineering activities with an understanding of the limitations.

Course Outcome: After the completion of the course, students will be able to		**Domain C or P or A**	**Level**
CO1	**Explain** the principles forces, laws and their applications.	Cognitive	Understanding, Apply
CO2	**Apply** the concept of friction, trusses and beams.	Cognitive	Understanding, Apply
CO3	**Understand** the concept of Inertia and Virtual work	Cognitive	Understanding, Apply
CO4	**Examine** Dynamics in linear and curvilinear motion	Cognitive	Understanding, Apply
CO5	**Apply** dynamic principles in connected bodies	Cognitive	Understanding, Apply
CO6	**Explain** free and forced vibration	Cognitive	Remember, Understanding

COURSE CONTENT

UNIT I **INTRODUCTION TO ENGINEERING MECHANICS** **9**

Force Systems Basic concepts, Particle equilibrium in 2-D & 3-D; Rigid Body equilibrium; System of Forces, Coplanar Concurrent Forces, Components in Space – Resultant- Moment of Forces and its Application; Couples and Resultant of Force System, Equilibrium of System of Forces, Free body diagrams, Equations of Equilibrium of Coplanar Systems and Spatial Systems; Static indeterminacy.

UNIT II **FRICTION AND BASIC STRUCTURAL ANALYSIS** **9**

Types of friction, Limiting friction, Laws of Friction, Static and Dynamic Friction; Motion of Bodies, wedge friction, screw jack & differential screw jack; Equilibrium in three dimensions; Method of Sections; Method of Joints; How to determine if a member is in tension or compression; Simple Trusses; Zero force members; Beams & types of beams; Frames & Machines.

UNIT III CENTROID , CENTRE OF GRAVITY AND VIRTUAL WORK AND ENERGY METHOD **9**

Centroid of simple figures from first principle, centroid of composite sections; Centre of Gravity and its implications; Area moment of inertia- Definition, Moment of inertia of plane sections from first principles, Theorems of moment of inertia, Moment of inertia of standard sections and composite sections; Mass moment inertia of circular plate, Cylinder, Cone, Sphere

Virtual displacements, principle of virtual work for particle and ideal system of rigid bodies, degrees of freedom. Active force diagram, systems with friction, mechanical efficiency. Conservative forces and potential energy (elastic and gravitational), energy equation for equilibrium. Applications of energy method for equilibrium.

UNIT IV REVIEW OF PARTICLE DYNAMICS AND INTRODUCTION TO KINETICS OF RIGID BODIES **9**

Rectilinear motion; Plane curvilinear motion (rectangular, path, and polar coordinates). 3-D curvilinear motion; Relative and constrained motion; Newton's 2nd law (rectangular, path, and polar coordinates). Work-kinetic energy, power, potential energy. Impulse-momentum (linear, angular); Impact (Direct and oblique). Types of motion, D'Alembert's principle and its applications in plane motion and connected bodies; Work energy principle and its application in plane motion of connected bodies; Kinetics of rigid body rotation.

UNIT V MECHANICAL VIBRATIONS **9**

Basic terminology, free and forced vibrations, resonance and its effects; Degree of freedom; Derivation for frequency and amplitude of free vibrations without damping and single degree of freedom system, simple problems, types of pendulum, use of simple, compound and torsion pendulums.

L	T	P	Total
45	0	0	45

TEXT BOOKS

1. Engineering Mechanics: Statics (14th Edition) by Russell C. Hibbeler , Best Sellers, 2015
2. D.S.Kumar "A text book of Engineering Mechanics" Publishers S.K.Kataria and Sons ,
3. 2012
4. Velusami.M.A. "Engineering Mechanics with Vector Approach": S.Chand Publishers, 2012
5. J. L. Meriam, L. G. Kraige "Engineering Mechanics: Dynamics",Sixth Edition 2012
6. K L Kumar, Veenu kumar"Engineering Mechanics'McGraw Hill Education; 4th edition

REFERENCE BOOKS

1. Jayakumar and Kumar , Engineering Mechanics, PHI Learning Pvt Ltd, 2013
2. Chandramouli, Engineering Mechanics, PHI Learning Pvt Ltd, 2011
3. K.V.Natarajan, "Engineering Mechanics", Dhanalakshmi Publishers, Chennai, 2006.
4. Beer F.P and Johnson E.R., "Vector Mechanics for Engineers – Statics and Dynamics", Tata McGraw-Hill Publishing Company Ltd., New Delhi, 2001.

E-REFERENCES

https://archive.nptel.ac.in/courses/112/106/112106286/

Mapping of CO with PO's

	PO1	PO2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2
CO 1	3	2	1	1	3	1	1	2	3	2	1	3		
CO 2	3	2	1	1	3	1	1	2	3	2	1	3		
CO 3	3	2	1	1	3	1	1	2	3	2	1	3		
CO 4	3	2	1	1	3	1	1	2	3	2	1	3		
CO 5	3	2	1	1	3	1	1	2	3	2	1	3		
CO 6	2	2	2	1	3	1	1	3	3	3	1	3		
Total	**17**	**12**	**7**	**6**	**18**	**6**	**6**	**13**	**18**	**13**	**6**	**18**		
Scaled Value	3	2	2	2	3	2	2	3	3	3	2	3		

Note:	**Total**	0	1-5	6-10	11-15
	Scaled value	0	1	2	3
	Relation	No	Low	Medium	High

Semester : **II**

Course Code : **XCP207**

Course Name : **PROGRAMMING FOR PROBLEM SOLVING LAB**

Prerequisite : **BASIC UNDERSTANDING SKILLS**

L	T	P	C
0	0	1	1

C	P	A
0.75	0.25	0

L	T	P	H
0	0	2	2

COURSE OBJECTIVES

- To learn programming language basics and syntax
- To ignite logical thinking
- To understand structured programming approach
- To deal with user defined data types
- To know about data storage in secondary memory

Course Outcome: After the completion of the course, students will be able to		**Domain C or P or A**	**Level**
CO1	**Solve** simple programs using I/O statements	Cognitive Psycomotor	Apply Responding
CO2	**Solve** programs using control structures and arrays	Cognitive Psycomotor	Apply Responding
CO3	**Solve** programs using functions and pointers	Cognitive Psycomotor	Apply Responding
CO4	**Solve** programs using structures	Cognitive Psycomotor	Apply Responding
CO5	**Solve** programs using files	Cognitive Psycomotor	Apply Responding

COURSE CONTENT

EXP.NO	TITLE	COs
1	Program to display a Leave Letter as per proper format	CO1
2	i. Program for addition of two numbers ii. Program to solve any mathematical formula.	CO1
3	Program to find greatest of 3 numbers using Branching Statements	CO2
4	Program to display divisible numbers between n1 and n2 using looping Statement	CO2
5	Program to search an array element in an array.	CO2
6	Program to find largest / smallest element in an array.	CO2
7	Program to perform string operations.	CO3
8	Program to find area of a rectangle of a given number use four function types.	CO3
9	Programs to pass and receive array and pointers using four function types	CO3
10	Programs using Recursion for finding factorial of a number	CO3
11	Program to read and display student mark sheet of a student structures with variables	CO4
12	Program to read and display student marks of a class using structures with arrays	CO4
13	Program to create linked list using structures with pointers	CO4
14	Program for copying contents of one file to another file.	CO5
15	Program using files to store and display student mark list of a class using structures with array	CO5

L	T	P	Total
0	0	30	30

Mapping of CO with PO's

	PO1	PO2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2
CO 1	3	2	0	0	3	0	0	0	0	0	2	3	2	0
CO 2	3	2	0	0	2	0	0	0	0	0	2	3	2	0
CO 3	2	2	1	2	2	0	0	0	0	0	2	2	2	0
CO 4	2	2	1	2	2	0	0	0	0	0	2	2	2	0
CO 5	2	2	1	0	2	0	0	1	0	2	2	2	2	0
Total	12	10	3	4	11	0	0	1	0	2	10	12	10	0
Scaled Value	3	2	1	1	3	0	0	1	0	1	2	3	2	0

Note:	**Total**	0	1-5	6-10	11-15
	Scaled value	0	1	2	3
	Relation	No	Low	Medium	High

Semester : **II**
Course Code : **XAC208**
Course Name : **APPLIED CHEMISTRY FOR ENGINEERS LAB**
Prerequisite : **NIL**

L	T	P	C
0	0	1	1

C	P	A
0	2	0

L	T	P	H
0	0	2	2

COURSE OBJECTIVES

- To learn programming language basics and syntax
- To ignite logical thinking
- To understand structured programming approach
- To deal with user defined data types
- To know about data storage in secondary memory

Course Outcome: After the completion of the course, students will be able to		**Domain C or P or A**	**Level**
CO1	**Ability** to Identify the principles of chemistry relevant to the study of science and engineering	Cognitive Psychomotor	Remember Perception
CO2	**Analyze** and **Measure** molecular/system properties such as surface tension, viscosity, conductance of solutions, redox potentials, extent of hardness, chloride content of water, etc.	Cognitive Psychomotor Affective	Understand Analyze Perception Receive
CO3	**Analyze** the synthetic procedure and rate constants of reactions from concentration of reactants/products as afunction of time	Cognitive	Apply

COURSE CONTENT

EXP.NO	TITLE	COs
1	Determination of chloride ion present in the water sample by Argentometric method.	CO1
2	Determination of total, temporary and permanent hardness of water sample by EDTA method.	CO1
3	Determination of cell constant and conductance of solutions.	CO2
4	Potentiometry - determination of redox potentials and emfs.	CO2
5	Determination of surface tension and viscosity.	CO3
6	Adsorption of acetic acid by charcoal.	CO3
7	Determination of the rate constant of a reaction.	CO3
8	Estimation of iron by colorimetric method.	CO3
9	Synthesis of a polymer/drug.	CO3
10	Saponification/acid value of oil.	CO3

L	T	P	Total
0	0	30	30

TEXT BOOKS

1. Laboratory Manual "Chemistry Lab", Department of Chemistry, PMIST, Thanjavur.

REFERENCE BOOKS

1. Mendham, Denney R.C,. Barnes J.D and Thomas N.J.K., "Vogel's Textbook of Quantitative Chemical Analysis", 6th Edition, Pearson Education, 2004.
2. Garland, C. W.; Nibler, J. W.; Shoemaker, D. P. "Experiments in Physical Chemistry", 8th Ed.; McGraw-Hill: New York, 2003.

E –REFERENCES

1. http://freevideolectures.com/Course/2380/Chemistry-Laboratory-Techniques
2. http://ocw.mit.edu/courses/chemistry/5-301-chemistry-laboratory-techniques
3. http://freevideolectures.com/Course/2941/Chemistry-1A-General-Chemistry-Fall-2011

Mapping of CO with PO's

	PO1	**PO2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO1**	**PSO2**
CO 1	3	3	3	3	2	3	3	0	1	**1**	1	0	0	0
CO 2	2	2	2	2	1	2	2	1	1	**1**	1	1	1	1
CO 3	2	2	2	2	1	2	2	0	1	**1**	0	0	0	0
Total	**7**	**7**	**7**	**7**	**4**	**7**	**7**	**1**	**3**	**3**	**2**	**1**	**1**	**1**
Scaled Value	2	2	2	2	1	2	2	1	1	1	1	1	1	1

Note:	**Total**	0	1-5	6-10	11-15
	Scaled value	0	1	2	3
	Relation	No	Low	Medium	High

Semester : III
Course Code : XMA 301
Course Name : Transforms and Partial Differential Equations
Prerequisite : Algebra , Calculus and Laplace Transforms

L	T	P	C
3	0	0	3

C	P	A
2.50	0.25	0.25

L	T	P	H
3	0	0	3

COURSE OBJECTIVES

- Introduction of methods to solve linear partial differential equations of second order and higher order.
- Find the solutions of pde's are determined by conditions at the boundaries of the spatial domain and initial conditions at time zero.
- Provide sufficient knowledge to engineering students in the specific mathematical tools and techniques such as Fourier series, Fourier transform and Z transform.
- To enable students to use Fourier series method both in the solution of pde and other wider context.

Course Outcome: After the completion of the course, students will be able to		**Domain C or P or A**	**Level**
CO1	**Solve** standard types of first order and second order partial differential equations with constant coefficients. Elimination of arbitrary constants and functions.	Cognitive	Applying
CO2	**State** Dirichlet's condition. **Explain** general Fourier series of the curve y = f(x) in the interval (0,2π) (-π, π), (0, 2 ℓ), (-ℓ,ℓ) , (0, π) and (0,ℓ). Perform harmonic analysis.	Cognitive Psychomotor	Understanding Guided Response
CO3	**Solve** one dimensional Wave equation and Heat flow equation by Fourier series method in Cartesian coordinates. Classify second order quasi pde.	Cognitive Affective	Applying Receiving
CO4	**Find** the Fourier transform and Fourier sine and cosine transforms of simple functions **using** definition and its properties.	Cognitive	Applying
CO5	**Apply** the properties of Z transform to **find** the Z transform and inverse Z transform of sequence and functions, and to solve the difference equation using them.	Cognitive	Applying

COURSE CONTENT

UNIT I PARTIAL DIFFERENTIAL EQUATIONS 9

Formation of partial differential equations by elimination of arbitrary constants and arbitrary functions – Solution of standard types of first order partial differential equations – Lagrange's linear equation – Linear partial differential equations of second and higher order with constant coefficients.

UNIT II FOURIER SERIES 9

Dirichlet's conditions – General Fourier series – Odd and even functions – Half range sine series – Half range cosine series –Parseval's identity – Harmonic Analysis.

UNIT III APPLICATIONS OF BOUNDARY VALUE PROBLEMS 9 + 3

Classification of second order quasi linear partial differential equations – Solutions of one dimensional wave equation – One dimensional heat equation – Steady state solution of two

dimensional heat equation (Insulated edges excluded) – Fourier series solutions in Cartesian coordinates **.**

UNIT IV FOURIER TRANSFORM 9 + 3

Fourier integral theorem (without proof) – Fourier transform pairs – Fourier Sine and Cosine transforms – properties – Transforms of simple functions – Convolution theorem – Parseval's identity.

UNIT V Z TRANSFORM AND DIFFERENCE EQUATIONS 9 + 3

Z-transform – Elementary properties – Inverse Z – transform – Convolution theorem – Initial and Final value theorems - Formation of difference equations – Solution of difference equations. using Z-transform.

L	T	P	Total
45	0	0	45

TEXT BOOKS

1. Grewal, B.S., "Higher Engineering Mathematics", 42nd Edition, Khanna Publishers, New Delhi (2012).
2. Veerarajan. T., "Engineering Mathematics Volume III", Second reprint, Tata McGraw Hill Education Pvt. Ltd., New Delhi, 2012.

REFERENCE BOOKS

1. Churchill, R.V. and Brown, J.W., "Fourier Series and Boundary Value Problems", Fourth Edition, McGraw Hill Book Co., Singapore (1987).
2. Kandasamy, P., Thilagavathy, K., and Gunavathy, K., "Engineering Mathematics Volume III", S. Chand & Company Ltd., New Delhi (1996).
3. Bali N.P. and Manish Goyal, "A Text Book of Engineering Mathematics" 7th Edition Lakshmi Publications (P) Limited, New Delhi (2007).
4. Erwin Kreyszig, "Advanced Engineering Mathematics", 8th Edition, Wiley India, 2007.
5. Ray Wylie. C and Barrett.L.C, "Advanced Engineering Mathematics" Tata McGraw Hill Education Pvt Ltd, Sixth Edition, New Delhi, 2012.
6. Narayanan, S., Manicavachagom Pillay, T.K. and Ramaniah, G., "Advanced Mathematics for Engineering Students", Volume: II and III, S.Viswanathan (Printers and Publishers) Pvt. Ltd., Chennai (2002).

E –REFERENCES

nptel:Advanced Engineering Mathematics, Prof. Jitendra Kumar, Department of Mathematics, Indian Institute of Technology, Kharagpur, India.

Mapping of CO with PO's

	GA1	GA 2	GA 3	GA 4	GA 5	GA 6	GA 7	GA 8	GA 9	GA 10	GA 11	GA 12
CO 1	3	2			2					1		2
CO 2	3	1								1		1
CO 3	3	1								1		1
CO 4	3	2								1		1
CO 5	3	2			1					1		2
Total	15	8	0	0	3	0	0	0	0	5	0	7
Scaled Value	3	2	0	0	1	0	0	0	0	1	0	2

Note:	**Total**	0	1-6	7-12	13-18
	Scaled value	0	1	2	3
	Relation	No	Low	Medium	High

Semester : **III**

Course Code : **XCE302**

Course Name : **MECHANICS OF SOLIDS-I**

Prerequisite : **ENGINEERING MECHANICS**

L	T	P	C
2	1	0	3

C	P	A
2.5	0	0.5

L	T	P	H
2	2	0	4

	Course Outcome: After the completion of the course, students will be able to	Domain C or P or A	Level
CO1	Analyse stresses and strains in members when subjected to loads.	Cognitive	Analyse
CO2	Evaluate the strain energy under various forces	Cognitive	Analyse
CO3	Calculate the shear force and bending moment due to various loading conditions.	Cognitive	Analyse
CO4	Examine the stability of structural members by studying the reactions and internal forces.	Cognitive	Analyse
CO5	Assess the output of shafts and springs for its maximum energy.	Cognitive	Knowledge

COURSE CONTENT

UNIT I **SIMPLE STRESSES & STRAINS** **9**

Concept and types of Stress and Strain, Hooke's Law, Elastic moduli and the relationship between them, Thermal stress, deformation of simple and compound bars.

UNIT II **STRAIN ENERGY** **9**

Strain energy and strain energy density – strain energy in traction, shear in flexure and torsion – Strain Energy due to axial force - Resilience - stresses due to impact and suddenly applied load - Principal stress and principal planes - Mohr's circle

UNIT III **TRANSVERSE LOADING AND STRESSES OF BEAMS** **9**

Beams – types of supports and loads – shear force and bending moment for simply supported, cantilever and over hanging beams. Theory of simple bending – analysis of stresses.

UNIT IV **ANALYSIS OF PLANE TRUSS, THIN CYLINDERS / SHELLS** **9**

Types of truss – Analysis of forces in truss members -Method of joints- Method of sections. - Thin cylinders and shells – under internal pressure – deformation of thin cylinders and shells

UNIT V **TORSION AND SPRINGS** **9**

Stresses and deformation in solid and hollow circular shaft– stepped shafts – shafts fixed at both ends. Spring – leaf springs – stresses in helical springs – deflection of springs.

L	T	P	Total
30	15	0	45

TEXT BOOKS

1. Dr. R.K.Bansal,“ Strength of Materials”, Laxmi Publications Pvt Ltd, New Delhi, 8th Edition
2. R.K. Rajput, “ Strength of Materials”, S.Chand and Company Ltd, New Delhi, 8th Edition
3. R.S. Khurmi, “Strength of Materials”, S. Chand & Company Ltd, New Delhi, 2013.

REFERENCE BOOKS

2. William Nash, Theory and Problems of Strength of Materials, Schaum’s Outline Series, McGraw-Hill International Edition.
3. Strength of Materials by R. Subramanian, Oxford University Press, New Delhi
4. Egor P Popov, “Engineering Mechanics of Solids”, Prentice Hall of India, New Delhi, 2012, Second Edition.

Mapping of CO with PO’s

	PO1	PO2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2
CO 1	2	3		1	3						2		2	
CO 2	1	3				2					2		2	
CO 3	1	2	2	1			1	1			2		1	
CO 4	1	2	2	1			1	1			2		1	
CO 5	1	2												
Total	6	12	4	3	3	2	2	2			8		6	
Scaled Value	**2**	**3**	**1**	**1**	**1**	**1**	**1**	**1**			**2**		**2**	

Note:	**Total**	0	1-5	6-10	11-15
	Scaled value	0	1	2	3
	Relation	No	Low	Medium	High

Semester : **III**

Course Code : **XCE 303**

Course Name : **FLUID MECHANICS AND MACHINERY**

Prerequisite : **NIL**

L	T	P	C
3	1	0	3

C	P	A
2.5	0	0.5

L	T	P	H
3	1	0	4

Course Objectives

- To understand about properties of fluids
- To Analyse the flow of fluid under various conditions
- To understand about various hydraulic Machines

Course Outcome: After the completion of the course, students will be able to		**Domain C or P or A**	**Level**
CO1	Understand the basic terms used in fluid mechanics, under static condition	Cognitive	Understand and Apply
CO2	Apply the principles of fluids under kinematics and dynamic conditions	Cognitive	Apply and Analyse
CO3	Perform the dimensional analysis for problems in fluid mechanics	Cognitive Affective	Analyse
CO4	Apply and analyze distribution of water through pipe and pipes	Cognitive	Apply and Analyse
CO5	Understand the components, the hydro-machines	Cognitive Affective	Understand

COURSE CONTENT

UNIT I **PROPERTIES OF FLUID AND FLUID STATICS** **12**

Basic Concepts and Definitions – Distinction between a fluid and a solid; Density, Specific weight, Specific gravity, Kinematic and dynamic viscosity; variation of viscosity with temperature, Newton's law of viscosity; vapour pressure, boiling point, cavitation; surface tension, capillarity, Bulk modulus of elasticity, compressibility.

Fluid Statics - Fluid Pressure: Pressure at a point, Pascal's law, Hydrostatic Law, Pressure measuring devices-manometers and its types- Pressure gauges and its types

UNIT II **FLUID KINEMATICS AND DYNAMICS** **12**

Classification of fluid flow - Types of Flow lines-stream function, velocity potential function, flow net- Continuity equation along stream lines and Cartesian coordinates. Equations of motion - Euler's equation; Bernoulli's equation – Derivation; Energy Principle; PRACTICAL applications of Bernoulli's equation: Venturimeter, orifice meter and Pitot tube; Momentum principle

UNIT III	FLOW THROUGH PIPES AND OPEN CHANNEL FLOW	15

Laminar flow through: circular pipes,-Hegen Poisullis Equation a Laminar flow through parallel plates. Loss of head through pipes, Darcy-Wisbech equation, minor losses, total energy equation- hydraulic gradient line- Pipes in series, equivalent pipes- pipes in parallel, power transmission through pipes., Syphon and Water hammer.

Comparison between open channel flow and pipe flow, geometrical parameters of a channel, classification of open channels, classification of open channel flow, Velocity Distribution of channel section

UNIT IV	DIMENSIONAL ANALYSIS AND HYDRAULIC SIMILITUDE	09

Dimensional homogeneity, Rayleigh method, Buckingham's Pi method and other methods. Dimensionless groups. Similitude, Model studies, Types of models. Application of dimensional analysis and model studies to fluid flow problem.

UNIT V	HYDRAULIC MACHINES	12

Turbines – classification –Pelton wheel –Francis and Kaplan turbines –draft tubes – performance of turbines – specific speed and their significance.

Pumps:-Centrifugal pump – description and working – head, discharge and efficiency of a Centrifugal pump. Reciprocating pump - description and working – types –working principle and use.

L	T	P	Total
3	1	0	60

TEXT BOOKS

1. R.K.Rajput, Fluid Mechanics and Hydraulic Machines, S.Chand& Company Ltd., New Delhi, 2002.
2. Bansal, R. K., Fluid Mechanics and Hydraulic Machines, Laxmi Publications (P) Ltd., New Delhi, 2011.
3. Hydraulics, Fluid Mechanics and Hydraulics Mechanics by P. N. Modi& S. M. Sethi Standard Publishers, New Delhi.
4. Hydraulics, Fluid Mechanics and Hydraulics Mechanics by K. R. Arora, Standard Publishers, New Delhi

REFERENCE BOOKS

1. Theory and Applications of Fluid Mechanics, K. Subramanya, Tata McGraw Hill.
2. Introduction to fluid mechanics, Robert W. Fox, Philip J. Pritchard & Alan T. Mcdonald, Wiley Student Edition, 2009.
3. Fluid Mechanics and Machinery, C. S. P. Ojha, R. Bengtsson and P. N. Chadramouli0, Oxford University Press, 2010.
4. Fluid Mechanics with Engineering Applications, R.L. Daugherty, J.B. Franzini and E.J.Fennimore, International Student Edition, McGraw Hill.

Mapping of CO with PO's														
	PO1	**PO2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO1**	**PSO2**
CO 1	2	1	0	0	0	1	0	1	1	1	0	0	0	1
CO 2	3	2	2	1	1	2	0	1	1	1	0	0	2	1
CO 3	**3**	**2**	**2**	**1**	**1**	**2**	**1**	**1**	**2**	**2**	**0**	**1**	**2**	**1**
CO 4	3	3	3	2	1	2	1	1	2	2	0	1	2	**1**
CO 5	**2**	**1**	**0**	**0**	**1**	**0**	**1**	**2**	**2**	**1**	**0**	**1**	**0**	**1**
Total	13	9	7	4	4	7	3	6	6	7	0	3	6	5
Scaled Value	**3**	**2**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**0**	**1**	**1**	**1**

Note:

Total	0	1-5	6-10	11-15
Scaled value	0	1	2	3
Relation	No	Low	Medium	High

Semester	**:**	**III**
Course Code	**:**	**XCE 304**
Course Name	**:**	**BUILDING MATERIALS AND CONSTRUCTION**
Prerequisite	**:**	**NIL**

L	T	P	C
3	0	0	3

C	P	A
3	0	0

L	T	P	H
3	0	0	3

Course Objectives

- Acquire knowledge on building materials
- Study various aspects of paints, varnishes and timber.
- Learn the construction principles of floors and finishing.

Course Outcome: After the completion of the course, students will be able to		**Domain C or P or A**	**Level**
CO1	Explain the characteristics of stones and bricks.	Cognitive	Understand
CO2	Describe the properties and tests on cement, aggregate, concrete, mortar.	Cognitive	Remember
CO3	Understand the significance of emerging building materials.	Cognitive	Understand
CO4	Identify the suitability of timber, paints and varnishes for building works.	Cognitive	Understand
CO5	Review the construction principles of floors.	Cognitive	Remember

COURSE CONTENT

UNIT I	**STONES, BRICKS AND TILES**	**9**

Stones: Properties of building stones-- relation to their structural requirements, classification of stones - stone quarrying - precautions in blasting, dressing of stone.

Bricks: Composition of good brick earth, various methods of manufacturing of bricks, Characteristics of good building bricks, classification of bricks. Introduction to light weight bricks.

Tiles: Characteristics of good tile – manufacturing methods, types of tiles, Economics and availability of materials. Uses of materials like Aluminum, Gypsum, Glass andBituminous materials-- their quality.

UNIT II	**LIME , CEMENT AND AGGREGATES**	**9**

Lime: Various, ingredients of lime - Constituents of lime stone classification of lime - various methods ofManufacture of lime and Fly ash applications.

Cement: Portland cement- Chemical Composition - Hydration, setting and fineness of cement. Various Types of cement and their properties. A Various field and laboratory tests for Cement.

Fine Aggregate: Characteristics of good sand and its classifications, bulking of sand. Alternatives to natural sand. Coarse Aggregate: Characteristics of good coarse aggregates for manufacture of concrete. Tests on aggregates.

UNIT III	**MORTAR, MASONRY AND TIMBER**	**9**

Mortar: Different types of mortars, preparation, setting and curing. Manufacturing methods of mortar. Concrete: Designation, workability of concrete in fresh state. Reinforcing steel: Types of reinforcement, specifications

Types of masonry, English and Flemish bonds, Rubble and Ashlar Masonry. Cavity and partition walls.

Timber: Timber as a building material and its uses. Various types of timber. Seasoning and its importance. Preservation of wood. Plywood & Laminates and their uses.

UNIT IV BUILDING COMPONENTS 9

Lintels, arches, vaults, stair cases - types. Floors : Concrete, Mosaic, Terrazzo floors – Roof : Pitched, Lean to roof, King and Queen post Trusses. R.C.C Roofs and Pre fabricated roofs.

UNIT V FLOORING AND FINISHING 9

Floors: Characteristics of good floors. Common types of floors. Stone flooring, concrete flooring, Terrazo flooring. Ceramic and mosaic tiles. Industrial floors. Methods of construction, and maintenance.

Finishing: Damp Proofing and water proofing materials_ and uses- Plastering Pointing, white washing and Distempering – Paints: Constituents of paint - Types of paints - Painting of new and old wood- Varnish. - Form Works - Scaffoldings and their types.

L	T	P	Total
3	0	0	3

TEXT BOOKS

1. Engineering Materials, Rangwala, S.C, (36th edition), Anand Charotar Publishing House, 2009.
2. Building Construction, S.S. Bhavikatti, Vikas publications House Pvt. ltd.
3. Building Materia1s, B.C. Punmia, Laxmi Publications Pvt. Ltd.
4. Building construction, (10^{th} edition), Punmia, B. C. Laxmi Publications, Bangalore, 2009.
5. A Text Book of Building Construction, Arora S.P. and Bindra S.P., Dhanpat Rai & Sons Publications, 2013.
6. Gambhir M.L., Neha Jamwal, Building Materials: Products, Properties and Systems, McGraw Hill Education (India) Private Limited, 2011.
7. Sushil Kumar, Building Construction, Standard Publishers, 2006.

REFERENCE BOOKS

1. Building Materials, M.L.Gambhir, Tata McGraw Hill Publishing Co. Ltd. New Delhi.
2. Building construction, P.C.Verghese, PHI Learning (P) Ltd.
3. Building construction and construction materials, Birdie, G.S. and Ahuja, T.D., Dhanpath RaiPublishing company, “New Delhi, 1986.
4. Advances in Building Materials and Construction, Central Building Research Institute, Roorkee, 2004

E-REFERENCES

http://nptel.iitm.ac.in

IS Codes

National Building Code of India, 2005.

Mapping of CO with PO's

	PO1	PO2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2
CO 1	2			1	1	1						2		
CO 2	1			2	2	1	2					1		
CO 3	1			2	1		1					1		
CO 4	2			2	2							2		
CO 5	2			2	2							2		
Total	8			9	8	2	3					8		

Scaled Value

Note:

Total	0	1-5	6-10	11-15
Scaled value	0	1	2	3
Relation	No	Low	Medium	High

Semester	:	**III**
Course Code	:	**XCE 305**
Course Name	:	**SURVEYING I**
Prerequisite	:	**NIL**

L	T	P	C
3	0	0	3

C	P	A
2.5	0	0.5

L	T	P	H
3	0	0	3

Course Objectives

- To ensure that the student develops knowledge of the basic and conventional surveying
- To acquire knowledge about the instruments, principles behind them and working of the instruments.
- To plotting of the area from the field measurements, determination of the area and the theory behind it.

Course Outcome: After the completion of the course, students will be able to		Domain C or P or A	Level
CO1	Identify the Principles and functions of various surveying methods	Cognitive	Understanding
CO2	Identify the methods of Levelling and determine the reduced levels	Cognitive	Applying
CO3	Classify the methods of Contouring and Measure the capacity of Reservoir	Cognitive	Understanding
CO4	Describe the methods and measure the angles and distances using Theodolite	Cognitive Affective	Understanding Responding
CO5	Understand the measurement of distance and heights of objects using tachometric principle	Cognitive Affective	Understanding Responding

COURSE CONTENT

UNIT I INTRODUCTION AND TRADITIONAL METHODS OF SURVEYING 9

Introduction to Plane and Geodetic Surveying, Chain surveying, Instruments used in chain surveying, Ranging and chaining lines, chaining past obstacles, Chaining on sloping ground, Corrections applied, Field book, Trapezoidal and Simpson's rule for computation of areas with irregular boundaries.

Compass Instrument, Measurement of angles and directions, Bearing, WCB & RB, Magnetic declination and its variation, Local attraction, Plotting of compass traverse, Latitude and departure

Plane Table Surveying: Principle, equipment, methods, orientation, two point and three-point problem and their solutions, errors & precautions, advantages and disadvantages of plane tabling.

UNIT II LEVELLING 9

Concept and Terminology, Leveling Instruments and their Temporary and permanent adjustments- method of leveling - theory of simple and differential leveling - Reduction of level, Height of collimation and Rise and fall methods, Inverted levels, Reciprocal levelling, Profile leveling and Cross sectioning - Level field book

UNIT III CONTOURING 9

Definition, Contour interval, Characteristics of contours, Types of contours, Steep slope

contours, Flat terrain contours, Methods of locating contours, interpolation of contours, sketching of contours, Contour gradient, Uses of contour maps, Definition for TIN, DTM, mass points.

UNIT IV THEODOLITE SURVEYING 9

Basic definitions; Fundamental lines; Temporary adjustments, Measurement of horizontal angles and vertical angles, Methods of repetition and reiteration, Problems of heights and distances by single plane and double plane method, Sources of errors in Theodolite survey.

UNIT V TACHOMETRY 9

Stadia and tangential methods of Tacheometry. Distance and Elevation formulae, Problems in tachometric survey.

L	T	P	Total
45	0	0	45

TEXT BOOKS

1. Surveying (Vol No. 1, 2 & 3) B.C.Punmia, Ashok Kumar Jain and Arun Kumar Jain - Laxmi Publications (P)Ltd. , New Delhi.
2. Madhu, N, Sathikumar, R and Satheesh Gobi, Advanced Surveying: Total Station,GIS and Remote Sensing, Pearson India, 2006..
3. "Text book of Surveying", C. Venkataramaiah, University press, India
4. "Surveying and levelling", R. Subramanian, Oxford University press.
5. Manoj, K. Arora and Badjatia, Geomatics Engineering, Nem Chand & Bros, 2011

REFERENCE BOOKS

1. Chandra, A.M., Higher Surveying, Third Edition, New Age International (P) Limited, 2002.
2. Anji Reddy, M., Remote sensing and Geographical information system, B.S. Publications, 2001.
3. Arora, K.R., Surveying, Vol-I, II and III, Standard Book House, 2015.
4. "Text book of Surveying", S.K. Duggal (Vol No. l&2), Tata McGraw Hill Publishing Co. Ltd. New Delhi.
5. "Plane Surveying", Alak de, S. Chand & Company, New Delhi.

E-REFERENCES

NPTEL Video Lectures on Surveying

Mapping of CO with PO's

	PO1	PO2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2
CO 1	3	3	3	3	3	3	2	3	2	2	3	3	3	2
CO 2	2	2	2	3	3	2	2	3	2	3	2	3	3	3
CO 3	3	1	2	3	3	2	1	3	2	2	2	3	3	3
CO 4	2	1	3	3	3	2	1	3	2	3	3	3	3	3
CO 5	2	1	3	3	3	2	1	3	2	3	3	3	3	3
Total	12	8	13	15	15	11	7	15	10	13	13	15	15	14
Scaled Value	3	2	3	3	3	3	2	3	2	3	3	3	3	3

Note:

Total	0	1-5	6-10	11-15
Scaled value	0	1	2	3
Relation	No	Low	Medium	High

Semester	**III**
Course Code	**XUM 306**
Course Name	**ENTREPRENEURSHIP DEVELOPMENT**
Prerequisite	**----**

L	**T**	**P**	**C**	**C**	**P**	**A**	**L**	**T**	**P**	**SS**	**H**
2	**0**	**0**	**2**	**2.7**	**0**	**0.3**	**2**	**0**	**0**	**1**	**3**

Course Objectives

Through this course the students will

- Understand the Entrepreneurial motivation and inclination
- Idea about the market assessment
- To get familiar in government policies and global opportunities for Entrepreneurship Development

Course Outcome: After the completion of the course, students will be able to		Domain C or P or A	Level	
CO1	Recognise and describe the role of innovation and motivation for an entrepreneur.	Cognitive	K2-	Understanding
CO2	Self-assess and appraise your entrepreneurship interest with your chosen entrepreneur.	Cognitive	K5-	Evaluate
CO3	Outline the importance of generation of new ideas for entrepreneurship and illustrate market assessment.	Cognitive	K4-	Analysing
CO4	Explain the competition in business and sketch/demonstrate/comply business model for dealing with competition.	Cognitive /	K2- K3-	Understanding , Apply

		Affective	A3 A2	Value Response
CO5	Describe and Explain venture creation and launching of small business and its management.	Cognitive	K1- K2-	Remembering, Understanding
CO6	Describe and Discuss various government policies and global opportunities for Entrepreneurship Development	Cognitive /	K1- K2-	Remembering Understanding

COURSE CONTENT

UNIT-I **INNOVATION AND ENTREPRENEURSHIP** **5**

Definition of Innovation, Creativity and Entrepreneurship; role of innovation in entrepreneurship development - Entrepreneurial motivation - Competencies and traits of an entrepreneur -Role of Family and Society; Entrepreneurship as a career and its role in national development

UNIT –II **SELF ASSESSMENT OF ENTREPRENEURIAL INCLININATION** **4**

Self-assessment of entrepreneurial inclination -Presentation by students on their entrepreneurial inclination rating -Case study of successful entrepreneurs

UNIT-III **NEW IDEA GENERATION TO MARKET ASSESSMENT** **9**

Importance of Idea generation-filtering-refinement - opportunity recognition - Description of chosen idea - value proposition, customer-problem-Solution statement -benefits; development status; IP ownership -Market Validation- Technology/ user/decision makers/ partners -market need; segmentation -market TAM,SAM and SOM -case study on market segmentation by popular companies

UNIT –IV **CUSTOMER – COMPETITION- BUSINESS MODEL** **9**

Customer-Target primary customer research, Decision making unit/ process-Beach head market; Cost of Customer Acquisition - Competition- comparative analysis, competitive advantages-; -Business model -Financial planning -Pitch documentation and presentation

UNIT – V **VENTURE CREATION AND LAUNCHING OF SMALL BUSINESS AND ITS MANAGEMENT** **9**

New enterprise creation - organizational and legal matters -Operational plan -Sales and distribution plan - Accounting -Team recruitment and management -Fund raising and management -Profile of a startup – case studies

UNIT – VI **GOVERNMENT INITIATIVES AND GLOBAL OPPORTUNITIES** **9**

Incubators and accelerators - capacity building -Startup policies- Startup India- Support for MSME; GeM Portal. Funding–national and international sources-Bilateral programmes by Govt. of India -Global reach for promoting cross-cultural entrepreneurship

L	T	P	SS	Total
30	---	---	15	45

REFERENCE BOOKS

1. A.P.Aruna, " Lecture Notes on Entrepreneurship Development", available as softcopy @ www.brain.net
2. Thomas W. Zimmerer, Norman M. Scarborough, "Essentials of Entrepreneurship and Small Business Management", Pearson; 3rd edition, 2001.
3. John Burnett, "Introducing Marketing", Open Text Book available at http://solr.bccampus.ca:8001/bcc/file/ddbe3343-9796-4801-a0cb-7af7b02e3191/1/Core%20Concepts%20of%20Marketing.pdf
4. Toubia, Olivier. "Idea Generation, Creativity, and Incentives", Marketing Science. Vol. 25.

pp.411-425. 10.1287/mksc.1050.0166, 2006.
5. Alexander Osterwalder and Yves Pigneur, "Business Model Generation: A Handbook for Visionaries, Game Changers, and Challengers",Wiley; 1st edition, 2010.
6. Gerardus Blokdyk,"3C's model The Ultimate Step-By-Step Guide"5starcooks, 2018.

Table -1 CO vs PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2
CO1	1						1		1		1			
CO2					1		1		1		1			
CO3			1	1	1	1	1	1	1		1	1		
CO4				1	1		1				1	1		
CO5	1		1	1	1	1	1	1	1		2	2		
CO6	1		1	1	1	1	1	1	1			2		
Total	3		3	4	5	3	6	3	5		6	6		
Scaled to 0,1,2 and 3	1	0	1	1	1	1	2	1	1	0	2	2	0	0

Total	0	1-6	7-12	13-18
Scale	0	1	2	3
Relation	No	Low	Medium	High

L – Lecture; T- Tutorial;
P-Practical;
SS – Self Study

Semester : III

Course Code : XUM 307

Course Name : Universal Human Values 2: Understanding Harmony

Prerequisite : None. Universal Human Values-I (Desirable)

L	T	P	C
2	1	0	3

C	P	A
3	0	0

L	T	P	H
2	1	0	3

COURSES ON HUMAN VALUES

During the Induction Program, students would get an initial exposure to human values through Universal Human Values-I. This exposure is to be augmented by this compulsory full semester foundation course.

Objective

This introductory course input is intended:

1. To help the students appreciate the essential complementarily between 'VALUES' and 'SKILLS' to ensure sustained happiness and prosperity which are the core aspiration so fall human beings.

2. To facilitate the development of a Holistic perspective among students towards life and

profession as well as towards happiness and prosperity based on a correct understanding of the Human reality and the rest of existence. Such a holistic perspective forms the basis of Universal Human Values and movement towards value-based living in a natural way.

3. To highlight plausible implications of such a Holistic understanding in terms of ethical human conduct, trustful and mutually fulfilling human behavior and mutually enriching interaction with Nature.

Thus, this course is intended to provide a much needed orientation input in value education to the young enquiring minds.

Salient Features of the Course

The salient features of this course are:

1. It presents a universal approach to value education by developing the right understanding of reality (i.e. a worldview of the reality "as it is") through the process of self-exploration.
2. The whole course is presented in the form of a dialogue whereby a set of proposals about various aspects of the reality are presented and the students are encouraged to self-explore the proposals by verifying them on the basis of their natural acceptance within oneself and validate experientially in living.
3. The prime focus throughout the course is toward affecting a qualitative transformation in the life of the student rather than just a transfer of information.
4. While introducing the holistic world view and it simplications, a critical appraisal of the prevailing notions is also made to enable the students discern the difference on their own right.

Course Methodology

1. The methodology of this course is explorational and thus universally adaptable. It involves a systematic and rational study of the human being vis-à-vis the rest of existence.
2. The course is in the form of 28lectures (discussions) and14 practice sessions.
3. It is free from any dogma or value prescriptions.
4. It is a process of self-investigation and self-exploration, and not of giving sermons. Whatever is found as truth or reality is stated as a proposal and the students are facilitated to verify it in their own right, based on their Natural Acceptance and subsequent Experiential Validation – the whole existence is the lab and every activity is a source of reflection.
5. This process of self-exploration takes the form of a dialogue between the teacher and the students to begin with, and then to continue within the student in every activity, leading to continuous self-evolution.

Course Outcome: After the completion of the course, students will be able to		**Domain C or P or A**	**Level**
CO1	Explore about the need of value education.	Cognitive	Understand
CO2	Interpret self and body needs and responses to ensure harmony within self.	Cognitive	Understand
CO3	Explore the harmony in the family and society	Cognitive	Understand
CO4	Explore about the harmony in the nature / existence	Cognitive	Understand
CO5	Discuss about the holistic understanding.	Cognitive	Understand

COURSE TOPICS

The course has 28 lectures and 14 tutorials in 5 modules. The lectures and tutorials are of 1-hour duration. Tutorial sessions are to be used to explore and practice what has been proposed during the lecture sessions.

The Teacher's Manual provides the outline for lectures as well as practice sessions. The teacher is expected to present the issues to be discussed as propositions and encourage the students to have a dialogue.

The syllabus for the lectures and practice sessions is given below:

Module 1	Introduction to Value Education	6	3

Lecture 1 : Understanding Value Education

Lecture 2 : Self-exploration as the Process for Value Education

Tutorial 1 : Practice Session PS1: Sharing about Oneself

Lecture 3 : Continuous Happiness and Prosperity– the Basic Human Aspirations

Lecture 4 : Right Understanding, Relationship and Physical Facility

Tutorial 2 : PracticeSessionPS2 : Exploring Human Consciousness

Lecture 5 : Happiness and Prosperity– Current Scenario

Lecture 6 : Method to Fulfill the Basic Human Aspirations

Tutorial 3 : Practice Session PS3 : Exploring Natural Acceptance

Expected outcome:

The students start exploring themselves: get comfortable with each other and with the teacher; they start appreciating the need and relevance for the course.
The students start finding that technical education without study of human values can generate more problems than solutions. They also start feeling that lack of understanding of human values is the root cause of most of the present-day problems; and a sustained solution could emerge only through understanding of value-based living. Any solution brought out through fear, temptation of dogma will not be sustainable.

The students are able to see that verification on the basic of natural acceptance and experiential validation through living is the only way to verify right or wrong, and referring to any external source like text or instrument or any other person cannot enable them to verify with authenticity; it will only develop assumptions.

The students are able to see that their practice in living is not in harmony with their natural acceptance most of the time, and all they need to do is to refer to their natural acceptance to overcome this disharmony.

The students are able to see that lack of right understanding leading to lack of relationship is the major cause of problems in their family and not the lack of physical facility in most

of the cases, while they have given higher priority to earning of physical facility in their life giving less value to or even ignoring relationships and not being aware that right understanding is the most important requirement for any human being.

Module 2	**Harmony in the Human Being**	**6**	**3**

Lecture 7	:	Understanding Human being as the Co-existence of the Self and the Body
Lecture 8	:	Distinguishing between the Needs of the Self and the Body
Tutorial 4	:	Practice Session PS4 : Exploring the difference of Needs of Self and Body
Lecture 9	:	The Body as an Instrument of the Self
Lecture 10	:	Understanding Harmony in the Self
Tutorial 5	:	Practice Session PS5 : Exploring Sources of Imagination in the Self
Lecture 11	:	Harmony of the Self with the Body
Lecture 12	:	Programme to ensure self-regulation and Health
Tutorial 6	:	Practice Session PS6 : Exploring Harmony of Self with the Body

Expected outcome:

The students are able to see that they can enlist their desires and the desires are not vague. Also they are able to relate their desires to 'I' and 'Body' distinctly. If any desire appears related to both, they are able to see that the feeling is related to I while the physical facility is related to the body. They are also able to see that 'I' and Body are two realities, and most of their desires are related to 'I' and not body, while their efforts are mostly centered on the fulfillment of the needs of the body assuming that it will meet the needs of 'I' too.

The students are able to see that all physical facility they are required for a limited time in a limited quantity. Also they are able to see that in case of feelings, they want continuity of the naturally acceptable feelings and they do not want feelings which are not naturally acceptable even for a single moment.

The students are able to see that activities like understanding, desire, though and selection are the activities of 'I' only the activities like breathing, palpitation of different parts of the body are fully the activities of the body with the acceptance of 'I' while the activities they do with their sense organs like hearing through ears, seeing through eyes, sensing through touch, tasting through tongue and smelling through nose or the activities they do with their work organs like hands, legs etc. are such activities that require the participation of both 'I' and body.

The students become aware of their activities of 'I' and start finding their focus of attention at different moments. Also they are able to see that most of their desires are coming from outside (through preconditioning or sensation) and are not based on their natural acceptance

The students are able to list down activities related to proper upkeep of the body and practice them in their daily routine. They are also able to appreciate the plants wildly growing in and around the campus which can be beneficial in curing different diseases.

Module 3	**Harmony in the Family and Society**	**6**	**3**

Lecture 13 : Harmony in the Family –the Basic Unit of Human Interaction

Lecture 14 : Values in Human-to-Human Relationship

Lecture 15 : 'Trust' – the Foundational Value in Relationship

Tutorial 7 : Practice Session PS 7 Exploring the Feeling of Trust

Lecture 16 : 'Respect'–as the Right Evaluation

Tutorial 8 : Practice Session PS 8 Exploring the Feeling of Respect

Lecture 17 : Understanding Harmony in the Society

Lecture 18 : Vision for the Universal Human Order

Tutorial 9 : Practice Session PS 9 Exploring Systems to fulfill Human Goal

Expected outcome:

The students are able to note that the natural acceptance (intention) is always for living in harmony, only competence is lacking! We generally evaluate ourselves on the basis of our intention and others on the basis of their competence! We seldom look at our competence and others' intention as a result we conclude that I am a good person and other is a badperson.
The students are able to see that respect is right evaluation, and only right evaluation leads to fulfillment in relationship. Many present problems in the society are an outcome of differentiation (lack of understanding of respect), like gender biasness, generation gap, caste conflicts, class struggle, dominations through power play, communal violence, clash of isms and so on so forth.

All these problems can be solved by realizing that the other is like me a she has the same natural acceptance, potential and program to ensure a happy and prosperous life for them and for others through he may have different body, physical facility or beliefs.

The students are able to use their creativity for education children. The students are able to see that they can play a role in providing value education for children. They are able to put in simple words the issues that are essential to understand for children and comprehensible to them. The students are able to develop an outline of holistic model for social science and compare it with the existing model.

Module 4	**Harmony in the Nature/Existence**	**4**	**2**

Lecture 19 : Understanding Harmony in the Nature

Lecture 20 : Interconnectedness, self-regulation and Mutual Fulfillment among the Four Orders of Nature

Tutorial 10 : Practice Session PS10 Exploring the Four Orders of Nature

Lecture 21	:	Realizing Existence as Co-existence at All Levels
Lecture 22	:	The Holistic Perception of Harmony in Existence
Tutorial 11	:	Practice Session PS 11Exploring Co-existence in Existence

Expected outcome:

The students are able to differentiate between the characteristics and activities of different orders and study the mutual fulfillment among them. They are also able to see that human being s are not fulfilling to other orders today and need to take appropriate steps to ensure right participation (in terms of nurturing, protection and right utilization) in the nature.

The students feel confident that they can understand the whole existence; nothing is a mystery in this existence. They are also able to see the interconnectedness in the nature, and point out how different courses of study relate to the different units and levels. Also they are able to make out how these courses can be made appropriate and holistic.

Module 5	**Implications of the Holistic Understanding – a Look at Professional Ethics**	**6**	**3**

Lecture 23	:	Natural Acceptance of Human Values
Lecture 24	:	Definitiveness of (Ethical) Human Conduct
Tutorial 12	:	Practice Session PS 12 : Exploring Ethical Human Conduct
Lecture 25	:	A Basis for Humanistic Education, Humanistic Constitution and Universal Human Order
Lecture 26	:	Competence in Professional Ethics
Tutorial 13	:	Practice Session PS13 : Exploring Humanistic Models in Education
Lecture 27	:	Holistic Technologies, Production Systems and Management Models-Typical Case Studies
Lecture 28	:	Strategies for Transition towards Value-based Life and Profession
Tutorial 14	:	Practice Session PS 14 : Exploring Steps of Transition towards Universal Human Order

Expected outcome:

The students are able to present sustainable solutions to the problems in society and nature. They are also able to see that these solutions are practicable and draw roadmaps to achieve them.
The students are able to grasp the right utilization of their knowledge in their streams of Technology/Engineering/Management/any other area of study to ensure mutual fulfilment. E.g. mutually enriching production system with rest of nature.
The students are able to sincerely evaluate the course and share with their friends. They are also able to suggest measures to make the course more effective and relevant. They are also able to make use of their understanding in the course for the happy and prosperous family and society.

Guidelines and Content for Practice Sessions (Tutorials)

In order to connect the content of the proposals with practice (living), 14 practice sessions have been designed. The full set of practice sessions is available in the Teacher's Manual as well as the website.

Practice Sessions for Module 1 – Introduction to Value Education

PS 1 : **Sharing about Oneself**

PS 2 : **Exploring Human Consciousness**

PS 3 : **Exploring Natural Acceptance**

Practice Sessions for Module 2 – Harmony in the Human Being

PS 4 : **Exploring the difference of Needs of Self and Body**

PS 5 : **Exploring Sources of Imagination in the Self**

PS 6 : **Exploring Harmony of Self with the Body**

Practice Sessions for Module 3 – Harmony in the Family and Society

PS 7 : **Exploring the Feeling of Trust**

As an example, PS7 is a practice session in module 3 regarding trust. It is explained below:

PS 7: Form small groups in the class and in that group initiate dialogue and ask the eight questions related to trust. The eight questions are:

1a. Do I want to make myself happy?	**1b. Am I able to make myself always happy?**
2a. Do I want to make the other happy?	**2b. Am I able to make the other always happy?**
3a. Does the other want to make him happy?	**3b. Is the other able to make him always happy?**
4a. Does the other want to make me happy?	**4b. Is the other able to make me always happy?**
Intention (Natural Acceptance)	**Competence**
What is the answer?	**What is the answer?**

Let each student answer the questions for himself and everyone else. Discuss the difference between intention and competence. Observe whether you evaluate your intention and competence as well as the others' intention and competence.

Expected outcome of PS 7: The students are able to see that the first four questions are related to our Natural Acceptance i.e. intention and the next four to our Competence. They are able to note that the intention is always correct, only competence is lacking! We generally evaluate ourselves on the basis of our intention and others on the basis of their competence! We seldom look at our competence and others' intention, as a result we conclude that I am a good person and other is a bad person.

PS 8 : **Exploring the Feeling of Respect**

PS 9 : **Exploring Systems to fulfil Human Goal**

Practice Sessions for Module 4 – Harmony in the Nature (Existence)

PS 10 : **Exploring the Four Orders of Nature**

PS 11 : **Exploring Co-existence in Existence**

Practice Sessions for Module 5 – Implications of the Holistic Understanding – a Look at Professional Ethics

PS 12 : **Exploring Ethical Human Conduct**

PS 13 : **Exploring Humanistic Models in Education**

PS 14 : **Exploring Steps of Transition towards Universal Human Order**

L	T	P	Total
30	15	0	45

READINGS

Text Book and Teachers Manual

a. The Textbook

A Foundation Course in Human Values and Professional Ethics, R R Gaur, RAsthana, G P Bagaria, 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN978-93-87034-47-1

b. The Teacher's Manual

Teachers' Manual for A Foundation Course in Human Values and Professional Ethics, R R Gaur, R Asthana, G P Bagaria, 2nd Revised Edition, Excel Books, NewDelhi, 2019.ISBN978-93-87034-53-2

Reference Books

1. Jeevan Vidya:EkParichaya, A Nagaraj, Jeevan VidyaPrakashan,Amarkantak,1999.
2. Human Values, A.N. Tripathi, NewAge Intl.Publishers, NewDelhi,2004
3. The Story of Stuff (Book).
4. The Story of My Experiments with Truth-by Mohandas Karam chand Gandhi
5. Small is Beautiful -E. F Schumacher.
6. Slow is Beautiful-Cecile Andrews
7. Economy of Permanence-JC Kumarappa
8. Bharat Mein Angreji Raj –Pandit Sunderlal
9. Rediscovering India- by Dharampal
10. Hind Swarajor Indian Home Rule-by Mohandas K.Gandhi
11. India Wins Freedom-Maulana Abdul Kalam Azad
12. Vivekananda-Romain Rolland (English)
13. Gandhi-Romain Rolland(English)

Semester : **III**

Course Code : **XCE 308**

Course Name : **STRENGTH OF MATERIALS LAB**

Prerequisite : **MECHANICS OF SOLIDS-I**

L	T	P	C
0	0	1	1

C	P	A
0	3	0

L	T	P	H
0	0	2	2

	Course Outcome: After the completion of the course, students will be able to	**Domain C or P or A**	**Level**
CO1	Perception about the behavior of solids under stress and strain.	Psychomotor	Respond
CO2	Calculate the forces and moments.	Psychomotor	Measure
CO3	Predict the properties of surfaces of solids.	Psychomotor	Measure
CO4	Behaviour of beams under different loading systems.	Psychomotor	Measure
CO5	Calculate the deflection of springs.	Psychomotor	Respond

COURSE CONTENT

1.Tension test on HYSD bar / MS rod

2. Impact Test (Izod and Charpy)

3. Hardness Test (Brinell and Rockwell)

4. Test on timber

i) Compressive strength test

ii)Tensile strength test

iii)Shear Strength test

iv) Static bending test

5. Deflection Test

6. Young's modulus of the given material (steel or wood)

7. Tests on springs.

L	T	P	Total
0	0	30	30

TEXT BOOKS

1. Egor P Popov, "Engineering Mechanics of Solids", Prentice Hall of India, New Delhi, 2012, Second Edition.
2. Srinath L.S, "Advanced Mechanics of Solids", Tata McGraw-Hill Publishing Co., New Delhi, 2009, Third Edition.
3. William Nash, Theory and Problems of Strength of Materials, Schaum's Outline Series, McGraw-Hill International Edition, 2011.

REFERENCE BOOKS

1. Timoshenko, S. and Young, D. H., "Elements of Strength of Materials", DVNC, New York, USA.

2. Kazmi, S. M. A., "Solid Mechanics" TMH, Delhi, India.

3. Hibbeler, R. C. Mechanics of Materials. 6th ed. East Rutherford, Pearson Prentice Hall, 2004

Mapping of CO with PO's

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO2
CO1	2	3		1	3						2		2	
CO2	1	3				2					2		2	
CO3	1	2	2	1			1	1			2		1	
CO4	1	2	2	1			1	1			2		1	
CO5	1	2												
Total	**6**	**12**	**4**	**3**	**3**	**2**	**2**	**2**			**8**		**6**	
Scaled Value	**2**	**3**	**1**	**1**	**1**	**1**	**1**	**1**			**2**		**2**	

1 – Low, 2 – Medium, 3 – High

Semester : III
Course Code : XCE 309
Course Name : FLUID MECHANICS AND MACHINERY LAB
Prerequisite : NIL

L	T	P	C
0	0	1	1

C	P	A
0	3	0

L	T	P	H
0	0	2	2

Course Objectives

- Upon Completion of this subject, the students can able to have hands on experience in flow measurements using different devices and also perform calculation related to losses in pipes and also perform characteristic study of pumps, turbines etc.,

Course Outcome:	**Domain or P or A**	**C Level**
Determine the coefficient of discharge through pipe and notch	Psychomotor	Respond
Verify the principle of Bernoullis Equation.	Psychomotor	Measure
Determine the minor losses for various fittings.	Psychomotor	Measure
Perform test on Efficiency of the Pumps	Psychomotor	Measure
Perform test on Efficiency of the Turbines	Psychomotor	Respond

LIST OF EXPERIMENTS

1. Determination of the Coefficient of discharge of given Orifice meter.
2. Determination of the Coefficient of discharge of given Venturi meter.
3. Verification of Bernoullis Equation.
4. Determination of friction factor for a given set of pipes.
5. Determination of minor losses for various fitting.
6. Determination of rate of flow through notches
7. Conducting performance test on centrifugal pump and draw their characteristic curves
8. Conducting performance test on Reciprocating pump and draw their characteristic curves
9. Conducting performance test submersible pump and draw their characteristic curves
10. Conducting load test on Pelton Turbine and draw their characteristic curves
11. Conducting load test on Francis Turbine and draw their characteristic curves
12. Study about Axial flow turbine- Kaplan turbine.

L	T	P	Total
0	0	15	15

TEXT BOOKS

1. R.K.Rajput, Fluid Mechanics and Hydraulic Machines, S.Chand& Company Ltd., New Delhi, 2002.
2. Bansal, R. K., Fluid Mechanics and Hydraulic Machines, Laxmi Publications (P) Ltd., New Delhi, 2011.
3. Hydraulics, Fluid Mechanics and Hydraulics Mechanics by P. N. Modi& S. M. Sethi Standard Publishers, New Delhi.
4. Hydraulics, Fluid Mechanics and Hydraulics Mechanics by K. R. Arora, Standard Publishers, New Delhi

REFERENCE BOOKS

1. Theory and Applications of Fluid Mechanics, K. Subramanya, Tata McGraw Hill.
2. Introduction to fluid mechanics, Robert W. Fox, Philip J. Pritchard & Alan T. Mcdonald, Wiley Student Edition, 2009.
3. Fluid Mechanics and Machinery, C. S. P. Ojha, R. Bengtsson and P. N. Chadramouli0, Oxford University Press, 2010.
4. Fluid Mechanics with Engineering Applications, R.L. Daugherty, J.B. Franzini and E.J.Fennimore, International Student Edition, McGraw Hill.

	PO1	PO2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2
CO 1	2		2	2	1				1		1	1	1	
CO 2	1		1	1	1				1		1	1		
CO 3	1			1					1				1	
CO 4	1		1						1					
CO 5	2			1	1						1		1	1
Total	7		4	5	3				4		3	2	3	1
Scaled Value	**2**		**1**	**1**	**1**				**1**		**1**	**1**	**1**	**1**

Note:	**Total**	0	1-5	6-10	11-15
	Scaled value	0	1	2	3
	Relation	No	Low	Medium	High

Semester : III

Course Code : XMA 401

Course Name : PROBABILITY DISTRIBUTIONS AND STATISTICAL METHODS

Prerequisite : ---

L	T	P	C
3	0	0	3

C	P	A
2.0	0.5	0.5

L	T	P	H
3	0	0	3

COURSE OBJECTIVES

- Appreciate the importance of probability and statistics in computing and research
- Develop skills in presenting quantitative data using appropriate diagrams, tabulations and summaries
- Use appropriate statistical method in the analysis of simple datasets.
- Interpret and clearly present output from statistical analyses in a clear concise and understandable manner
- The main objective of this course is to provide students with the foundations of probabilities and statistical analysis mostly used in varied applications in engineering and science like disease modeling, climate prediction and computer networks etc.

Course Outcome: After the completion of the course, students will be able to		**Domain C or P or A**	**Level**
CO1	**Explain** conditional probability, independent events; **find** expected values and Moments of Discrete random variables with their properties.	Cognitive	Understanding Remembering
CO2	**Find** distribution function, Marginal density function, conditional density function and to **define** density function of conditional distribution functions normal, exponential and gamma distributions.	Cognitive	Remembering
CO3	**Determine** the statistical parameters of Binomial, Poisson and Normal and to find correlation, regression and Rank Correlation coefficient of two variables.	Cognitive	Understanding
	Moments, skewness and Kurtosis.	Psychomotor	Guided Response
CO4	**Explain** large sample test for single proportion, difference of proportion, single mean, difference of means and difference of standard deviations with simple problems.	Cognitive	Understanding
CO5	**Explain** small sample test for single mean, difference of mean and correlation coefficients, variance test, chi square test with simple problems.	Cognitive Affective	Understanding Receiving

COURSE CONTENT

UNIT I BASIC PROBABILITY 9

Probability spaces, conditional probability, independence; Discrete random variables, Independent random variables, the multinomial distribution, Poisson approximation to the binomial distribution, infinite sequences of Bernoulli trials, sums of independent random

variables; Expectation of Discrete Random Variables, Moments, Variance of a sum, Correlation coefficient, Chebyshev's Inequality.

UNIT II CONTINUOUS PROBABILITY DISTRIBUTIONS & BIVARIATE DISTRIBUTIONS 9

Continuous random variables and their properties, distribution functions and densities, normal, exponential and gamma densities. Bivariate distributions and their properties, distribution of sums and quotients, conditional densities, Bayes' rule.

UNIT III BASIC STATISTICS 9

Measures of Central tendency: Moments, skewness and Kurtosis - Probability distributions: Binomial, Poisson and Normal - evaluation of statistical parameters for these three distributions, Correlation and regression – Rank correlation

UNIT IV APPLIED STATISTICS 9

Curve fitting by the method of least squares- fitting of straight lines, second degree parabolas and more general curves. Test of significance: Large sample test for single proportion, difference of proportions, single mean, difference of means, and difference of standard deviations.

UNIT V SMALL SAMPLES 9 + 3

Test for single mean, difference of means and correlation coefficients, test for ratio of variances - Chi-square test for goodness of fit and independence of attributes

L	T	P	Total
45	0	0	45

TEXT BOOKS

1. B.S. Grewal, "Higher Engineering Mathematics", Khanna Publishers, 43rd Edition, 2015.
2. N.P. Bali and M. Goyal, "A text book of Engineering Mathematics", Laxmi Publications, 2010.
3. Veerarajan T., "Probability, Statistics and Random processes", Tata McGraw-Hill, New Delhi,

REFERENCE BOOKS

1. P. G. Hoel, S. C. Port and C. J. Stone, "Introduction to Probability Theory", Universal Book Stall, 2003
2. S. Ross, "A First Course in Probability", Pearson Education India, 2002.
3. W. Feller, "An Introduction to Probability Theory and its Applications", Vol. 1, Wiley, 1968.
4. E. Kreyszig, "Advanced Engineering Mathematics", John Wiley & Sons, 2006.

E –REFERENCES

nptel

Probability and Statistics by Prof.Someshkumar, Department of Mathematics, IIT Kharagpur. (http://nptel.ac.in/noc/noc_courselist.php)

Mapping of CO with PO's

	GA1	GA 2	GA 3	GA 4	GA 5	GA 6	GA 7	GA 8	GA 9	GA 10	GA 11	GA 12
CO 1	3	2	1	0	0	0	0	0	1	1		1
CO 2	3	2	1	0	0	0	0	0	1	1		1
CO 3	3	2	1	1	0	0	0	0	1	1		1
CO 4	3	2	1	1	1	1	0	0	1	1	1	1
CO 5	3	2	1	1	1	1	1	0	1	1	1	1
Total	**15**	**10**	**5**	**3**	**2**	**2**	**1**	**0**	**5**	**5**	**2**	**5**
Scaled Value	3	2	1	1	1	1	1	0	1	1	1	1

Note:	**Total**	0	1-6	7-12	13-18
	Scaled value	0	1	2	3
	Relation	No	Low	Medium	High

Semester : **IV**

Course Code : **XCE 402**

Course Name : **MECHANICS OF SOLIDS-II**

Prerequisite : **MECHANICS OF SOLIDS-I**

L	T	P	C
2	1	0	3

C	P	A
2.5	0	0.5

L	T	P	H
2	2	0	4

	Course Outcome: After the completion of the course, students will be able to	Domain C or P or A	Level
CO1	Determine the deflection of Simple and Curved members	Cognitive	Analyse
CO2	Analyse indeterminate structures for shear force and bending moment.	Cognitive& Affective	Analyzing & Respond
CO3	Discuss the failure criteria of the column and cylinder based on end condition	Cognitive& Affective	Understanding & Respond
CO4	Compute the deflection of beams by energy principles	Cognitive& Affective	Application & Receive
CO5	Analyse the degrees of freedom for static and kinematic frames.	Cognitive	Analyse

COURSE CONTENT

UNIT I **DEFLECTIONS OF BEAMS** **9**

Introduction, Equation of Elastic Curve, Methods for Determining Deflections (Double Integration, Macaulay's Method, Moment-Area Method). Strain energy and dummy unit load approaches to deflection of Simple and Curved members.

UNIT II **INDETERMINATE BEAMS** **9**

Propped cantilever and fixed beams-fixed end moments and reactions– Theorem of Three Moments – Shear force and Bending moment diagrams for continuous beams.

UNIT III **COLUMNS AND THICK CYLINDERS** **9**

Introduction – Short and Long Columns, Euler's Theory, Rankine-Gordon Formula, Eccentrically Loaded Columns - Thick cylinders – compound cylinders.

UNIT IV **ENERGY PRINCIPLES** **9**

Castigliano's theorems – principle of virtual work – Maxwell's reciprocal theorems.- application of energy theorems for computing deflections in beams and trusses.

UNIT V **INDETERMINATE BEAMS AND FRAMES** **9**

Degree of static and kinematic indeterminacies for beams and plane frames - analysis of indeterminate pin-jointed frames - rigid frames.

L	T	P	Total
45	0	0	45

TEXT BOOKS

1 .Dr. R.K.Bansal,“ Strength of Materials”, Laxmi Publications Pvt Ltd, New Delhi, 8th Edition

2. R.K. Rajput, “ Strength of Materials”, S.Chand and Company Ltd, New Delhi, 8th Edition

3. R.S. Khurmi, “Strength of Materials”, S. Chand & Company Ltd, New Delhi, 2013

REFERENCE BOOKS

1. William Nash, Theory and Problems of Strength of Materials, Schaum’s Outline Series, McGraw-Hill International Edition.

4. Strength of Materials by R. Subramanian, Oxford University Press, New Delhi

5. Egor P Popov, “Engineering Mechanics of Solids”, Prentice Hall of India, New Delhi, 2012, Second Edition.

Mapping of CO with PO’s

	PO1	PO2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2
CO 1	1					1			1					
CO 2	2	1				1		1			1		3	
CO 3	1				1		1				1			
CO 4	3	1		3			1						1	
CO 5	3	3											1	
Total	10	5	0	3	1	2	2	1	1	0	2	0	5	0
Scaled Value	**2**	**1**	**0**	**1**	**1**	**1**	**1**	**1**	**1**		**1**		**1**	

Note:

Total	0	1-5	6-10	11-15
Scaled value	0	1	2	3
Relation	No	Low	Medium	High

Semester : **IV**

Course Code : **XCE 403**

Course Name : **SURVEYING II**

Prerequisite : **SURVEYING I**

L	T	P	C
3	0	0	3

C	P	A
2.5	0	0.5

L	T	P	H
3	0	0	3

Course Objectives

- To understand the basics and elements of different types of curves on roads and their preliminary survey
- To get introduced to different geodetic methods of survey such as triangulation, trigonometric leveling
- To learn about surveying applications in setting out of curves, buildings, culverts and tunnels
- To learn about errors in measurements and their adjustments in a traverse
- To get introduced to modern advanced surveying techniques

Course Outcome: After the completion of the course, students will be able to		**Domain C or P or A**	**Level**
CO1	Illustrate the features of Triangulation system	Cognitive	Understand
CO2	Understand the importance of advanced techniques involved in surveying	Cognitive	Understand
CO3	Apply the knowledge, techniques, skills, and applicable tools of the discipline to engineering and surveying activities	Applying	Applying
CO4	Transfer the knowledge for the implementation of Civil infrastructure facilities	Cognitive Affective	Applying
CO5	Relate the knowledge on surveying to the new frontiers of science	Cognitive	Understand

COURSE CONTENT

UNIT I TRIANGULATION AND TRILATERATION

Triangulation - network- Signals. Baseline - choices - instruments and accessories - extension of base lines - corrections - Intervisibility of height and distances - Trigonometric levelling - Axis single corrections

UNIT II CURVE SETTING

Elements of simple and compound curves – Method of setting out– Elements of Reverse curve - Transition curve – length of curve – Elements of transition curve - Vertical curves

UNIT III MODERN FIELD SURVEYING

Principle of Electronic Distance Measurement, Modulation, Types of EDM instruments, Distomat, Total Station – Parts of a Total Station – Accessories – Advantages and Applications, Field Procedure for total station survey, Errors in Total Station Survey; Global Positioning Systems- Segments, GPS measurements, errors and biases, Surveying with GPS, Co-ordinate transformation, accuracy considerations.

UNIT IV PHOTOGRAMMETRY SURVEYING

Introduction, Basic concepts, perspective geometry of aerial photograph, relief and tilt displacements, terrestrial photogrammetry, flight planning; Stereoscopy, ground control extension for photographic mapping- aerial triangulation, radial triangulation, methods; photographic mapping- mapping using paper prints,

mapping using stereo plotting instruments, mosaics, map substitutes.

UNIT V REMOTE SENSING

Introduction –Electromagnetic Spectrum, interaction of electromagnetic radiation with the atmosphere and earth surface, remote sensing data acquisition: platforms and sensors; visual image interpretation; digital image processing.

L	T	P	Total
3	1		4

TEXT BOOKS

1. Punmia B.C. Surveying, Vols. I, II and III, Laxmi Publications, 2007
2. Madhu, N, Sathikumar, R and Satheesh Gobi, Advanced Surveying: Total Station,GIS and Remote Sensing, Pearson India, 2006.
3. Manoj, K. Arora and Badjatia, Geomatics Engineering, Nem Chand & Bros, 2011.

REFERENCE BOOKS

1. Bhavikatti, S.S., Surveying and Levelling, Vol. I and II, I.K. International, 2010.
2. Chandra, A.M., Higher Surveying, Third Edition, New Age International (P) Limited, 2002.
3. Anji Reddy, M., Remote sensing and Geographical information system, B.S. Publications, 2001.

E-REFERENCES

NPTEL Video Lectures on Surveying

Mapping of CO with PO's

	PO1	PO2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2
CO 1	2		2	2	1				1		1	1	1	
CO 2	1		1	1	1				1		1	1		
CO 3	1			1					1				1	
CO 4	1		1						1					
CO 5	2			1	1						1		1	1
Total	7		4	5	3				4		3	2	3	1
Scaled Value	**2**		**1**	**1**	**1**				**1**		**1**	**1**	**1**	**1**

Note:

Total	0	1-5	6-10	11-15
Scaled value	0	1	2	3
Relation	No	Low	Medium	High

Semester : **IV**

Course Code : **XCE 404**

Course Name : **GEOTECHNICAL ENGINEERING – I**

Prerequisite : **NIL**

L	T	P	C
2	1	0	3

C	P	A
2	0.5	0.5

L	T	P	H
2	1	0	3

Course Objectives

- To understand the soil properties, composition and structure
- To Familiarize the students an understanding of permeability and seepage of soils
- To learn the stress-strain relationship
- To know about the strength of soil and its analysis

Course Outcome: After the completion of the course, students will be able to		**Domain C or P or A**	**Level**
CO1	**Identify** and **analyze** various types of soils for engineering utilization.	Cognitive & Psychomotor	Remembering & Observation
CO2	**Determine** the necessary index and engineering properties of soils.	Cognitive Affective Psychomotor	Analyzing Respond to Phenomena Observation
CO3	**Predicts** the stress distribution pattern of soil	Cognitive, Affective & Psychomotor	Application Respond to Phenomena Manipulation
CO4	**Illustrate** the failure modes of Soil	Cognitive & Psychomotor	Understanding Manipulation
CO5	**Investigate** the soil using appropriate methods and equipments.	Cognitive & Psychomotor	Remembering Observation

COURSE CONTENT

UNIT I **SOIL PROPERTIES AND SUB SOIL INVESTIGATION** **9**

Origin of Soils and Rocks; Rock cycle; Soil minarology; Index properties including consistency limits and grain size distribution – Identification and classification of soil – Textural HRB and BIS specification

Methods of exploration, geophysical and conventional methods; Sounding drilling and boring technique; Field tests – penetration tests

UNIT II **SOIL - WATER STATICS** **7**

Concept effective and neutral stresses – Darcy's law, Permeability – Field and Laboratory permeability tests –Seepage flow, seepage pressure, exit gradient - Flownet – significance of Laplace equation – quick sand condition, Liquefaction

UNIT III **COMPRESSIBILITY AND CONSOLIDATION OF SOIL** **12**

Compaction – Factors affecting compaction – proctor test – Field compaction – Field compaction controls, CBR value and CBR test

Consolidation of soils – Terzaghi's one dimensional consolidation theory – pressure void ratio relationship – prediction of pre consolidation pressure – Total settlement and time rate settlement – secondary compression – coefficient of consolidation – Curve fitting methods, consolidation models.

UNIT IV **STRESSES IN SOIL FROM SURFACE LOADS** **8**

Vertical stress distribution in soil - Boussinesq's and Westerguard's equations – Newmark's influence chart – Principle, Construction and use - Equivalent point load and other approximate procedures, stress isobars & pressure bulbs

UNIT V SHEAR STRENGTH OF SOIL 9

Shear Strength; Mohr – Coulomb failure criterion and models – laboratory and field tests – shear properties of cohesion less and cohesive soils - Shear Strength. Parameters for under consolidated, normally consolidated and over consolidated clays; Soil sensors applied in field, Modern advancements; Trenchless Technology

L	T	P	Total
45	0	0	45

TEXT BOOKS

1. Murthy, V. N. S. "Geotechnical Engineering: Principles and Practices ofSoil Mechanics and Foundation Engineering", CRC Press, 2002
2. Ranjan, Gopal & Rao, A.S.R., "Basic and Applied Soil Mechanics", New Age Int. Pvt. Ltd., 2004.
3. Venkatramaiah, C. "Geotechnical Engineering", New Age International Publishers, New Delhi, 3rd edition, 2005, Reprint 2011.
4. Punmia. B.C.,Asok Kumar Jain and Arun Kumar Jain, "Soil Mechanics and Foundations" Laxmi Publications Pvt. Ltd., New Delhi, Sixteenth edi.tion,2005

REFERENCE BOOKS

1. Terzaghi, K., Peck, R. B. &Mesri, G., "Soil Mechanics in Engineering Practice", Wiley, 1996.
2. Craig, R.F. "Craig's Soil Mechanics", 7th Ed., Spon Press, 2004.
3. Holtz, R.D. & Kovacs, W.D., "An Introduction to Geotechnical Engineering", Prentice Hall, 1981.
4. Lambe, T.W. & Whitman, R.V., "Soil Mechanics", John Wiley & Sons, 1979.
5. Mitchell, J.K. & Soga, K., "Fundamentals of Soil Behaviour", John Wiley & Sons, 2005.
6. Coduto, D.P. "Geotechnical Engineering: Principles and Practices", Pearson Education, Prentice Hall, 2007.
7. Bolton, M.D. "A Guide to Soil Mechanics", Universities Press, 2003.
8. Das, B.M. "Principles of Geotechnical Engineering", Thomson Books, 2013.

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2. https://nptel.ac.in/courses/105/101/105101201/
3. http://www.nitttrchd.ac.in/sitenew1/civil/civil.php#page=page-1

IS Codes

1. IS 1498:1970, Classification and identification of soils for general Engineering purposes (first revision) Reaffirm Dec 2011

Mapping of CO with PO's

	PO1	PO2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2
CO 1	2	1		1		1		2		1		1	2	2
CO 2	1	2	1	1		2		2		1		1	2	2
CO 3	2	1	1	1		1		3		1	1	1	2	2
CO 4	1	2	1	1	1	1		2		1	1	1	2	2
CO 5	1	3	1	1	1	1	2	2	3	1	1	1	2	2
Total	7	9	4	5	2	6	2	11	3	5	3	5	10	10
Scaled Value	**2**	**2**	**1**	**1**	**1**	**2**	**1**	**3**	**1**	**1**	**1**	**1**	**2**	**2**

Note:

Total	0	1-5	6-10	11-15
Scaled value	0	1	2	3
Relation	No	Low	Medium	High

Semester : IV

Course Code : XCE 405

Course Name : CONCRETE TECHNOLOGY

Prerequisite : NIL

L	T	P	C
3	0	0	3

C	P	A
2.5	0	0.5

L	T	P	H
3	0	0	3

Course Objectives

- Acquire knowledge on construction materials
- Study the properties of fresh and hardened concrete.
- Learn the mix design procedure

Course Outcome: After the completion of the course, students will be able to		**Domain C or P or A**	**Level**
CO1	**Identify** and **test** the properties of ingredients of Concrete	C	(Understand)
CO2	**Identify** and **test** the properties of Concrete	C	(Remember)
CO3	**Carry out** the mix design of M20 and M35 as per IS456	C,A	(Understand) Manipulation
CO4	**Ensure** quality during Transporting, Laying, Compacting and finishing of concrete	C,A	(Understand) Manipulation
CO5	**Adopt** special concreting technologies to meet out the modern construction requirements.	C	(Remember)

COURSE CONTENT

UNIT I CONSTITUENT MATERIALS 9

Cement: - Properties - Testing – modern methods of analysis - Blended Cements; Aggregates: Classification- Properties - Testing - Artificial aggregates; Water: Various sources - Quality Testing; Admixtures and Chemicals: Properties – Uses - Use of eco-friendly recyclable and sustainable materials

UNIT II FRESH CONCRETE 9

Rheology - Workability: Factors affecting - Measurement - Testing; Manufacture of concrete: Process -Compaction; Properties: Segregation - Bleeding - Setting times - Curing - Finishing.

UNIT III HARDENED CONCRETE 9

Strength: Compressive - Tensile - Flexure - Strength relationships - Testing as per IS codes – Factors influencing strength – NDT techniques; Thermal properties: Durability of concrete: Shrinkage - Creep - Cracks - Acid, Sulphate and Chloride attack.

UNIT IV CONCRETE MIX DESIGN 9

Concepts of mix design - Factors influencing mix design – ACI and IS code recommended mix design methods; Non-pumpable concrete; Pumpable concrete:.

UNIT V SPECIAL CONCRETES 9

Manufacture, Properties and Uses: High strength and high performance concrete - Waterproofing concrete - Fiber Reinforced concrete - Light weight and High Density Concrete - Aerated - No fines - Organic concrete; Special concreting methods: Self compacting concrete - Hot and Cold weather concreting - Prepacked - Vacuum - Gunite and Shotcrete – Ferrocement - Quality control - Sampling and testing-Acceptance criteria

L	T	P	Total
45	0	0	45

TEXT BOOKS

1. Shetty M S. Concrete Technology: Theory and Practice, 7th Edition, S. Chand & Company Ltd-New Delhi, 2014.
2. Varghese PC. Building Materials (English), 2nd Edition, PHI Learning, 2014.
3. Neville AM. Properties of Concrete, Pearson India, 2012.
4. Zongjin Li. Advanced Concrete Technology, John Wiley & Sons. 2011.

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1. Santhakumar AR. Concrete Technology, 1st Edition , Oxford University Press-New Delhi, 2006.
2. Ghambir ML. Concrete Technology, 5th Edition , McGraw Hill Education, 2013.
3. Sandor Popovic. Concrete Materials, 2nd Ed.: Properties, Specifications, and Testing, William Andrew, 2012.
4. John Newman. Advanced Concrete Technology 3: Processes 1st Edition, Elsevier Science, 2003.

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http://nptel.ac.in/courses/105102012

http://nptel.ac.in/courses/105104030

http://freevideolectures.com/Course/3357/Concrete-Technology

http://engineeringvideolectures.com/course/289

Mapping of CO with PO's

	PO1	PO2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2
CO 1	1	3	1	1					1	3	1	3	1	
CO 2					1				2	2				
CO 3	1	3	3	3					1				3	
CO 4	1					1	1		1			1		1
CO 5					1					3				
Total	3	6	4	4	2	1	1		5	8	1	4	4	1
Scaled Value	1	2	1	1	1	1	1		1	2	1	1	1	1

Note:

Total	0	1-5	6-10	11-15
Scaled value	0	1	2	3
Relation	No	Low	Medium	High

Semester : **IV**

Course Code : **XUM 406**

Course Name : **ECONOMICS FOR ENGINEERS**

Prerequisite : **NIL**

L	T	P	C
3	0	0	3

C	P	A
3	0	0

L	T	P	H
3	0	0	3

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

		Domain C or P or A	**Level**
CO1	**Understand** the concepts of Economics in Engineering and **Demonstrate** in creation of Cost sheets.	Cognitive	Remember, Understand, Apply
CO2	**Analyze and Interpret** Break-even analysis and Social cost benefit analysis	Cognitive	Remember, Understand, Apply
CO3	**Illustrate** and **Make use of** value engineering procedures	Cognitive	Remember, Understand, Apply
CO4	**Understand** , **analyze and Solve** replacement problems	Cognitive	Remember, Understand, Apply
CO5	**Explain** depreciation	Cognitive	Remember, Understand, Apply

COURSE CONTENT

UNIT I **INTRODUCTION TO ECONOMICS** **9**

Flow in an economy, Law of supply and demand, Concept of Engineering Economics – Engineering efficiency, Economic efficiency, Scope of engineering economics- types of costing, element of costs, preparation of cost sheet and estimation, Marginal cost, Marginal Revenue, Sunk cost, Opportunity cost.

UNIT II **BREAK-EVEN ANALYSIS & SOCIAL COST BENEFIT ANALYSIS** **9**

Margin of Safety, Profit, Cost & Quantity analysis-Product Mix decisions and CVP analysis, Profit/Volume Ratio (P/V Ratio), Application of Marginal costing, Limitations. **Social Cost Benefit Analysis**: compare different project alternatives, Calculate direct, indirect and external effects; Monetizing effects; Result of a social cost benefit analysis.

UNIT III **VALUE ENGINEERING & COST ACCOUNTING** **9**

Value engineering – Function, aims, Value engineering procedure - Make or buy decision .Business operating costs, Business overhead costs, Equipment operating costs

UNIT IV **REPLACEMENT ANALYSIS** **9**

Replacement analysis –Types of replacement problem, determination of economic life of an asset, Replacement of an asset with a new asset.

UNIT V **DEPRECIATION** **9**

Depreciation- Introduction, Straight line method of depreciation, declining balance method of depreciation-Sum of the years digits method of depreciation, sinking fund method of depreciation, Annuity method of depreciation, service output method of depreciation

L	T	P	Total
45	0	0	45

TEXT BOOKS

1. S P Gupta, Ajay Sharma & Satish Ahuja, "Cost Accounting", V K Global Publications, Faridabad, Haryana, 2012
2. S.P.Jain & Narang, "Cost accounting – Principles and Practice", Kalyani Publishers, Calcutta, 2012
3. Panneer Selvam, R, "Engineering Economics", Prentice Hall of India Ltd, New Delhi, 2013.
4. William G.Sullivan, James A.Bontadelli & Elin M.Wicks, "Engineering Economy", Prentice Hall International, New York, 2001.

REFERENCE BOOKS

1. Luke M Froeb / Brian T Mccann, " Managerial Economics – A problem solving approach" Thomson learning 2007
2. Truett & Truett, "Managerial economics- Analysis, problems & cases " Wiley India 8th edition 2004.
3. Chan S.Park, "Contemporary Engineering Economics", Prentice Hall of India, 2002.
4. Donald.G. Newman, Jerome.P.Lavelle, "Engineering Economics and analysis" Engg. Press, Texas, 2002

Mapping of CO with PO's

	PO1	PO2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2
CO 1			2	1	1		1		1		1	1		
CO 2	1	1	3	2	3		1	1						
CO 3					2		1		1					
CO 4	1	1	2	2	2		1				1	1		
CO 5	2	3		2	3		1	2	1			2		
Total	4	5	7	7	11		5	3	3		2	4		
Scaled Value	1	1	2	2	3		1	1	1		1	1		

Note:

Total	0	1-5	6-10	11-15
Scaled value	0	1	2	3
Relation	No	Low	Medium	High

Semester : IV

Course Code : XUM 407

Course Name : DISASTER MANAGEMENT

Prerequisite : NIL

L	T	P	C
3	0	0	3

C	P	A
3	0	0

L	T	P	H
3	0	0	3

	Course Outcome: After the completion of the course, students will be able to	Domain C or P or A	Level
CO1	Understand the concepts of disasters, their significance and types	Cognitive	Understand
CO2	Understand the relationship between vulnerability, disasters, disaster prevention and risk reduction	Cognitive	Understand
CO3	Able to understanding of preliminary approaches of Disaster Risk Reduction (DRR)	Cognitive	Understand
CO4	Develop awareness of institutional processes in the country	Cognitive	Application
CO5	Develop rudimentary ability to respond to their surroundings with potential disaster response in areas where they live, with due sensitivity	Cognitive	Application

COURSE CONTENT

UNIT I INTRODUCTION TO DISASTERS 6

Importance &Significance, Types of Disasters, Climate Change, DM cycle

UNIT II RISK ASSESSMENT 12

Risk, Vulnerability, Types of Risk, Risk identification, Emerging Risks, Risk Assessment, Damage Assessment, Risk modeling.

UNIT III DISASTER MANAGEMENT 10

Phases, Cycle of Disaster Management, Institutional Framework, Incident Command System, DM Plan, Community Based DM, Community health and safety, Early Warning and Disaster Monitoring, Disaster Communication, Role of GIS and Remote Sensing, Do's and Don'ts in various disasters.

UNIT IV DISASTER RISK MANAGEMENT IN INDIA 10

Hazard and Vulnerability profile of India, Components of Disaster Relief: Water, Food, Sanitation, Shelter, Health, Waste Management, Institutional arrangements (Mitigation, Response and Preparedness), Disaster Management Act and Policy – Other related policies, plans, programmes and legislation

UNIT V DISASTER MANAGEMENT: APPLICATIONS AND CASE STUDIES 7

Landslide Hazard Zonation, Earthquake Vulnerability Assessment of Buildings and Infrastructure, Drought Assessment, Coastal Flooding, Forest Fire, Man Made disasters, Space Based Inputs for Disaster Mitigation and Management, Cast Study

L	T	P	Total
45	0	0	45

TEXT BOOKS

1. Singhal J.P. Disaster Management, Laxmi Publications, 2010. ISBN-10: 9380386427 ISBN-13: 978-9380386423
2. Tushar Bhattacharya, Disaster Science and Management, McGraw Hill India Education Pvt. Ltd., 2012. **ISBN-10:** 1259007367, **ISBN-13:** 978-1259007361)
3. Gupta Anil K, Sreeja S. Nair. Environmental Knowledge for Disaster Risk Management, NIDM, New Delhi, 2011
4. KapurAnu Vulnerable India: A Geographical Study of Disasters, IIAS and Sage Publishers, New Delhi, 2010

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1. Siddhartha Gautam and K Leelakrisha Rao, "Disaster Management Programmes and Policies", Vista International Pub House, 2012
2. Arun Kumar, "Global Disaster Management", SBS Publishers, 2008
3. Pardeep Sahni, Alka Dhameja and Uma medury, "Disaster mitigation: Experiences and reflections", PHI, 2000
4. Govt. of India: Disaster Management Act , Government of India, New Delhi, 2005
5. Government of India, National Disaster Management Policy, 2009

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- NIDM Publications at http://nidm.gov.in- Official Website of National Institute of Disaster Management (NIDM), Ministry of Home Affairs, Government of India
- http://cwc.gov.in , http://ekdrm.net , http://www.emdat.be , http://www.nws.noaa.gov , http://pubs.usgs.gov , http://nidm.gov.ini http://www.imd.gov.ini

Mapping of CO with PO's

	GA1	GA2	GA3	GA4	GA5	GA6	GA7	GA8	GA9	GA10	GA11	GA12
CO 1	1			1		2	2	1	1			1
CO 2	1	1	2	2		1	1		1	1	1	1
CO 3	1	1	2	1	3	1	1		1		1	1
CO 4	1	1	2	2		1	1	2	2	2	1	1
CO 5	1	1		1		1		1	1	1	1	1
Total	5	4	6	7	3	6	5	4	6	4	4	5
Scaled Value	1	1	2	2	3	2	1	1	2	1	1	1

Note:

Total	0	1-5	6-10	11-15
Scaled value	0	1	2	3
Relation	No	Low	Medium	High

Semester	:	**IV**
Course Code	:	**XCE 408**
Course Name	:	**COMPUTER AIDED CIVIL ENGINEERING DRAWING**
Prerequisite	:	**NIL**

L	T	P	C
0	0	1	1

C	P	A
0	3	0

L	T	P	H
0	0	2	2

Course Objectives

CO1	Draw and develop Parametric design and the conventions of formal engineering drawing	Psychomotor	Perception
CO2	Draw and interpret 2D & 3D drawings.	Psychomotor	Mechanism
CO3	Communicate a design idea/concept graphically	Psychomotor	Mechanism
CO4	Draw a plan, Elevation and Section for framed and Industrial buildings using CADD	Psychomotor	Mechanism
CO5	Draw an Isometric and Perspective view of buildings.	Psychomotor	Perception

EXPERIMENTS **30 Hrs.**

1. Introduction about autoCAD and its commands
2. Conventional Signs and Symbols
3. Carpentary Joints (Housed Joint, Notched joint, Dovetails Joint, Stub Tenon Joint, Havled joint (Bevel and Straight), Mortise and Tension Joint)
4. Panelled Door and Flush door
5. Panelled Window and Glazed window
6. Roof Trusses
7. Drawing a Plan, Section and Elevation of Single storeyed buildings
8. Drawing a Plan, Section and Elevation of Primary school building for 250 students
9. Drawing a Plan, Section and Elevation of Primary Health Centre
10. Drawing a Plan, Section and Elevation of Office Building
11. Plan and elevation of Dog legged stair case

L	T	P	Total
15	0	30	45

TEXT BOOKS

1. Subhash C Sharma &Gurucharan Singh (2005), "Civil Engineering Drawing", Standard Publishers
2. Ajeet Singh (2002), "Working with AUTOCAD 2000 with updates on AUTOCAD 200I", Tata- McGraw-Hill Company Limited, New Delhi
3. Sham TickooSwapna D (2009), "AUTOCAD for Engineers and Designers", Pearson Education
4. Venugopal (2007), "Engineering Drawing and Graphics+AUTOCAD", New Age International Pvt. Ltd

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1. Corresponding set of CAD Software Theory and User Manuals.
2. Balagopal and Prabhu (1987), "Building Drawing and Detailing", Spades publishing KDR building, Calicut,
3. Malik R.S., Meo, G.S. (2009) Civil Engineering Drawing, Computech Publication Ltd New Asian
4. Sikka, V.B. (2013), A Course in Civil Engineering Drawing, S.K.Kataria& Sons,

Mapping of CO with PO's

	PO1	**PO2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO1**	**PSO2**
CO 1	1		1	3	1			2	3	1		3	2	2
CO 2				3	3	2		1	3	2	1	1	1	1
CO 3		2	1	3	1	3		3	3	1		3	2	
CO 4	1		2	3	2	3		2	1			3	1	**2**
CO 5		2	1	3	3	1	1	1	2	2		3	2	**2**
Total	2	4	4	15	10	9	1	9	12	6	1	13	8	**7**
Scaled Value	**1**	**1**	**1**	**3**	**2**	**2**	1	**2**	**2**	**1**	**1**	**3**	2	2

Note:

Total	0	1-5	6-10	11-15
Scaled value	0	1	2	3
Relation	No	Low	Medium	High

Semester	**:**	**IV**
Course Code	**:**	**XCE409**
Course Name	**:**	**SURVEYING LAB**
Prerequisite	**:**	**NIL**

L	T	P	C
0	0	1	1

C	P	A
0	3	0

L	T	P	H
0	0	2	2

Course Objectives

- To ensure that the student develops knowledge of the basic and conventional surveying
- To acquire knowledge about the instruments, principles behind them and working of the instruments.
- To plotting of the area from the field measurements, determination of the area and the theory behind it.

Course Outcome: After the completion of the course, students will be able to		Domain C or P or A	Level
CO1	Implement the basic surveying methods	Psychomotor	Manipulation
CO2	Determine the reduced levels using the principles of Leveling	Psychomotor	Manipulation
CO3	Draw the contour map and Measure the capacity of Reservoir	Psychomotor	Manipulation
CO4	Measure the angles and distances using Theodolite	Psychomotor	Manipulation
CO5	Measurement of distance and heights of objects using tachometric principle	Psychomotor	Manipulation

COURSE CONTENT

1. Chain surveying- Distance Measurements EDM
2. Compass Surveying- Magnetic declination and its variation
3. Plane Table Surveying-Two point and three-point problem
4. Levelling-Height of collimation and Rise and fall methods
5. Levelling- Longitudinal and cross sectioning
6. Contouring – Radial and Square
7. Theodolite surveying-Single plane method and double plane method.
8. Tachometric surveying-Determination of Instrument constants
9. Stadia Tachometry – Staff held Vertical (Angle of Elevation and Depression)
10. Tangential tachometry – Both angles of Elevation and Depression
11. Triangulation and Trilateration
12. Setting out simple circular curve
13. Area calculation and contouring using Total Station
14. Co-ordinate measurement using Global Positioning System

L	T	P	Total
0	0	30	30

TEXT BOOKS

1. Punmia B.C. Surveying, Vols. I, II and III, Laxmi Publications, 2007
2. Madhu, N, Sathikumar, R and Satheesh Gobi, Advanced Surveying: Total Station,GIS and Remote Sensing, Pearson India, 2006.
3. Manoj, K. Arora and Badjatia, Geomatics Engineering, Nem Chand & Bros, 2011.

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1. Bhavikatti, S.S., Surveying and Levelling, Vol. I and II, I.K. International, 2010.
2. Chandra, A.M., Higher Surveying, Third Edition, New Age International (P) Limited, 2002.
3. Anji Reddy, M., Remote sensing and Geographical information system, B.S. Publications, 2001.

Mapping of CO with PO's

	PO1	**PO2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO1**	**PSO2**
CO 1	1			3	1			2	3	1		3	2	2
CO 2				3	3	2		1	3	2	1	1	1	1
CO 3		2	1	3	1	3		3	3	1		3	2	
CO 4	1		2	3	2	3		2	1			3	1	**2**
CO 5		2	1	3	3	1	1	1	2	2		3	2	**2**
Total	2	4	4	15	10	9	1	9	12	6	1	13	8	**7**
Scaled Value	**1**	**1**	**1**	**3**	**2**	**2**	**1**	**2**	**2**	**1**	**1**	**3**	**2**	**2**

Note:

Total	0	1-5	6-10	11-15
Scaled value	0	1	2	3
Relation	No	Low	Medium	High

Semester	**:**	**IV**
Course Code	**:**	**XCE410**
Course Name	**:**	**GEOTECHNICAL ENGINEERING LAB**
Prerequisite	**:**	**GEOTECHNICAL ENGINEERING**

L	T	P	C
3	0	0	3

C	P	A
2	0.5	0.5

L	T	P	H
3	0	0	3

Course Objectives

- To understand the handling of equipments
- To provide the hands on training in determination of Engineering and index properties of soils, applied in field problems.
- To provide the knowledge on the use of experimental results pertaining to foundation problems

Course Outcome: After the completion of the course, students will be able to		**Domain C or P or A**	**Level**
CO1	**Identify** and **analyze** various types of soils for engineering utilization.	Psychomotor	Remembering & Observation
CO2	**Determine** the necessary index and engineering properties of soils.	Psychomotor	Analyzing Respond to Phenomena Observation
CO3	**Investigate** the soil using appropriate methods and equipments.	Psychomotor	Remembering Observation

COURSE CONTENT

Experiments in Geotechnical Engineering	**30**

- Water content determination (Oven drying method)
- Grain size distribution - Sieve analysis and Hydrometer analysis
- Determination of Specific gravity by Pycnometer and density bottle method
- Determination of Liquid and Plastic limit (Casagrande method)
- Determination of Shrinkage limit of soil
- Determination of moisture-density relationship (Standard Proctor's)
- Determination of Permeability by Constant and Variable head method
- Determination of in-situ density by sand replacement and core cutter method
- Determination of Relative density - Sand
- Unconfined compression test for fine grained soils
- Triaxial Compression Test
- Direct shear test for coarse grained soils
- California Bearing Ratio (CBR) Test
- Plate load test, SPT and SCPT – study experiments

L	T	P	Total
0	0	30	30

TEXT BOOKS

1. Murthy, V. N. S. “Geotechnical Engineering: Principles and Practices ofSoil Mechanics and Foundation Engineering”, CRC Press, 2002
2. Ranjan, Gopal & Rao, A.S.R., “Basic and Applied Soil Mechanics”, New Age Int. Pvt. Ltd., 2004.

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1. K.H. Head and R. J. Epps, “Manual of Soil Laboratory Testing vol II”, 3rd Edition, Whittles Publishing, 2011.
2. B.M. Das, “Soil Mechanics Laboratory Manual”, 6th Ed., London, University Press, 2001.
3. 2. J.E. Bowles, “Physical Properties of Soils”, 2nd Ed., McGraw Hill International, Singapore, 1990.

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2. https://nptel.ac.in/courses/105/101/105101201/
3. http://www.nitttrchd.ac.in/sitenew1/civil/civil.php#page=page-1

IS Codes

1. IS 1498:1970, Classification and identification of soils for general Engineering purposes (first revision) Reaffirm Dec 2011
2. IS 1888: 1982 Method of Load Test on Soils. • IS 1892: 1979 Code of Practice for Subsurface Investigation for Foundations
3. IS 2131: 1981 Method for Standard Penetration Test for Soils.
4. IS 2720: Part 31: 1990 Methods of Test for Soils - Part 1 to 31:
5. IS 4968: Part III: 1976 Method for Subsurface Sounding for Soils - Part II: Static Cone Penetration Test.

Mapping of CO with PO’s

	PO1	**PO2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO1**	**PSO2**
CO 1	2				3			1				1	1	1
CO 2	2				3			1				1	1	1
CO 3	2				3			1	1	1		1	1	1
Total	6				9			3	1	1		3	3	3
Scaled Value	**2**				**2**			**1**	**1**	**1**		**1**	**1**	**1**

Note:

Total	0	1-5	6-10	11-15
Scaled value	0	1	2	3
Relation	No	Low	Medium	High

Semester	**:**	**V**
Course Code	**:**	**XCE 501**
Course Name	**:**	**STRUCTURAL ANALYSIS**
Prerequisite	**:**	**MECHANICS OF SOLIDS**

L	T	P	C
2	1	0	3

C	P	A
2	0	1

L	T	P	H
2	2	0	4

Course Objectives

Students will be exposed to the theories and concepts of structural analysis.

An understanding of real issues in the behaviours of structures.

To introduce the students to various methods for the analysis of buildings

Course Outcome: After the completion of the course, students will be able to		**Domain C or P or A**	**Level**
CO1	Identify the behavior of structural element under various loading condition.	Cognitive Affective	Understand & Analyse
CO2	Analyse the continuous beams and rigid frames by slope defection method.	Cognitive Affective	Understand & Analyse
CO3	Understand the concept of moment distribution and analysis of continuous beams and rigid frames with and without sway.	Cognitive Affective	Understand & Analyse
CO4	Superimpose the effects of settlement and rotation of the supports over the regular analysis.	Cognitive Affective	Understand & Analyse
CO5	Apply knowledge on advanced methods of analysis of structures including arches and cables.	Cognitive Affective	Understand & Analyse

COURSE CONTENT

UNIT I INDETERMINATE FRAMES 12

Degree of static and kinematic indeterminacies for beams and plane frames - analysis of indeterminate pin-jointed frames - rigid frames.

UNIT II SLOPE DEFLECTION METHOD 12

Continuous beams and Rigid frames (with And without sway) – Symmetry and Asymmetry– Simplification for hinged end – Support Displacements.

UNIT III MOMENT DISTRIBUTION METHOD 12

Stiffness and carry over factors-Distribution and carryover of Moments– Analysis of continuous Beams with and without displacement – Plane Rigid Frames with and without Sway

UNIT IV MOVING LOADS AND INFLUENCE LINES 12

Influence lines for reactions in statically determinate structures – Influence lines for shear force and bending moment in beam sections – Calculation of critical stress resultants due to concentrated and distributed moving loads.

UNIT V ARCHES AND SUSPENSION CABLES 12

Types of Arches – Transfer of loads - Arch action- Horizontal forces- Analysis of Parabolic and Circular Arches(Hinged, fixed)- Cables- Components and their functions – Analysis of Suspension Cables, Reaction-Tension and Length of suspension cables.

L	T	P	Total
30	30	0	60

TEXT BOOKS

1. Vaidyanadhan, R and Perumal, P, "Comprehensive Structural Analysis – Vol. 1 & Vol. 2", Laxmi Publications, New Delhi, 2013.
2. L.S. Negi& R.S. Jangid, Structural Analysis", Tata McGraw-Hill Publications, New Delhi, 2013
3. S SBhavikatti, Structural Analysis", Vikas Publishing House, 2011.

REFERENCE BOOKS

1. C.K. Wang, "Analysis of Indeterminate Structures", Tata McGraw-Hill, 2010.
2. B.C Punmia, Ashok Kumar Jain, Arun Kumar Jain, "Theory of Structures", Laxmi Publication, 2012.
3. DevdasMenon, "Structural Analysis", Narosa Publishers, 2010.

Mapping of CO with PO's

	PO1	**PO2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO1**	**PSO2**
CO 1	2	3				1							1	
CO 2	3	1	1			1								
CO 3	1	3	2					1	1		1			
CO 4	3	2	2		1	1					1		1	
CO 5	1	1	1		1								1	1
Total	10	10	6		2	3	2	1	1		2		3	1
Scaled Value	**2**	**2**	**2**		**1**	**1**	**1**	**1**	**1**		**1**		**1**	**1**

Note:

Total	0	1-5	6-10	11-15
Scaled value	0	1	2	3
Relation	No	Low	Medium	High

Semester : **V**

Course Code : **XCE 502**

Course Name : **TRANSPORTATION ENGINEERING**

Prerequisite : **NIL**

L	T	P	C
2	1	0	3

C	P	A
2	0.5	0.5

L	T	P	H
2	1	0	3

Course Objectives

- To understand the importance of transportation and characteristics, the history of highway development, surveys and classification of roads
- To study about the geometric design of highways, traffic characteristics and design of intersections, the pavement materials and design
- To know about the basics and design of various components of railway engineering, the types and functions of track, junctions and railway stations
- To learn about the aircraft characteristics, planning and components of airport
- To study about the types and components of docks and harbours
- To know about various urban transportation systems and Intelligent Transportation Systems

Course Outcome: After the completion of the course, students will be able to		**Domain C or P or A**	**Level**
CO1	**Carryout** surveys involved in planning and highway alignment, **design** cross section elements, sight distance, horizontal and vertical alignment	Cognitive & Affective Psychomotor	Remembering Respond & Observation
CO2	**Implement** traffic studies, traffic regulations and control, and intersection design determine the characteristics of pavement materials design flexible and rigid pavements as per IRC	Cognitive Psychomotor	Analyzing Observation
CO3	**Carry out** the surveys for railways, airports and harbours	Cognitive, Affective & Psychomotor	Application Respond to Phenomena Manipulation
CO4	**Plan** the layout of different types of terminals	Cognitive & Affective	Understanding Manipulation
CO5	**Demonstrate** the fundamentals of Intelligent Transportation Systems	Cognitive & Psychomotor	Remembering Observation

COURSE CONTENT

UNIT I INTRODUCTION **9**

Importance of transportation, different modes of transportation, characteristics of road transport, scope of highway and traffic engineering Highway development and planning: Importance, classification of roads, road patterns, planning surveys; highway alignment and surveys Highway Geometric Design: Cross section elements, sight distance, design of horizontal and vertical alignment

UNIT II TRAFFIC ENGINEERING **9**

Traffic characteristics - Traffic studies-speed, volume, speed and delay, origin-destination, parking and accident studies; capacity of urban roads and highways; traffic operations-regulation and control; design of intersections- at grade and grade separated Pavement Materials and Design: Specifications and tests on pavement materials, pavement design factors, design of flexible and rigid pavements as per IRC

UNIT III	RAILWAY ENGINEERING	9

Location surveys and alignment - Permanent way - Gauges - Components - Functions and requirements - Geometric design Track Junctions-Points and crossings - types and functions - design and layout - simple problems - Railway stations and yards. Signaling and interlocking - control systems of train movements

UNIT IV	AIRPORT ENGINEERING	7

Aircraft characteristics - Airport obstructions and zoning - Runway - taxiways and aprons- Terminal area planning

UNIT V	DOCKS AND HARBOURS AND URBAN TRANSPORTATION SYSTEMS	11

Types - Layout and planning principles- breakwaters - docks- wharves and quays - Transit sheds- warehouses- navigation aids.

Bus transit - Mass Rapid Transit System - Light Rail Transit. Transport economics and Financing - Intelligent Transportation Systems (ITS)

L	T	P	Total
45	0	0	45

TEXT BOOKS

1. Khanna, S.K and Justo, C.E.G., Highway Engineering, Nem Chand and Bros. 2001
2. Kadiyali, Principles of Highway Engineering, Khanna Publishers, 2019
3. M.M. Agarwal, Railway Engineering, Prabha & Co. 2007.
4. Khanna, S.K. and Arora, M.G. Airport Planning and Design, Nemchand and Bros. 1999.

REFERENCE BOOKS

1. Kadiyali, L.R, Traffic Engineering and Transport Planning, Khanna Publishers, New Delhi, 1999
2. Oza and Oza, Elements of Dock and Harbour Engineering, Charotar Publishing House, 1996.
3. Vazirani V N and Chandola S P “Transportation Engineering - Vol.2”, Khanna Publishers, 1998

E-REFERENCES

1. https://nptel.ac.in/courses/105/101/105101087/
2. https://nptel.ac.in/courses/105/105/105105107/
3. https://nptel.ac.in/courses/105/104/105104098/

IS Codes

1. IRC and IRC SP codes and manuals

Mapping of CO with PO's

	PO1	PO2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2
CO 1	3	1		1		1		2		1		1	2	1
CO 2	1	2	1	1		2		2		1		1	1	2
CO 3	1	2	1	1		1		2		1	1	1	2	1
CO 4	2	2	1	1	1	2		1		1	1	1	2	2
CO 5	1	3	1	1	1	1	2	2	3	1	1	1	1	1
Total	8	10	4	5	2	7	2	9	3	5	3	5	8	7

Scaled Value

Note:

Total	0	1-5	6-10	11-15
Scaled value	0	1	2	3
Relation	No	Low	Medium	High

Semester	**:**	**V**
Course Code	**:**	**XCE 503**
Course Name	**:**	**ENVIRONMENTAL ENGINEERING**
Prerequisite	**:**	**NIL**

L	T	P	C
3	0	0	3

C	P	A
2.5	0	0.5

L	T	P	H
3	0	0	3

Learning Objectives

The objectives of this course is

- To acquire the knowledge on extent of pollution on land, water and air.
- To understand the physical, chemical, and biological phenomena for successful design, operation and maintenance of water and sewage treatment plants.

To make the students conversant with the processing and disposal of municipal solid waste and Hazardous Waste.

Course Outcome: After the completion of the course, students will be able to		**Domain C or P or A**	**Level**
CO1	Understand the qualities of water and wastewater	Cognitive	Knowledge
CO2	Analyse the principles of water and wastewater treatment technologies and their functions	Cognitive	Comprehension
CO3	Plan strategies to control, reduce and monitor air and noise pollution.	Cognitive	Analysis
CO4	Identify the most appropriate technique for solid waste treatment and disposal	Cognitive Affective	Understand & Analyse
CO5	Understand the fundamentals of Plumbing work in residential buildings	Cognitive Affective	Understand

COURSE CONTENT

UNIT I WATER AND SEWAGE 12

Water: -Sources of Water and quality issues, water quality requirement for different beneficial uses, Water quality standards, water quality indices, Water Supply systems, Need for planned water supply schemes, Water demand industrial and agricultural water requirements, Components of water supply system; Transmission of water, Distribution system, Various valves used in W/S systems, service reservoirs and design.

Sewage- Wastewater quality parameters Storm Water- Quantification and design of Storm water; Sewage and Sullage, Quantity of Sewage, Sewage flow variations. Conveyance of sewage- Sewers, shapes design parameters, operation and maintenance of sewers, Sewage pumping; Sewerage, Sewer appurtenances, Design of sewerage systems, Pollution due to improper disposal of sewage. Government authorities and their roles in water supply, sewerage disposal

UNIT II WATER AND WASTEWATER TREATMENT 10

Water Treatment: Aeration, sedimentation, coagulation flocculation, filtration, disinfection, advanced treatments like adsorption, ion exchange, membrane processes.

Wastewater treatment: Aerobic and anaerobic treatment systems, suspended and attached growth systems, Septic tank, grey water treatment .

UNIT III	AIR AND NOISE	8

Air - Composition and properties of air, Quantification of air pollutants, Monitoring of air pollutants, Effects of Air pollution, Air pollution- Occupational hazards, Urban air pollution automobile pollution, Air quality standards, Control measures for Air pollution, construction and limitations.

Noise- Basic concept, measurement and various control methods.

UNIT IV	SOLID AND HAZARDOUS WASTE MANAGEMENT	8

Solid waste management-Municipal solid waste, Composition and various chemical and physical parameters of MSW, Collection, transport, treatment and disposal of MSW. Special MSW: waste from commercial establishments and other urban areas, solid waste from construction activities, biomedical wastes. Government authorities and their roles in Solid waste management and monitoring/control of environmental pollution.

Hazardous waste: Types and nature of hazardous waste

UNIT V	BUILDING PLUMBING	7

Introduction to various types of home plumbing systems for water supply and waste water disposal, high rise building plumbing, Pressure reducing valves, Break pressure tanks, Storage tanks, Building drainage for high rise buildings, various kinds of fixtures and fittings used.

L	T	P	Total
45	0	0	45

TEXT BOOKS

1. Peavy, H.s, Rowe, D.R, Tchobanoglous, G. Environmental Engineering, Mc-Graw - Hill International Editions, New York 1985.
2. MetCalf and Eddy. Wastewater Engineering, Treatment, Disposal and Reuse, Tata McGraw-Hill, New Delhi.
3. Integrated Solid Waste Management, Tchobanoglous, Theissen& Vigil. McGraw Hill Publication International Editions, New York 1985.
4. CPHEEO Manual on Water Supply And Treatment,1999
5. CPHEEO Manual on Sewerage And Sewage Treatment,1993

REFERENCES

1. B.C. Punmia, Watersupply Engineering, Volume –II, Laxmi Publication 2008
2. B.C. Punmia, Wastewater Engineering, Volume – II, Laxmi Publication 2008
3. S.K. Garg, Wastewater Engineering, Khanna Publishers, New Delhi, 2007
4. Gurucharan Singh," Water supply and Sanitary Engineering", Standard Publishers Distributors, 2009
5. Garg, S.K., "Environmental Engineering I & II", Khanna Publishers, New Delhi 2007
6. Rangwala, " Water Supply and Sanitary Engineering PB,24/e, Charotar Publishing house Pvt. Ltd.- Anand, 2011
7. Introduction to Environmental Engineering and Science by Gilbert Masters, Prentice Hall, New Jersey.
8. Standard methods for the Examination of Water and Wastewater,17thEdition,WPCF,APHA and AWWA,USA,1989.

Mapping of CO with PO's

	PO1	PO2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2
CO 1		1	3	1	1	1			1				1	
CO 2		1	3	1	1	1			2				2	1
CO 3	1		1	2			1		1		1		2	
CO 4	1	1	1	1			1		2		1		1	
CO 5			2	2					3			2	5	
Total	2	3	9	7	2	2	2		9		2	2	11	1
Scaled Value	1	1	2	2	1	1	1	0	2	0	1	1	3	1

Note:

Total	0	1-5	6-10	11-15
Scaled value	0	1	2	3
Relation	No	Low	Medium	High

Semester : V

Course Code : XCE 504

Course Name : GEOTECHNICAL ENGINEERING – II

Prerequisite : MECHANICS OF SOLIDS AND GEOTECHNICAL ENGINEERING - I

L	T	P	C
2	1	0	3

C	P	A
2	0.5	0.5

L	T	P	H
2	1	0	3

Course Objectives

- To understand the application of soil properties in stability of slope analysis, improvement of soil strength and effect of lateral earth pressure on geostructures.
- To estimate the load carrying capacity of different types of soils
- To satisfy the expectation of ability of calculating the dimensions of shallow foundations
- To know about the types, analysis and design of deep foundations, geo-environmental, geotechnical earthque engineering

Course Outcome: After the completion of the course, students will be able to		**Domain C or P or A**	**Level**
CO1	**Identify** and **analyze** different types slope failures.	Cognitive & Affective	Remembering & Analyzing
CO2	**Analyze** earth retaining structures with different loading conditions and able to understand the soil stabilization methods	Cognitive Affective	Analyzing & Responding
CO3	**Determine** the safe bearing capacity of different soils. **Calculate** the size and shape of foundation required for actual loading from structures.	Cognitive, Affective & Psychomotor	Applyzing & Manipulating
CO4	**Demonstrate** the failure modes of piles, piers and caissons	Cognitive & Psychomotor	Understanding & Manipulating
CO5	**Understand** the effect of soil pollution and soil dynamics on foundation performance	Cognitive & Affective	Remembering Analyzing

COURSE CONTENT

UNIT I STABILITY OF SLOPES 8

Classifications of slopes, Stability analysis of infinite slopes. Stability analysis of finite slopes by Swedish and Friction circle method.

Stability analysis by Taylor's stability number, Taylor stability number

curves. Stability of slopes of earthen embankments under sudden draw down, steady seepage and during construction. Bishop's method of stability analysis.

UNIT II SOIL RETAINING WALLS AND GROUND IMPROVEMENT TECHNIQUES 8

Active, passive and earth pressure at rest. Rankine's and Coulomb's theories of earth pressure. Rebhann's and Culman's graphical methods for active earth pressure for vertical and inclined back retaining walls, horizontal and inclined cohesion less back fill. Earth pressure on cantilever sheet piles Stability analysis of retaining walls.

Ground modification by vibro replacement, stone columns, preloading and prefabricated drains, Reinforced earth structures, Introduction to geotextiles and geomembranes, applications of geotextiles, design methods using geotextiles, geogrids, geonets, geomembranes, geotubes, grouting, deep mixing, PVDs, vacuum consolidation.

UNIT III BEARING CAPACITY OF SOIL AND SHALLOW FOUNDATIONS 10

Methods of estimation of bearing capacity, effect of water table on bearing capacity, Terzaghi, Vesic, Hansen, Moyerhof's analysis, Bearing capacity of stratified soils. IS code recommendations for minimum depth, factor of safety, design for local shear and general shear failure. Methods of estimation of settlement of footings. Limits of settlements for various structures, Methods of finding out bearing capacity from plate load test, standard penetration test data. Collapsible soil; Identification, Collapse settlement: foundation design. Behaviour of expansive soil, foundation practices, underreamed piles. Methods of finding out load carrying capacity of under reamed piles in clayey and sandy soil. Provision of IS 2911 Part III-1980 for design of under-reamed pile foundations.

UNIT IV DEEP FOUNDATIONS AND MACHINE FOUNDATIONS 10

Philosophy of deep foundation, piles - classification, estimation of individual and group capacity, static and dynamic approaches, pile load test, settlement of pile and pile groups, negative skin friction. piers, caissons or well foundation – analysis, tilting and corrections, Cofferdams – construction, use.

Machine foundations; introduction, machine vibration, structural design of foundation to rotary machines, impact machines, vibration characteristics, design consideration of foundation to impact machine, grillage, pile and raft foundation.

UNIT V ENVIRONMENTAL GEOTECHNOLOGY AND EARTHQUAKE GEOTECHNOLOGY 9

A consideration of technical and scientific aspects of key geo-societal issues. Case studies and analysis of current and historic databases will be used to illustrate topics including impact of climate change, energy resources, water and soil pollution, and health risks posed by heavy metals and emerging pollutants. Sanitary land fills, settlement of sanitary land fill.

Introduction to soil dynamics, Different methods of analysis for earthquake conditions - Pseudo-static method of design - Effect of earthquake forces on various foundations, Liquefaction, Tsunami, soil behavior during earthquake – foundation settlement and land sliding during earthquake – remedial measures.

Application of Remote Sensing, GIS and GPS in contaminated soil mapping and other geotechnical study

L	T	P	Total
30	15	0	45

TEXT BOOKS

1. Murthy, V. N. S. "Geotechnical Engineering: Principles and Practices of Soil Mechanics and Foundation Engineering", CRC Press, 2002
2. Purushothama Raj, P. Ground Improvement Techniques, Laxmi Publications. 2016
3. Venkatramaiah, C. "Geotechnical Engineering", New Age International Publishers, New Delhi, 3rd edition, 2005, Reprint 2011.
4. Punmia. B.C.,Asok Kumar Jain and Arun Kumar Jain, "Soil Mechanics and Foundations" Laxmi Publications Pvt. Ltd., New Delhi, Sixteenth edi.tion,2005

REFERENCE BOOKS

1. Terzaghi, K., Peck, R. B. &Mesri, G., "Soil Mechanics in Engineering Practice", Wiley, 1996.
2. Craig, R.F. "Craig's Soil Mechanics", 7th Ed., Spon Press, 2004.
3. Holtz, R.D. & Kovacs, W.D., "An Introduction to Geotechnical Engineering", Prentice Hall, 1981.
4. Lambe, T.W. & Whitman, R.V., "Soil Mechanics", John Wiley & Sons, 1979.
5. Mitchell, J.K. & Soga, K., "Fundamentals of Soil Behaviour", John Wiley & Sons, 2005.
6. Coduto, D.P. "Geotechnical Engineering: Principles and Practices", Pearson Education, Prentice Hall, 2007.
7. Jie Han, "Principles and Practice of Ground Improvement", John Wiley & Sons, 2020
8. Das, B.M. "Principles of Geotechnical Engineering", Thomson Books, 2013.

E-REFERENCES

1. https://nptel.ac.in
2. https://nptel.ac.in/courses/105/101/105101201/
3. http://www.nitttrchd.ac.in/sitenew1/civil/civil.php#page=page-1

IS Codes

1. IS : 2974 (Part I to V) code of practice for different types of machine foundation
2. IS : 6403 – 2016 – Code of practice for shallow foundation
3. IS : 1904 – 2002 – Code of practice for design and construction of foundation
4. IS : 2911 – 20016 – Code of practice for design and construction of pile
5. IRC – 78 – 2000 – Code of practice for road bridges and specifications

Mapping of CO with PO's

	PO1	PO2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2
CO 1	1	1		1		1		1		1		1	1	2
CO 2	2	1	1	1		1		2		1		1	2	2
CO 3	1	1	2	1	1	1		3		2	1	1	1	2
CO 4	1	1	1	1	1	1		1		1	1	1	2	2
CO 5	2	2	1	1	1	1	1	3	3	1	1	1	2	2
Total	7	6	5	5	3	5	1	10	3	6	3	5	8	10

Scaled Value

Note:

Total	0	1-5	6-10	11-15
Scaled value	0	1	2	3
Relation	No	Low	Medium	High

Semester : V
Course Code : XCE507
Course Name : ENVIRONMENTAL ENGINEERING LAB
Prerequisite : ---

L	T	P	C
0	0	1	1

C	P	A
3	0	0

L	T	P	H
0	0	2	2

Course Objectives

- To understand the analysis of water and Waste water
- To understand the level of Noise pollution
- To gain knowledge about the suitability of water for drinking and construction purpose
- To provide the knowledge of effluent standards for disposal.

Course Outcome: After the completion of the course, students will be able to		**Domain C or P or A**	**Level**
CO1	Understand and analyse the qualities of water	Psychomotor	Understanding& Observation
CO2	Understand and analyse the qualities of waste water	Psychomotor	Understanding& Observation
CO3	Identify the level of Noise pollution	Psychomotor	Analyzing
CO4	Gather the knowledge about the suitability of water and effluent disposal standards	Affective & Psychomotor	Analyzing & Observation

EXPERIMENTS **30 HRS.**

1. Physical Characterization of water: Turbidity, Electrical Conductivity, pH
2. Analysis of solids content of water: Dissolved, Settleable, suspended, total, volatile
3. Alkalinity and acidity
4. Total Hardness
5. Analysis of ions: chloride and sulfate
6. Optimum coagulant dose
7. Residual chlorine
8. Dissolved Oxygen (D.O) and Biochemical Oxygen Demand (BOD)
9. Chemical Oxygen Demand (COD)
10. Ambient noise measurement

P - 30Hrs.

TEXT BOOKS

1. CPHEEO Manual on Water Supply And Treatment,1999
2. CPHEEO Manual on Sewerage And Sewage Treatment,1993

REFERENCES

1. Standard methods for the Examination of Water and Wastewater,17thEdition,WPCF,APHA and AWWA,USA,1989.

Mapping of CO with PO's

	PO1	PO2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2
CO 1	2	2			1				1			1		
CO 2	2	2			1				1			1		
CO 3	2	1			1				1			1		
CO 4	2		3		1	1	1		1					1
Total	8	5	3		4	1	1		4			3		1
Scaled Value	2	1	1		1	1	1		1			1		1

Note:	**Total**	0	1-5	6-10	11-15				
	Scaled value	0	1	2	3				
	Relation	No	Low	Medium	High				

Semester : V

Course Code : XCE508

Course Name : CONCRETE AND HIGHWAY LAB

Prerequisite : TRANSPORTATION ENGINEERING

L	T	P	C
0	0	3	3

C	P	A
2	0.5	0.5

L	T	P	H
0	0	3	6

Course Objectives

- To understand the handling of equipments
- To provide the hands on training in determination of properties of pavement materials
- To provide the knowledge on the use of experimental results pertaining to pavement design

Course Outcome: After the completion of the course, students will be able to		**Domain or P or A**	**C Level**
CO1	**Identify** and **analyze** various types of pavement materials	Psychomotor	Remembering & Observation
CO2	**Determine** the necessary properties of pavement materials	Psychomotor	Analyzing Respond to Phenomena Observation
CO3	**Investigate** the appropriate methods and equipments.	Psychomotor	Remembering Observation

COURSE CONTENT

Experiments in Transportation Engineering	**30**

Tests on Aggregates

- CBR test.
- Aggregate crushing value test.
- Los Angeles abrasion value test of aggregates.
- Aggregate impact value test.
- Shape test of aggregates - Flakiness Index
- Specific gravity and water absorption test for coarse aggregates.
- Fineness modulus

Tests on Bituminous Materials

- Softening point (Ring and ball test) of bitumen.
- Penetration value test of bitumen.
- Marshall Stability test.
- Specific gravity.
- Loss on heating
- Design of B C mix
- Binder content

L	T	P	Total
0	0	30	30

TEXT BOOKS

1. Khanna.S. K., Justo.C.E.G and Veeraragavan A. "Highway Engineering", Nemchand Publishers, 2014.
2. Subramanian K.P., "Highways, Railways, Airport and Harbour Engineering", Scitech Publications (India), Chennai, 2010
3. Kadiyali.L.R. "Principles and Practice of Highway Engineering", Khanna Technical Publications, 8th edition Delhi, 2013.

REFERENCE BOOKS

1. Highway Materials and Pavement Testing, Nem Chand and Bros., Roorkee, Revised Fifth Edition, 2009
2. Mix Design Methods Asphalt Institute Manual Series No. 2, Sixth Edition,1997, Lexington, KY, USA

E-REFERENCES

1. https://www.vlab.co.in/ba-nptel-labs-civil-engineering

IS Codes

1. Methods for testing tar and bituminous materials, IS 1201-1978 to IS 1220- 1978, Bureau of Indian Standards
2. Methods of test for aggregates, IS 2386 – 1978, Bureau of Indian Standards

Mapping of CO with PO's

	PO1	PO2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2
CO 1	2				3			1				1	1	1
CO 2	2				3			1				1	1	1
CO 3	2				3			1	1	1		1	1	1
Total	6				9			3	1	1		3	3	3

Scaled Value

Note:

Total	0	1-5	6-10	11-15
Scaled value	0	1	2	3
Relation	No	Low	Medium	High

Semester	**: VI**
Subject Name	**: DESIGN OF RCC STRUCTURES**
Subject Code	**: XCE601**
Prerequisite	**: STRUCTURAL ANALYSIS**

L	T	P	H
3	0	0	3

C	P	A
2.5	0	0.5

L	T	P	H
3	0	0	3

Course Objectives

1. Students will be exposed to the theories and concepts of structural design.
2. Hands-on design experience and skills will be gained and learned through problem sets and a comprehensive design project using software.
3. An understanding of real-world open-ended design issues will be developed.

Course Outcome: After the completion of the course, students will be able to		**Domain C or P or A**	**Level**
CO1	Perceive the knowledge on basics of design	Cognitive	Understand
CO2	Interpret ultimate and serviceability limit state approaches in current structural design philosophy	Cognitive	Understand
CO3	Understand the design concept of structural elements	Cognitive & Affective	Analyse & Apply
CO4	Model building structure and analyse structural elements for design actions	Cognitive & Affective	Analyse & Apply
CO5	Analyse and design different types of footing	Cognitive & Affective	Analyse & Apply

COURSE CONTENT

UNIT I	**METHODS OF DESIGN OF CONCRETE STRUCTURES**	**9**

Study of the strength, behavior, and design of indeterminate reinforced concrete structures, Load and stresses, load combinations, Working stress and limit state approach. Concepts of Yield line theory

UNIT II	**LIMIT STATE DESIGN FOR FLEXURE**	**9**

Design of one way and two way slab – singly and doubly reinforced beams- continuous beams –Flanged beams – Staircase.

UNIT III	**LIMIT STATE DESIGN FOR SHEAR, BOND AND TORSION**	**9**

Behaviour of RC members in bond and anchorage – Design requirements –Behaviour of RC beams in shear and torsion – Design of RC members for combined bending shear and torsion.

UNIT IV	**DESIGN OF COLUMNS**	**9**

Types of columns –Design of short columns for axial, uniaxial and biaxial bending – Design of slender column.

UNIT V	**DESIGN OF FOOTINGS**	**9**

Design of Isolated footings (Flat and Sloped) – Design of combined rectangular footing for two columns only – Design of Raft Footing.

L	T	P	Total
45	0	0	45

TEXT BOOKS

1. Varghese, P.C., "Limit State Design of Reinforced Concrete", Prentice Hall of India, Pvt. Ltd., New Delhi,Second Edition, 2010.
2. Krishna Raju, N., "Design of Reinforced Concrete Structures", CBS Publishers & Distributors, New Delhi,2007.

REFERENCES

1. DevadasMenon&UnnikrishnanPillai, Reinforced Concrete Design,Tata McGraw-Hill Publishing Company Ltd., New Delhi 2011
2. Dr.P.Purushothaman, Reinforced Concrete Structures, Oxford Publication (P) Ltd, Delhi, 2007.
3. M.L.Gambhir, Design of reinforced concrete structures, PHI Learning Private Limited, 2013.
4. IS 456 -2000, Plain and Reinforced Concrete – Code of Practice, 4th revision
5. SP16-1980.

Mapping of course outcomes with program outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3		1										2	
CO2	2	3		1		1	1						3	1
CO3	1	1	3	1		1	1	1			1		1	
CO4	1		2	1				1	1		1		3	
CO5	1		2	1				1	1		1		3	
	8	4	8	4		2	2	3	2		3		12	1

Note:

Total	0	1-5	6-10	11-15
Scaled value	0	1	2	3
Relation	No	Low	Medium	High

Semester : VI

Course Code : XCE602

Course Name : DESIGN OF STEEL STRUCTURES

Prerequisite : MECHANICS OF SOLIDS

L	T	P	C
3	1		4

C	P	A
2	1	0

L	T	P	H
3	2		5

Course Objectives

To understand the provisions of IS800-2007 code of practice for the design of structural members using various connections and cross-sections.

To study the behavior and design of compression, tension members and flexural members using simple and built-up sections.

To study the design of bolted and welded connections.

Course Outcome: After the completion of the course, students will be able to		**Domain C or P or A**	**Level**
CO1	Design of structural connections	Cognitive	Understand
CO2	Design of tension	Cognitive & Affective	Analyse & Apply
CO3	Design of compression members	Cognitive	Understand
CO4	Understand fabrication of plate girders and gantry girders	Cognitive	Understand
CO5	Design of structural elements of Industrial Structures.	Cognitive	Understand

COURSE CONTENT

UNIT I	**CONNECTIONS**	**9**

Properties of steel – Structural steel sections – Limit State Design Concepts – Loads on Structures – Metal joining methods using welding, bolting – Design of bolted and welded joints – Eccentric connections - Efficiency of joints – High Tension bolts

UNIT II	**TENSION MEMBERS**	**9**

Types of sections – Net area – Net effective sections for Angles and Tee – Design of connections in tension members – Use of lug angles – Design of tension splice – Concept of shear lag

UNIT III	**COMPRESSION MEMBERS**	**9**

Types of compression members – Theory of columns – Basis of current codal provision for compression member design – Slenderness ratio – Design of single section and compound section compression members – Design of lacing and battening type columns – Design of column bases – Gusseted base

UNIT IV	**BEAMS**	**9**

Design of laterally supported and unsupported beams – Built up beams – Beams subjected to biaxial bending – Design of plate girders– Intermediate and bearing stiffeners – Web splices – Design of beam columns

UNIT V	**TRUSSES AND INDUSTRIAL STRUCTURES**	**9**

Roof trusses – Roof and side coverings – Design loads - Design of purlin and elements of truss- Design of gantry girder

L	T	P	Total
45	0	0	45

TEXT BOOKS

1. N.Subramaniayan , “Design of Steel Structures: Theory and Practice” , Oxford University Press, 2010.
2. S.S Bhavikatti, “Design of Steel Structures”, I.K International Publishing Houses Pvt. Ltd, 2012.
3. Ramachandra S., “Design of Steel Structures – Vol. I & II”, Standard Publication, New Delhi,2010

REFERENCE BOOKS

1. Duggal S.K., “Limit state Design of Steel Structures”, 2nd edition, Tata McGraw - Hill Education, 2014
2. Dayaratnam, P., “Design of Steel Structures”, A.H.Wheeler& Co. Ltd., Allahabad, 2008
3. Jack C. McCormac , Stephen F.Csernak , “Structural Steel Design”Prentice Hall, Jul 2011

IS Codes

1. IS 800 -2007, General Construction in Steel, Code of Practice.
2. SP6 – 1 : ISI Hand Book of Structural Engineers, Part -I

Mapping of CO with PO’s

	PO1	PO2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2
CO 1	2	1	3	2			1	1	1				2	
CO 2	2	1	3	2			1		1				2	
CO 3	1	1	3	1		1							1	
CO 4	3	1	3	3	1	1							2	
CO 5	2	1	2	1		1							2	
Total	10	5	15	9	1	3	2	1	2				9	
Scaled Value	**2**	**1**	**3**	**2**	**1**	**1**	**1**	**1**	**1**				**2**	

Note:

Total	0	1-5	6-10	11-15
Scaled value	0	1	2	3
Relation	No	Low	Medium	High

Semester : VI

Course Code : XCE603

Course Name : CONSTRUCTION ENGINEERING & MANAGEMENT

Prerequisite : STRUCTURAL ANALYSIS

L	T	P	C
3	0	0	3

C	P	A
2	0	1

L	T	P	H
3	0	0	3

COURSE OBJECTIVES

To introduce the students to the basic concepts and principles of construction management.

To familiarize the students with the various construction management techniques including scheduling, resource management.

To study the elements of quality control and safety of construction projects.

COURSE OUTCOMES		**DOMAIN**	**LEVEL**
At the end of this course, the students should be able to			
CO1	**Understand** the basic concepts of construction management such as types and functions of management, life-cycle stages of projects, project delivery types of contracts, and bidding	Cognitive	Understanding
CO2	**Ascertain** a basic ability to plan, control and monitor construction projects with respect to time and cost	Cognitive Affective	Understanding Responding
CO3	**Understanding** of modern construction practices.	Cognitive	Understanding
CO4	**Receiving** an idea how construction projects are administered with respect to contract structures and issues.	Cognitive Affective	Understanding Responding
CO5	**Ability** to put forward ideas and understandings to others with effective communication processes.	Cognitive Affective	Understanding Responding

COURSE CONTENT

UNIT I BASICS OF CONSTRUCTION 05

Unique features of construction, construction projects types and features, phases of a project, Agencies involved and their methods of execution.

UNIT II CONSTRUCTION PLANNING AND SCHEDULING 13

Stages of project planning: pre-tender planning, Pre-construction planning, detailed construction planning, Process of development of plans and schedules, work break-down structure, activity lists, estimating durations, sequence of activities, Techniques of planning- Bar charts, Gantt Charts. Networks:

preparation of CPM networks: activity on link and activity on node representation, computation of float values, PERT- determining three time estimates, analysis.

UNIT III CONSTRUCTION METHODS & EQUIPMENT BASICS 09

Types of foundations and construction methods; Basics of Formwork and Staging; Common building construction methods (conventional walls and slabs; Basics of Slip forming for tall structures)Equipment for Earthmoving, Dewatering; Concrete mixing, transporting & placing; Cranes, Hoists and other equipment for lifting; Equipment for transportation of materials.

UNIT IV	PROJECT PLANNING,ORGANIZING, MONITORING & CONTROL	09

Site layout including enabling structures, developing site organization, Documentation at site; Manpower: planning, organizing, staffing, motivation; Materials: concepts of planning, procurement and inventory control; Equipment: Funds: cash flow, sources of funds; and S-Curves. Earned Value; Resource Scheduling- Bar chart, resource constraints and conflicts; Common Good Practices in Construction. Supervision, record keeping, periodic progress, reports, periodical progress meetings. Updating of plans: purpose, frequency and methods of updating. Common causes of time and cost overruns and corrective measures.

UNIT V	CONSTRUCTION QUALITY & CONTRACTS MANAGEMENT	09

Concept of quality, quality of constructed structure, use of manuals and checklists for quality control, role of inspection, basics of statistical quality control. Safety, Health and Environment on project sites: accidents; their causes, effects and preventive measures, costs of accidents, occupational health problems in construction, organizing for safety and health.

Importance of contracts; Types of Contracts, parties to a contract; Common contract clauses (Notice to proceed, rights and duties of

Various parties, notices to be given, Contract Duration and Price. Performance parameters; Delays, penalties and liquidated damages; Force Majeure, Suspension and Termination. Changes & variations, Dispute Resolution methods. Classification of costs, time cost, trade-off in construction projects, compression and decompression.

L	T	P	Total
30	15	0	45

TEXT BOOKS

1. Kumar NeerajJha, “Construction Project management”, Dorling Kindersley, Publishers, New Delhi.2013.
2. Chitkara.K.K, “Construction Project Management planning, Scheduling and control”, Tata McGraw Hill Publishing Company, New Delhi, 2010.
3. National Building Code, Bureau of Indian Standards, New Delhi, 2017.

REFERENCES

1. Punmia, B.C., Khandelwal, K.K., “Project Planning with PERT and CPM”, Laxmi Publications, 2016.
2. Vohra.N.D., “Quantitative Techniques in Management”, Tata McGraw Hill Publishing Company, New Delhi, 2010.
3. Joy.P.K, “Total Project Management”, Macmillan India Ltd, New Delhi, 2000.

Cos Versus Pos Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO2
CO1				1	3	2	1	1	**1**					1
CO2	2	1						2	1	1		1	1	1
CO3	2	1		2		1	1	1	2		1		1	
CO4						2	1	1	1	1			1	
CO5			2				1							
Total Values	4	2	2	3	3	5	4	5	5	2	1	1	3	2
Scaled Value	1	1	1	1	1	1	1	1	1	1	1	1	1	1

Note:

Total	0	1-5	6-10	11-15
Scaled value	0	1	2	3
Relation	No	Low	Medium	High

Semester : **VI**

Course Code : **XGS606**

Course Name : **Professional Skills**

Prerequisite : Nil

L	T	P	C
1	0	2	3

C	P	A
2.60	0.40	0

L	T	P	H
1	0	4	5

Course Outcome: After the completion of the course, students will be able to		Domain C or P or A	Level
CO1	**Ability** to understand communications	Cognitive	Remember
CO2	**Apply** the known skills for career	Cognitive	Apply
CO3	**Identify** inner strength	Cognitive	Remember
CO4	**Construct** the attitude as a professional	Cognitive	Create
CO5	**Practicing** Etiquettes	Psychomotor	Guided Response

COURSE CONTENT

UNIT I	**Communication**	**9**

1.1 – Brainstorming
1.2 – LSRW

UNIT II	**Career Skills**	**9**

2.1 – Resume & CV preparing Skills
2.2 – Interview Skills
2.3 – Exploring Career Opportunities

UNIT III	**Team Skills**	**9**

3.1 – Listening as a Team Skill
3.2 – Team Building at work place

UNIT IV	**Professional Skills**	**9**

4.1 – Attitude and Goal Setting
4.2 – Verbal and Non Verbal Communications

UNIT V	**Professional Etiquettes**	**9**

5.1 - Social Etiquettes
5.2 - Cultural Ethics at work place

L	T	P	Total
30	0	0	30

SUGGESTED READINGS

1. Er. A. K. Jain, Dr. Pravin S. R. Bhatia, Dr. A. M. Sheikh Professional Communication Skills S. Chand Publications, 2015
2. Alan Pannett. Key Skills for Professionals: How to Succeed in Professional Services, Kogan Page; 1st edition, 2013

Mapping of CO with PO's

	PO1	PO2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2
CO 1								1	3	**3**		2		
CO 2								1	3	**3**		2		
CO 3								1	2	**3**		2		
CO 4								1	2	**3**		2		
CO 5								1	2	**3**		2		
Total								**5**	**12**	**15**		**10**		
Scaled Value	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**2**	**3**	**0**	**2**	**0**	**0**

Note:	**Total**	0	1-6	7-12	13-18
	Scaled value	0	1	2	3
	Relation	No	Low	Medium	High

Semester : **VI**

Course Code : **XUM607**

Course Name : **CYBER SECURITY**

Prerequisite : Nil

L	T	P	C
3	0	0	3

C	P	A
3	0	0

L	T	P	H
3	0	0	3

Course Outcome: After the completion of the course, students will be able to		**Domain C or P or A**	**Level**
CO1	**Ability** to understand communications	Cognitive	Remember
CO2	**Apply** the known skills for career	Cognitive	Apply
CO3	**Identify** inner strength	Cognitive	Remember
CO4	**Construct** the attitude as a professional	Cognitive	Create
CO5	**Practicing** Etiquettes	Psychomotor	Guided Response

COURSE CONTENT

UNIT I INTRODUCTION **9**

Cyber Security – Cyber Security policy – Domain of Cyber Security Policy – Laws and Regulations – Enterprise Policy – Technology Operations – Technology Configuration - Strategy Versus Policy – Cyber Security Evolution – Productivity – Internet – E commerce – Counter Measures – Challenges

UNIT II CYBER SECURITY OBJECTIVES AND GUIDANCE **9**

Cyber Security Metrics – Security Management Goals – Counting Vulnerabilities – Security Frameworks – E Commerce Systems – Industrial Control Systems – Personal Mobile Devices – Security Policy Objectives – Guidance for Decision Makers – Tone at the Top – Policy as a Project– Cyber Security Management – Arriving at Goals – Cyber Security Documentation. The Catalog Approach – Catalog Format – Cyber Security Policy Taxonomy.

UNIT III CYBER SECURITY POLICY CATALOG **9**

Cyber Governance Issues – Net Neutrality – Internet Names and Numbers – Copyright and Trademarks – Email and Messaging - Cyber User Issues - Malvertising - Impersonation – Appropriate Use – Cyber Crime – Geo location – Privacy - Cyber Conflict Issues – Intellectual property Theft – Cyber Espionage – Cyber Sabotage – Cyber Welfare

UNIT IV INFORMATION SECURITY CONCEPTS **9**

Information Security Overview: Background and Current Scenario - Types of Attacks - Goals for Security - E-commerce Security - Computer Forensics – Steganography

UNIT V SECURITY THREATS AND VULNERABILITIES **9**

Overview of Security threats -Weak / Strong Passwords and Password Cracking - Insecure Network connections - Malicious Code - Programming Bugs - Cyber crime and Cyber terrorism - Information Warfare and Surveillance

L	T	P	Total
45	0	0	45

REFERENCE BOOKS

1.Jennifer L. Bayuk, J. Healey, P. Rohmeyer, Marcus Sachs , Jeffrey Schmidt, Joseph Weiss "Cyber Security Policy Guidebook" John Wiley & Sons 2012.

2. Rick Howard "Cyber Security Essentials" Auerbach Publications 2011.

3. Richard A. Clarke, Robert Knake "Cyberwar: The Next Threat to National Security & What to Do About It" Ecco 2010

4. Dan Shoemaker Cyber security The Essential Body Of Knowledge, 1st ed. Cengage Learning 2011

5. Rhodes-Ousley, Mark, "Information Security: The Complete Reference", Second Edition, McGraw-Hill, 2013.

REFERENCE BOOKS

1.Jennifer L. Bayuk, J. Healey, P. Rohmeyer, Marcus Sachs , Jeffrey Schmidt, Joseph Weiss "Cyber Security Policy Guidebook" John Wiley & Sons 2012.

2. Rick Howard "Cyber Security Essentials" Auerbach Publications 2011.

Semester : VI

Course Code : XCE608

Course Name : CONSTRUCTION MANAGEMENT LAB

Prerequisite : Nil

L	T	P	C
0	0	1	1

C	P	A
3	0	0

L	T	P	H
0	0	2	2

Course Outcome: After the completion of the course, students will be able to		Domain C or P or A	Level
CO1	Plan and Schedule of a construction project using MS PROJECT	Psychomotor	Guided Response
CO2	Plan and Schedule of a construction project using PRIMAVERA	Psychomotor	Guided Response
CO3	Draw a Gantt Chart for managing dependencies between task	Psychomotor	Guided Response

EXPERIMENTS **30 Hrs.**

1. Preparation of Planning and Scheduling by using MS PROJECT - scheduling for a small construction project - Allocation of resource- Tracking of a Project-Cost analysis- Reports preparation.
2. Preparation of Planning and Scheduling by using PRIMAVERA - scheduling for a small construction project - Allocation of resource- Tracking of a Project-Cost analysis- Reports preparation.
3. Prepare a schedule for the construction of Residential building using MS-Project.
4. Prepare a schedule for the construction of Residential building using PRIMAVERA.

TEXT BOOKS

1. Paulson. B.R., Computer Applications in Construction, McGraw Hill, 2005.
2. Feigenbaum .L, Construction Scheduling with Primavera Project Planner, 2009

REFERENCES

1. Krishnamoorthy .C.S and Rajeev .S, Computer Aided Design, Narosa publishing house, New Delhi, 2001.
2. Harrison .H .B, Structural Analysis and Design, vol. I & II, Pergamon press, 2001
3. Feigenbaum .L, Construction Scheduling with Primavera Project Planner, Prentice Hall Inc., 2009.

Mapping of CO with PO's

	PO1	PO2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2
CO 1				1	3		1		**1**					1
CO 2	2	1							1	1		1	1	1
CO 3	2	1		2			1		2		1		1	
Total	4	2	2	3	3		4		5	2	1	1	3	2
Scaled Value	1	1	1	1	1		1		1	1	1	1	1	1

Note:

Total	0	1-5	6-10	11-15
Scaled value	0	1	2	3
Relation	No	Low	Medium	High

Semester : VI
Course Code : XCE609
Course Name : SURVEY CAMP
Prerequisite : Nil

L	T	P	C
0	0	1	1

C	P	A
0	1	0

L	T	P	T
0	0	2	2

Course Objectives

This course aims at providing

Identify the features of the study area.

To prepare the contour map and calculate area of the given area.

Course Outcome: After the completion of the course, students will be able to		**Domain C or P or A**
CO1	to get practical training in the field work - Work in a teamwork	Cognitive - Psychomotor
CO2	Mark a road alignment of (L-section, Cross-section) a given gradient connecting any two stations on the map - Calculate the earth work	Cognitive Psychomotor
CO3	Interpret the contours	Cognitive
CO4	Prepare a topographical plan of a given area	Cognitive Psychomotor
CO5	Able to prepare record with original field observations, calculations and plots.	Cognitive Psychomotor

COURSE CONTENT

Survey camp using Theodolite, cross staff, levelling staff, tapes, plane table and total station. The camp must involve work on a large area of not less than 400 hectares. At the end of the camp, each student shall have mapped and contoured the area. The camp record shall include all original field observations, calculations and plots.

(i) Triangulation

(ii) Trilateration

(iii) Sun / Star observation to determine azimuth

(iv) Use of GPS to determine latitude and longitude

L	T	P	Total
0	0	30	30

REFERENCES

1. Clark D., Plane and Geodetic Surveying, Vols. I and II, C.B.S. Publishers and Distributors, Delhi, Sixth Edition, 2004.
2. James M.Anderson and Edward M.Mikhail, Introduction to Surveying, McGraw-Hill Book Company, 1985.
3. Wolf P.R., Elements of Photogrammetry, McGraw-Hill Book Company, Second Edition, 2009.

Mapping of CO with PO's

	PO1	PO2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2
CO 1	1	2				1								1
CO 2	1	2				1								1
CO 3	1	2				1								1
CO 4	1	2				1								1
CO 5	1	2				1								1
Total	5	10				5								5
Scaled Value	**1**	**2**				**1**								**1**

Note:

Total	0	1-5	6-10	11-15
Scaled value	0	1	2	3
Relation	No	Low	Medium	High

Semester	**VII**
Subject Name	**PROJECT PHASE I**
Subject Code	**XCE 707**

L	T	P	C
0	0	2	2

C	P	A
1.5	0.5	1.0

L	T	P	H
0	0	2	4

	Course Outcome: After the completion of the course, students will be able to	**Domain C or P or A**	**Level**
CO1	Identify the engineering problem relevant to the domain interest.	Cognitive	Analyse
CO2	Interpret and infer literature survey for its worthiness.	Cognitive	Analyse & Apply
CO3	Analyse and identify an appropriate technique for solve the problem.	Cognitive	Analyze & Apply
CO4	Perform experimentation /Simulation /Programming /Fabrication, Collect and interpret data.	Cognitive Psychomotor	Create, Apply Precision
CO5	Record and report the technical findings as a document.	Cognitive	Remember & Understand
CO6	Devote oneself as a responsible member and display as a leader in a team to manage projects.	Cognitive Affective	Create & Organization Valuing
CO7	Responding of project findings among the technocrats.	Affective	Responding

Mapping of CO with GA's

	GA1	**GA2**	**GA3**	**GA4**	**GA5**	**GA6**	**GA7**	**GA8**	**GA9**	**GA10**	**GA11**	**GA12**
CO 1	3	3	--	--	--	1	1	1	--	--	--	1
CO 2	2	2	--	1	--	1	--	--	--	--	--	--
CO 3	1	1	1	2	2	1	1	1	--	--	--	--
CO 4	2	2	3	3	3	1	1	1	--	--	--	--
CO 5	1	1	1	1	1	--	--	--	2	3	2	3
CO 6	--	--	--	2	--	3	1	3	3	3	2	3
CO 7	1	1	--	2	--	3	--	--	1	3	2	1
	10	10	5	11	6	10	4	6	6	9	6	8

Note:

Total	0	1-5	6-10	11-15
Scaled value	0	1	2	3
Relation	No	Low	Medium	High

Semester VIII
Subject Name PROJECT PHASE I I
Subject Code XCE 804

L	T	P	C
0	0	2	2

C	P	A
1.5	0.5	1.0

L	T	P	H
0	0	2	4

Course Outcome: After the completion of the course, students will be able to		**Domain C or P or A**	**Level**
CO1	Identify the engineering problem relevant to the domain interest.	Cognitive	Analyse
CO2	Interpret and infer literature survey for its worthiness.	Cognitive	Analyse & Apply
CO3	Analyse and identify an appropriate technique for solve the problem.	Cognitive	Analyze & Apply
CO4	Perform experimentation /Simulation /Programming /Fabrication, Collect and interpret data.	Cognitive Psychomotor	Create, Apply Precision
CO5	Record and report the technical findings as a document.	Cognitive	Remember & Understand
CO6	Devote oneself as a responsible member and display as a leader in a team to manage projects.	Cognitive Affective	Create & Organization Valuing
CO7	Responding of project findings among the technocrats.	Affective	Responding

Mapping of CO with GA's

	GA1	**GA2**	**GA3**	**GA4**	**GA5**	**GA6**	**GA7**	**GA8**	**GA9**	**GA10**	**GA11**	**GA12**
CO 1	3	3	--	--	--	1	1	1	--	--	--	1
CO 2	2	2	--	1	--	1	--	--	--	--	--	--
CO 3	1	1	1	2	2	1	1	1	--	--	--	--
CO 4	2	2	3	3	3	1	1	1	--	--	--	--
CO 5	1	1	1	1	1	--	--	--	2	3	2	3
CO 6	--	--	--	2	--	3	1	3	3	3	2	3
CO 7	1	1	--	2	--	3	--	--	1	3	2	1
	10	10	5	11	6	10	4	6	6	9	6	8

Note:

Total	0	1-5	6-10	11-15
Scaled value	0	1	2	3
Relation	No	Low	Medium	High

2. Bachelor of Technology (Civil Engineering) (Part Time)

Semester	**:**	**V**
Course Code	**:**	**PCE501**
Course Name	**:**	**DESIGN OF STEEL STRUCTURES**
Prerequisite	**:**	**MECHANICS OF SOLIDS**

L	T	P	C
3	1		4

C	P	A
2	1	0

L	T	P	H
3	2		5

Course Objectives

To understand the provisions of IS800-2007 code of practice for the design of structural members using various connections and cross-sections.

To study the behavior and design of compression, tension members and flexural members using simple and built-up sections.

To study the design of bolted and welded connections.

Course Outcome: After the completion of the course, students will be able to		**Domain C or P or A**	**Level**
CO1	Design of structural connections	Cognitive	Understand
CO2	Design of tension	Cognitive Affective	Analyse Apply
CO3	Design of compression members	Cognitive	Understand
CO4	Understand fabrication of plate girders and gantry girders	Cognitive	Understand
CO5	Design of structural elements of Industrial Structures.	Cognitive	Understand

COURSE CONTENT

UNIT I	**CONNECTIONS**	**9**

Properties of steel – Structural steel sections – Limit State Design Concepts – Loads on Structures – Metal joining methods using welding, bolting – Design of bolted and welded joints – Eccentric connections - Efficiency of joints – High Tension bolts

UNIT II	**TENSION MEMBERS**	**9**

Types of sections – Net area – Net effective sections for Angles and Tee – Design of connections in tension members – Use of lug angles – Design of tension splice – Concept of shear lag

UNIT III	**COMPRESSION MEMBERS**	**9**

Types of compression members – Theory of columns – Basis of current codal provision for compression member design – Slenderness ratio – Design of single section and compound section compression members – Design of lacing and battening type columns – Design of column bases – Gusseted base

UNIT IV	**BEAMS**	**9**

Design of laterally supported and unsupported beams – Built up beams – Beams subjected to biaxial bending – Design of plate girders– Intermediate and bearing stiffeners – Web splices – Design of beam columns

UNIT V	**TRUSSES AND INDUSTRIAL STRUCTURES**	**9**

Roof trusses – Roof and side coverings – Design loads - Design of purlin and elements of

truss- Design of gantry girder

L	T	P	Total
45	0	0	45

TEXT BOOKS

4. N.Subramaniayan , “Design of Steel Structures: Theory and Practice” , Oxford University Press, 2010.
5. S.S Bhavikatti, “Design of Steel Structures”, I.K International Publishing Houses Pvt. Ltd, 2012.
6. Ramachandra S., “Design of Steel Structures – Vol. I & II”, Standard Publication, New Delhi,2010

REFERENCE BOOKS

4. Duggal S.K., “Limit state Design of Steel Structures”, 2nd edition, Tata McGraw - Hill Education, 2014
5. Dayaratnam, P., “Design of Steel Structures”, A.H.Wheeler& Co. Ltd., Allahabad, 2008
6. Jack C. McCormac , Stephen F.Csernak , “Structural Steel Design”Prentice Hall, Jul 2011

IS Codes

3. IS 800 -2007, General Construction in Steel, Code of Practice.
4. SP6 – 1 : ISI Hand Book of Structural Engineers, Part -I

Mapping of CO with PO’s

	PO1	PO2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2
CO 1	2	1	3	2			1	1	1				2	
CO 2	2	1	3	2			1		1				2	
CO 3	1	1	3	1		1							1	
CO 4	3	1	3	3	1	1							2	
CO 5	2	1	2	1		1							2	
Total	10	5	15	9	1	3	2	1	2				9	
Scaled Value	**2**	**1**	**3**	**2**	**1**	**1**	**1**	**1**	**1**				**2**	

Note:

Total	0	1-5	6-10	11-15
Scaled value	0	1	2	3
Relation	No	Low	Medium	High

Semester : **V**

Course Code : **PUM503**

Course Name : **ENVIRONMENTAL STUDIES**

Prerequisite :

L	T	P	C
0	0	0	0

C	P	A
2.5	0	0.5

L	T	P	H
2	0	0	2

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

		Domain C or P or A	**Level**
CO1	**Describe** the significance of natural resources and **explain** anthropogenic impacts.	Cognitive	Remembering and understanding
CO2	**Illustrate** the significance of ecosystem, biodiversity and natural geo bio chemical cycles for maintaining ecological balance.	Cognitive	Understanding
CO3	**Identify** the facts, consequences, preventive measures of major pollutions and **recognize** the disaster phenomenon	Cognitive Affecting	Remembering Receiving
CO4	**Explain** the socio-economic, policy dynamics and **practice** the control measures of global issues for sustainable development	Cognitive	Understanding and Analyse
CO5	**Recognize** the impact of population and **apply** the Environmental ethics towards environmental protection.	Cognitive	Understanding And Apply

COURSE CONTENT

UNIT I **INTRODUCTION TO ENVIRONMENTAL STUDIES AND RESOURCES** **12**

Definition, scope and importance – Need for public awareness – Forest resources: Use and over-exploitation, deforestation, case studies. Timber extraction, mining, dams and their effects on forests and tribal people – Water resources: Use and over-utilization of surface and ground water, flood, drought, conflicts over water, dams-benefits and problems – Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies – Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies – Energy resources: Growing energy needs, renewable and non-renewable energy sources, use of alternate energy sources, case studies – Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification – Role of an individual in conservation of natural resources – Equitable use of resources for sustainable lifestyles.

UNIT II **ECOSYSTEMS AND BIODIVERSITY** **8**

Concept of an ecosystem – Structure and function of an ecosystem – Producers, consumers and decomposers – Energy flow in the ecosystem – Ecological succession – Food chains, food webs and ecological pyramids – Introduction, types, characteristic features, structure and function of the (a) Forest ecosystem (b) Grassland ecosystem (c) Desert ecosystem (d) Aquatic ecosystem (ponds, streams, lakes, rivers, oceans, estuaries) – Introduction to Biodiversity – Definition: genetic, species and ecosystem diversity - Biodiversity patterns and global biodiversity hot spots. India as a mega-biodiversity nation; Endangered and endemic species of India Threats to biodiversity : Habitat loss, poaching of wildlife, man--- wildlife conflicts, biological invasions; Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.

UNIT III	ENVIRONMENTAL POLLUTION	8

Definition – Causes, effects and control measures of: (a) Air pollution (b) Water pollution (c) Soil pollution (d) Marine pollution (e) Noise pollution (f) Thermal pollution (g) Nuclear hazards – Solid waste management: Causes, effects and control measures of urban and industrial wastes – Role of an individual in prevention of pollution – Pollution case studies – Disaster management: flood, earthquake, cyclone and landslide.

UNIT IV	SOCIAL ISSUES AND THE ENVIRONMENT	9

Urban problems related to energy – Water conservation, rain water harvesting, watershed management – Resettlement and rehabilitation of people; its problems and concerns, climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust, 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 – International agreements: Montreal and Kyoto protocols and Convention on Biological Diversity (CBD).Nature reserves, tribal populations and rights, and human wildlife conflicts in Indian context. Issues involved in enforcement of environmental legislation – Public awareness.

UNIT V	HUMAN POPULATION AND THE ENVIRONMENT	8

Human population growth: Impacts on environment, human health and welfare. Resettlement and rehabilitation of project affected persons; case studies. Environmental movements : Chipko, Silent valley, Bishnois of Rajasthan. Environmental ethics: Role of Indian and other religions and cultures in environmental conservation. Environmental communication and public awareness, case studies (e.g., CNG vehicles in Delhi).

L	T	P	Total
45	0	0	45

TEXT BOOKS

1. Mahua Basu,S. Xavier, Fundamentals of Environmental Studies, Cambridge University Press, 2019
2. Bharucha Erach, Textbook of Environmental Studies for Undergraduate Courses, Orient Blackswan Pvt Ltd, 2018
3. Anubha Kaushik, C.P. Kaushik, Perspectives in Environmental Studies, New Age International Pvt Ltd Publishers,2018
4. Divan Shyam,Environmental Law and Policy in India, OUP India,2019
5. Varun Dutt Sharma,S.K. Pandey, Vimal Kumar sharma, Environmental Education and Disaster Management, CBS Publishers & Distributors,2019

REFERENCE BOOKS

1. M.V. Subba Rao, Natural Resources, Conservation, Management and Health Care, Discovery Publishing Pvt.Ltd,2020
2. Masters Gilbert M. Introduction to Environmental Engineering 3rd Edition , Pearson Education India, 3rd edition ,2015.
3. P.D. Sharma, Ecology and Environment Thirteenth Edition, Rastogi Publications,2017
4. Dr. Avneesh Gaur, Environmental Engineering and Disaster Management, Vayu Education Of India,2021

E-REFERENCES

1. http://www.e-booksdirectory.com/details.php?ebook=10526
2. https://www.free-ebooks.net/ebook/Introduction-to-Environmental-Science
3. https://www.free-ebooks.net/ebook/What-is-Biodiversity
4. https://www.learner.org/courses/envsci/unit/unit_vis.php?unit=4
5. http://bookboon.com/en/pollution-prevention-and-control-ebook
6. http://www.e-booksdirectory.com/details.php?ebook=8557
7. http://www.e-booksdirectory.com/details.php?ebook=6804
8. http://bookboon.com/en/atmospheric-pollution-ebook
9. http://www.e-booksdirectory.com/details.php?ebook=3749
10. http://www.e-booksdirectory.com/details.php?ebook=2604
11. http://www.e-booksdirectory.com/details.php?ebook=2116
12. http://www.e-booksdirectory.com/details.php?ebook=1026
13. http://www.faadooengineers.com/threads/7894-Environmental-Science

Mapping of CO's with PO's:

	PO1	PO2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2
CO 1														
CO 2	**2**					**2**	**1**			**1**		**1**	**2**	
CO 3	**2**	**1**	**3**			**3**	**1**		**2**	**1**		**1**	**2**	**1**
CO 4	**1**	**1**	**2**			**3**	**2**	**3**				**1**	**1**	**1**
CO 5	**2**	**1**	**1**			**3**						**1**	**2**	**1**
Total	**10**	**3**	**6**			**11**	**4**	**3**	**2**	**2**		**5**	**10**	**3**
Scaled Value	**2**	**1**	**2**			**3**	**1**	**1**	**1**	**1**	**1**	**1**	**2**	**1**

Note:

Total	0	1-5	6-10	11-15
Scaled value	0	1	2	3
Relation	No	Low	Medium	High

Semester : **V**

Course Code : **PCE504**

Course Name : **COMPUTER AIDED DESIGN & DRAFTING**

Prerequisite : **COMPUTER AIDED CIVIL ENGINEERING DRAWING**

L	T	P	C
0	0	2	2

C	P	A
0	3	0

L	T	P	H
0	0	3	3

	Course Outcome: After the completion of the course, students will be able to	Domain C or P or A	Level
CO1	To select the appropriate Structural system for a conventional reinforced concrete Structure	Psychomotor	Respond
CO2	Determine the preliminary designs of structures assuming preliminary dimensions	Psychomotor	Respond
CO3	Apply the fundaments of reinforced concrete to design structures like retaining walls, water tanks, staircase, and other structures of importance.	Psychomotor	Respond
CO4	Understand fabrication of plate girders and gantry girders	Psychomotor	Respond
CO5	Design of structural elements of Industrial Structures.	Psychomotor	Respond

COURSE CONTENT

Detailed design and drawing of the following reinforced concrete structures and steel structures using software packages like Auto CAD /Revit and Staad Pro / Etabs.

1. Design of Raft and Pile with pile cap (Four Piles only) Foundations and reinforcement details.
2. Design and Drawing of RCC cantilever and counterfort type retaining walls with reinforcement details.
3. Detailing and Drafting of Solid slab and RCC Tee beam bridges for IRC loading and reinforcement details.
4. Design and Drawing of staircase.
5. Detailing and Drafting of Circular and Rectangular Water Tank .
6. Design of plate girder bridge – Detailed Drawings including connections.
7. Design of Gantry girder– Detailed Drawings including connections.
8. Design of Roof Truss – Detailed Drawings including Connections.

L	T	P	Total
0	0	30	30

TEXT BOOKS

1. Krishna Raju, N., "Design of Reinforced Concrete Structures", CBS Publishers & Distributors, New Delhi, 2007.

2. Devadas Menon & Unnikrishnan Pillai, Reinforced Concrete Design, Tata McGraw-Hill Publishing Company Ltd., New Delhi 2011

3. Ramachandra S., "Design of Steel Structures – Vol. I & II", Standard Publication, New Delhi,2010

REFERENCE BOOKS

1. Dr.P.Purushothaman, Reinforced Concrete Structures, Oxford Publication (P) Ltd, Delhi, 2007.

2. Krishnamurthy, D., "Structural Design & Drawing – Vol. II", CBS Publishers & Distributors.

3. Duggal S.K.,"Limit state Design of Steel Structures", 2nd edition, Tata McGraw Hill, 2014.

IS CODES:

1. IS 456 -2000, Plain and Reinforced Concrete – Code of Practice, 4th revision

2.SP16-1980, SP6 – 1 : ISI Hand Book of Structural Engineers, Part -I

3. IS 800 -2007, General Construction in Steel, Code of Practice.

Mapping of CO with PO's

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3		1										2	
CO2	2	3		1		1	1						3	1
CO3	1	1	3	1		1	1	1			1		1	
CO4	1	1	3	1		1							1	
CO5	3	1	3	3	1	1							2	
Total	**10**	**6**	**10**	**6**	**1**	**4**	**2**	**1**	**1**		**1**		**9**	**1**
Scaled Value	**2**	**2**	**2**	**2**	**1**	**1**	**1**	**1**	**1**		**1**		**2**	**1**

Note:

Total	0	1-5	6-10	11-15
Scaled value	0	1	2	3
Relation	No	Low	Medium	High

Semester : **V**

Course Code : **PCE505**

Course Name : **ESTIMATION, COSTING AND VALUATION**

Prerequisite : **Nil**

L	T	P	C
0	0	2	2

C	P	A
0	3	0

L	T	P	H
0	0	2	2

Course Outcome: After the completion of the course, students will be able to		**Domain C or P or A**	**Level**
CO1	Draw center line marking in the field as per the plan	Psychomotor	Guide Response
CO2	Estimate the quantities of items and labour requirements of Civil Engineering works.	Psychomotor	Guide Response
CO3	Prepare the abstract and detailed estimate of any construction project	Psychomotor	Guide Response

EXPERIMENTS **30 Hrs.**

1. Building marking
2. Detailed Estimate of Residential buildings (RCC and Masonry)
3. Detailed Estimate of Water supply & Sanitary work
4. Detailed Estimate of Culverts and Bridges
5. Detailed Estimate of Earthwork for Roads
6. Detailed Estimate of Steel Roof Trusses
7. Preparation of Bar bending schedule
8. Rate Analysis of Different Items for Construction work
9. Preparation of valuation report in standard Government form
10. Estimation using Spread Sheet

TEXT BOOKS

1. Dutta, B.N., “Estimating and Costing in Civil Engineering Theory and Practice”, UBS Publishers & Distributors Pvt. Ltd.,New Delhi, 2010.
2. Kohli, D.D and Kohli, R.C., “A Text Book of Estimating and Costing (Civil)”, S.Chand& Company Ltd., New Delhi, 2004
3. M.Chakraborty,”Estimating,Costing, Specification and Valuation in Civil Engineering”,Kolkata,1997.

REFERENCE BOOKS

1. Aggarwal, A., Upadhyay, A.K., Civil Estimating, Costing &Valuation, S.K Kataria& Sons, New Delhi.
2. Birdie.G.S., "A Text Book on Estimating and Costing", DhanpatRai and Sons, New Delhi
3. Chandola, S.P. and Vazirani, Estimating and Costing, Khanna Publication
4. Rangwala. S.C., "Elements of Estimating and Costing", Charotar Publishing House,Anand
5. IS 1200-1974, Parts 1-25, Methods of Measurements of Building and Civil Engineering works – Bureau of Indian Standards, New Delhi.
6. Standard Data Books and Schedule of rates of Central and State Public Works Departments

	PO1	PO2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2
CO 1	2	1		1	2		1	1			1	1		
CO 2	2	1		1			1				1	1		
CO 3	2	1	2	1			1				2	1	1	
Total	6	3	2	3	2		3	1			4	3	1	
Scaled Value	2	1	1	1	1		1	1			1	1	1	

Note:

Total	0	1-5	6-10	11-15
Scaled value	0	1	2	3
Relation	No	Low	Medium	High

Semester	**:**	**VI**
Course Code	**:**	**PCE601**
Course Name	**:**	**FINITE ELEMENT METHOD**
Prerequisite	**:**	**STRUCTURAL ANALYSIS**

L	T	P	C
3	1	0	4

C	P	A
2.5	0	0.5

L	T	P	H
3	2	0	5

Course Outcome: After the completion of the course, students will be able to		**Domain C or P or A**	**Level**
CO1	Gain knowledge on basic concepts of FEM	Cognitive	Understand
CO2	Determine stresses and displacements for one and two dimensional elements under various loading.	Cognitive	Understand
CO3	Analyse the higher order elements using Isoparametric mapping and numerical integration.	Cognitive	Analyse
CO4	Identify and Apply concepts of FEM in fluid mechanics.	Cognitive	Apply

COURSE CONTENT

UNIT I	**INTRODUCTION – VARIATIONAL FORMULATION**	**12**

Methods of Engineering analysis – Basic concept of FEM and its procedure- Advantages and Disadvantages - Weighted Residual Method – Principle of Stationary Total Potential – Rayleigh Ritz method.

UNIT II	**ONE DIMENSIONAL FINITE ELEMENT ANALYSIS**	**12**

Finite element: modelling, coordinates, shape functions, stiffness matrix, stiffness equation, finite element equation for one dimensional element. Load or force vector – Temperature effects.

UNIT III	**TWO DIMENSIONAL FINITE ELEMENT ANALYSIS**	**12**

Finite element modelling, coordinates, shape functions, stiffness matrix, stiffness equation, finite element equation for two dimensional elements. Plane stress and plane strain – Constant Strain Triangular element – Linear Strain Triangular elements - Temperature effects.

UNIT IV	**ISOPARAMETRIC ELEMENTS AND FORMULATION**	**12**

Shape function for 4 noded elements using natural coordinate system and transformation – element stiffness matrix equations –Higher order two dimensional element – Shape function derivation for rectangular and triangular element – Lagrangean and Serendipity elements.

UNIT V	**APPLICATIONS TO FIELD PROBLEMS IN TWO DIMENSION**	**12**

Heat Transfer – Application to Heat Transfer in two dimensions – Application to Fluid Mechanics in two dimensions.

L	T	P	T

45	**15**	**0**	**60**

TEXT BOOKS

1. Krishnamoorthy,C.S.,"Finite Element Analysis –Theory and Programming", Second Edition, Tata McGraw Hill, 2015.
2. Bhavikati , S.S., "Finite Element Analysis ", New Age International Publishers , 2016.
3. S.S.Rao, "The Finite Element Method in Engineering", Pergaman Press, 2011.

REFERENCES

1. J.N.Reddy, "An Introduction to Finite Element Method", McGraw-Hill, Intl. Student Edition, 2013.
2. Chandrupatla, T.R., and Belegundu, A.D., "Introduction to Finite Element in Engineering", Third Edition, Prentice Hall, India, 2012.
3. O. C. Zienkiewicz, Robert Leroy Taylor, Perumal Nithiarasu, "The Finite Element Method for Fluid Dynamics", Butterworth-Heinemann, 2013.

Mapping of CO's with PO's:

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO 1**	**PSO2**
CO1	1	3	2			1							1	1
CO2	2	2	3	1		1							1	
CO3	3	1	1	1		2				2		1	1	1
CO4	3	2	1		1	1	1	1	1	1	1			
Total	9	8	7	2	1	5	1	1	1	3	1	1	3	2
Scaled Value	**2**	**2**	**2**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**

Note:

Total	0	1-5	6-10	11-15
Scaled value	0	1	2	3
Relation	No	Low	Medium	High

Semester	**:**	**VI**
Course Code	**:**	**PCE601**
Course Name	**:**	**FINITE ELEMENT METHOD**
Prerequisite	**:**	**STRUCTURAL ANALYSIS**

L	T	P	C
3	1	0	4

C	P	A
2.5	0	0.5

L	T	P	H
3	2	0	5

Course Outcome: After the completion of the course, students will be able to		**Domain C or P or A**	**Level**
CO1	Gain knowledge on basic concepts of FEM	Cognitive	Understand
CO2	Determine stresses and displacements for one and two dimensional elements under various loading.	Cognitive	Understand
CO3	Analyse the higher order elements using Isoparametric mapping and numerical integration.	Cognitive	Analyse
CO4	Identify and Apply concepts of FEM in fluid mechanics.	Cognitive	Apply

COURSE CONTENT

UNIT I	**INTRODUCTION – VARIATIONAL FORMULATION**	**12**

Methods of Engineering analysis – Basic concept of FEM and its procedure- Advantages and Disadvantages - Weighted Residual Method – Principle of Stationary Total Potential – Rayleigh Ritz method.

UNIT II	**ONE DIMENSIONAL FINITE ELEMENT ANALYSIS**	**12**

Finite element: modelling, coordinates, shape functions, stiffness matrix, stiffness equation, finite element equation for one dimensional element. Load or force vector – Temperature effects.

UNIT III	**TWO DIMENSIONAL FINITE ELEMENT ANALYSIS**	**12**

Finite element modelling, coordinates, shape functions, stiffness matrix, stiffness equation, finite element equation for two dimensional elements. Plane stress and plane strain – Constant Strain Triangular element – Linear Strain Triangular elements - Temperature effects.

UNIT IV	**ISOPARAMETRIC ELEMENTS AND FORMULATION**	**12**

Shape function for 4 noded elements using natural coordinate system and transformation – element stiffness matrix equations –Higher order two dimensional element – Shape function derivation for rectangular and triangular element – Lagrangean and Serendipity elements.

UNIT V	**APPLICATIONS TO FIELD PROBLEMS IN TWO DIMENSION**	**12**

Heat Transfer – Application to Heat Transfer in two dimensions – Application to Fluid Mechanics in two dimensions.

L	T	P	T

45	**15**	**0**	**60**

TEXT BOOKS

4. Krishnamoorthy,C.S.,"Finite Element Analysis –Theory and Programming", Second Edition, Tata McGraw Hill, 2015.
5. Bhavikati , S.S., "Finite Element Analysis ", New Age International Publishers , 2016.
6. S.S.Rao, "The Finite Element Method in Engineering", Pergaman Press, 2011.

REFERENCES

4. J.N.Reddy, "An Introduction to Finite Element Method", McGraw-Hill, Intl. Student Edition, 2013.
5. Chandrupatla, T.R., and Belegundu, A.D., "Introduction to Finite Element in Engineering", Third Edition, Prentice Hall, India, 2012.
6. O. C. Zienkiewicz, Robert Leroy Taylor, Perumal Nithiarasu, "The Finite Element Method for Fluid Dynamics", Butterworth-Heinemann, 2013.

Mapping of CO's with PO's:

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO 1**	**PSO2**
CO1	1	3	2			1							1	1
CO2	2	2	3	1		1							1	
CO3	3	1	1	1		2				2		1	1	1
CO4	3	2	1		1	1	1	1	1	1	1			
Total	9	8	7	2	1	5	1	1	1	3	1	1	3	2
Scaled Value	**2**	**2**	**2**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**

Note:

Total	0	1-5	6-10	11-15
Scaled value	0	1	2	3
Relation	No	Low	Medium	High

3.Master of Technology(Environmental Engineering)(Full Time)

Semester	Course Code	Course Name	L	T	P	C
I	YEN101	Environment Chemistry	3	0	0	3

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

CO1 Students will gain competency in solving environmental issues of chemicals based pollution

CO2 Ability to determine chemicals mobility in aquatic systems

CO3 Ability to identify contaminating chemicals in air and their fate

CO4 Understand the type of soil contaminants and provide remediation

CO5 Identify emerging environmental contaminants including speciation

COURSE CONTENT

UNIT I **INTRODUCTION** **9**

Stoichiometry and mass balance-Chemical equilibria, acid base, solubility product(Ksp), heavy metal precipitation, amphoteric hydroxides, CO2 solubility in water and species distribution –Chemical kinetics, First order, Colloids, electrical properties, double layer theory, environmental significance of colloids, coagulation

UNIT II **AQUATIC CHEMISTRY** **9**

Water quality parameters- environmental significance and determination; Fate of chemicals in aquatic environment, volatilization, partitioning, hydrolysis, photochemical transformation– Degradation of synthetic chemicals-Metals, complex formation, oxidation and reduction, Eh – pH diagrams, redox zones, Fe – sorption- Chemical speciation

UNIT III **ATMOSPHERIC CHEMISTRY** **9**

Atmospheric structure –-chemical and photochemical reactions – photochemical smog. Ozone layer depletion, greenhouse gases and global warming, CO2 capture – Acid rain - origin and composition of particulates. Air quality parameters-effects and determination

UNIT IV **SOIL CHEMISTRY** **9**

Nature and composition of soil-Clays- cation exchange capacity-acid base and ion-exchange reactions in soil. Reclamation of contaminated land.

UNIT V **EMERGING AREAS** **9**

Principles of green chemistry, Atom economy, mass index - Nano materials, CNT, titania, composites, environmental applications.

TEXT BOOKS

1. Sawyer,C.N., MacCarty, P.L. and Parkin, G.F., Chemistry for Environmental Engineering and Science, Tata McGraw – Hill, Fifth edition, New Delhi 2003.
2. Colin Baird ‘Environmental Chemistry’, Freeman and company, New York, 2011.
3. Manahan, S.E., "Environmental Chemistry", Ninth Edition, CRC press, 2009.
4. Ronald A. Hites ,"Elements of Environmental Chemistry", Wiley, 2nd Edition,2012.

REFERENCES

1. Des W. Connell, “Basic Concepts of Environmental Chemistry”, CRC Press, 2nd Edition, 2005
2. Gary W VanLoon, Stephen J Duffy,” Environmental Chemistry: A Global Perspective”, Oxford

University Press, 2010

CO-PO's Mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**
CO1	3		1				
CO2		3	2		1	2	1
CO3			3			1	1
CO4	2		3	1			1
CO5	2		2	1			1
Scaled Value	**2**	**1**	**3**	**1**	**1**	**1**	**1**

Note:	**Total**	0	1-5	6-10	11-15
	Scaled value	0	1	2	3
	Relation	No	Low	Medium	High

Semester	Course Code	Course Name	L	T	P	C
I	YEN102	Environmental Microbiology	3	0	0	3

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

CO1 Explain the basic importance and functional elements of environmental microbiology including the potential applications in the environment

CO2 Understand and describe the type of microorganisms in the environment, their importance in water supplies and the role of microorganisms in the cycling of nutrients in an ecosystem.

CO3 Understand the metabolic processes on carbohydrates, protein and lipids, importance of enzymes, production of energy and the various additional metabolic processes.

CO4 Select and apply appropriate methods for assessing the water, air and soil borne pathogens, their health implications, importance of microbes in aerobic and anaerobic cycles and deterioration of water bodies

CO5 Conduct testing and research on toxicology, understand the importance of test organisms, environmental applications such as biomagnifications, biomonitoring and in developing risk based standards.

COURSE CONTENT

UNIT I **FUNDAMENTALS OF MICROBIOLOGY** **9**

Cell – Prokaryotes Vs Eukaryotes – Classification of microbes – Ultra structure of a bacterial cell and cell wall – Size, shape and arrangement of bacterial cells – Structure of DNA (double helical and chemical) – RNA types and plasmids – Types of Microbiological media – Methods of sterilization and inoculation – Isolation, development of pure culture and preservation of soil bacteria – Simple and Gram staining – Growth of bacteria – Factors influencing growth – Growth curve

UNIT II **MICROBIAL ECOLOGY AND METABOLISM** **9**

Ecological group of microorganisms based on Oxygen requirement, Carbon source, temperature, habitat and nutrient requirements – Extremophile bacterial types – Types of interaction – symbiosis, mutualism, commensalism, competition, parasitism and predation – Plant and animal microbes interactions – Glycolysis – Kreb's cycle – β-Oxidation and Electron transport chain.

UNIT III **SOIL MICROBIOLOGY** **9**

Soil bacteria, actinomycetes, algae, fungi and protozoans and their role– Rhizosphere microbes – Carbon, Nitrogen, Phosphorous and Sulfur cycles – Biodegradation (cellulose, pectin) and Bio-deterioration (leather) – Bioremediation of oil spills – Microbial leaching of mineral ores – Bioaccumulation and Biomagnification

UNIT IV **AQUATIC MICROBIOLOGY** **9**

Hydrological cycle – Marine, Brackish and Fresh water ecosystems – Water borne bacterial diseases – Biological indicators of water pollution – Quality checking of potable water – Algae in water supplies – problems and control – Microbiology of sewage treatment.

UNIT V **ATMOSPHERIC MICROBIOLOGY** **9**

Aerofungi, algae and bacteria – Microbial aeroallergens – Deposition of microbes in atmosphere – Gravitational setting, Surface impaction and rain and electrostatic deposition – Air borne microbial diseases – Pertussis, Q fever

TEXT BOOKS

1. Pelczar Jr. MJ, Chan ECS and Krieg, NR., "Microbiology", McGraw Hill. Inc, New York, 1993.

2. Prescott, L.M., Harley, J.P. and Klein, D.A., “Microbiology”, McGraw Hill, New York, 2006.Stanley E. Manahan, "Environmental Science and Technology", Lewis Publishers, 200
3. Atlas, R.A. and Bartha, R., “Microbial Ecology – Fundamentals and Application”, Benjamin Cummings, New York, 2000.

REFERENCES

1. Egbert Boeker and Rienk Vangrondella, “Environmental Science”, John Wiley & Sons Ltd., USA, 2001.
2. Grant, Wd. and Long, PL., “Environmental Microbiology”, Blackie Glasgow, London, 1981.
3. Grerard J. Tortora, Berdell R. Funke, Christine and L. Case, “ Microbiology: An Introduction”, Benjamin Cummings, U.S.A., 2004.

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**
CO1	3				1		
CO2		3					
CO3		3	3				
CO4			2	3			
CO5				3		2	1
Scaled Value	**1**	**2**	**1**	**2**	**1**	**1**	**1**

Note:	**Total**	0	1-5	6-10	11-15
	Scaled value	0	1	2	3
	Relation	No	Low	Medium	High

Semester	Course Code	Course Name	L	T	P	C
I	YEN103	Principles and Design of Physico-Chemical Treatment Systems	3	1	0	4

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

CO 1	Classify various physical and chemical treatment options for treatment of water and wastewater
CO 2	Explain the mechanism behind the treatment processes and their advantages and disadvantages
CO 3	Design the treatment scheme for municipal water and wastewater
CO 4	Analyse the specific needs on residue management and up gradation of existing plants
CO 5	Gain knowledge on operation and maintenance of various treatment units

COURSE CONTENT		**Hours**
UNIT I	**INTRODUCTION**	**9**
	Pollutants in water and wastewater–characteristics, standards for performance-significance of physico-chemical treatment–Selection criteria-types of reactor-reactor selection-batch-continuous type-kinetics	
UNIT II	**PHYSICAL TREATMENT**	**9**
	Physical treatment - screening – mixing, equalization –sedimentation – filtration – evaporation– incineration–gas transfer–mass transfer coefficient adsorption – isotherms – membrane separation, Reverse Osmosis, Nanofiltration, Ultrafiltration and Electrodialysis, Distillation– Stripping and Crystallization – Recent advances.	
UNIT III	**CHEMICAL TREATMENT**	**9**
	Principles of Chemical treatment– Coagulation - flocculation–Precipitation – flotation - solidification and stabilization–Disinfection, Ion exchange, Electrolytic methods, Solvent extraction–advanced oxidation/reduction– recent trends	
UNIT IV	**DESIGN OF MUNICIPAL WATER TREATMENT PLANTS**	**9**
	Selection of treatment–design of municipal water treatment plant units–aerators–chemical feeding– flocculation–clarifier–tube settling–filters–rapid sand filters, slow sand filter, pressure filter, dual media filter – disinfection flow charts–layouts –construction and O&M aspects–case studies, residue management – upgradation of existing plants – recent trends.	
UNIT V	**DESIGN OF WASTEWATER TREATMENT PLANTS**	**9**

Design of municipal wastewater treatment units-screens- grit chamber-settling tanks- sludge thickening - sludge dewatering systems - sludge drying beds - design of industrial wastewater treatment units - equalization - neutralization - chemical feeding devices – mixers - floatation units - oil skimmer - flowcharts – layouts -construction and O&M aspects – case studies, retrofitting - residue management – upgradation of existing plants – recent trends.

TEXT BOOKS

1. Metcalf Eddy ,Inc. George Tchobanoglous, Franklin Burton H, David Stensel," Wastewater Engineering", Tata McGraw-Hill Education ,2002
2. Hendricks," Water Treatment Unit Processes: Physical and Chemical," CRC, 2006.
3. Qasim.S.R., Guang Zhu., "Wastewater Treatment and Reuse" – Volume 1& 2 2018.
4. Ajey Kumar Patel, Achanta Ramakrishna Rao," Aeration Systems for Wastewater Treatment", Lap Lambert Academic PublishinG,-2011

REFERENCES

1. Lee, C.C. and Shun dar Lin, "Handbook of Environmental Engineering Calculations", McGraw Hill, New York, 1999.
2. CPHEEO manual – "Manual for sewerage and sewage treatment systems" – Part A,B,C, Ministry of Urban development, New Delhi, 2013.
3. CPHEEO manual – "Manual for water supply and treatment" –Ministry of Urban Development, New Delhi, 1999.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	2	3			2	1	3
CO2	2	2	3		2	1	1
CO3		3		3	3	1	3
CO4				3	2	1	2
CO5	3	2		3		3	2
						7	11
Total	**2**	**2**	**1**	**2**	**2**	**2**	**3**

Note:	**Total**	0	1-5	6-10	11-15
	Scaled value	0	1	2	3
	Relation	No	Low	Medium	High

Semester	Course name	Course Code	L	T	P	C
I	YEN106	Environmental Quality Measurements Laboratory	0	0	4	2

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

CO1 Ability to calibrate and standardize the equipments

CO2 Explain the operation and mechanism of different analytical equipments and their advantages and limitations

CO3 Relate the theoretical knowledge of sampling and analysis into lab practice

CO4 Estimate the concentration of various parameters in water, wastewater, and ambient air

CO5 Able to perform field oriented testing of Solid waste water, wastewater and soil

List of Experiments:

1. Good Laboratory Practices, Quality control, calibration of Glassware

a) Water

a. Determination of pH, Turbidity and Electrical conductivity
b. Determination of Alkalinity
c. Determination of Acidity
d. Determination of Chlorides
e. Determination of Total Hardness
f. Determination of iron
g. Determination of Sulphates
h. Determination of Fluorides
i. Determination of Residual chlorine
j. Test on Dissolved Oxygen

b) Wastewater

a. BOD
b. COD
c. Total Solids, Suspended Solids, Volatile Solids, Non Volatile Solids
d. Determination of Ammoniacal Nitrogen

C)Air

a. Determination of Ambient Air Quality Parameters- SPM, CO, NO_x and SO_x

c) Soil

a. Soil Analysis – pH and Conductivity

d) Noise

a. Determination of Noise

e) Solid waste

a. Composition of Municipal Solid waste
b. Proximate and Ultimate Analysis

TEXT BOOKS

1. APHA, "Standard Methods for the Examination of Water and Wastewater", 22nd Ed. Washington, 2012.
2. "Laboratory Manual for the Examination of water, wastewater soil Rump", H.H. and Krist, H. – Second Edition, VCH, Germany, 3rd Edition, 1999.
3. "Methods of air sampling & analysis" ,James P.Lodge Jr(Editor) 3rd Edition,
4. Lewis publishers, Inc, USA,1989. Standard Methods for the Examination of Water and Wastewater, 20th Edition.
5. Manual on water supply and Treatment, CPHEEO, Ministry of Urban Development, GOI, New Delhi, 2000.

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**
CO1				3			
CO2	3					3	3
CO3	2	2					1
CO4			2	2	3	3	
CO5	2			3	3	3	2
Total	**2**	**1**	**1**	**2**	**2**	**2**	**2**

Note:	**Total**	0	1-5	6-10	11-15
	Scaled value	0	1	2	3
	Relation	No	Low	Medium	High

Semester	Course Code	Course Name	L	T	P	C
I	YEN109	Microbiology Laboratory	0	0	4	2

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

CO1 Explain the basic importance and functional elements of environmental microbiology including the types of microorganisms in air, water and soil.

CO2 Understand and describe the type of microorganisms in the environment, their importance and the method of culturing of microorganisms in the laboratory.

CO3 Understand the basic biochemical method of identification of microorganisms and to identify them using microscopial tool.

CO4 Select and apply appropriate methods for detection in the water, air and soil borne pathogens, their health implications, importance of microbes in our daily life.

CO5 Conduct testing and research on toxicology, the importance of test organisms, environmental applications of such microorganisms in toxicological studies and in developing risk based standards.

List of Experiments

1. Preparation of culture media
2. Isolation, culturing and Identification of Microorganisms
3. Microorganisms from polluted habitats (soil, water and air)
4. Measurement of growth of microorganisms
5. Biodegradation of organic matter in waste water Analysis of air borne microorganisms
6. Staining of bacteria.
7. Effect of pH, temperature on microbial growth
8. Pollutant removal using microbes from industrial effluent.
9. Bacteriological analysis of wastewater (Coliforms, E.coli, Streptococcus) – MPN
10. Bacteriological analysis of wastewater (Coliforms, Streptococcus) - MF techniques
11. Detection of Anaerobic Bacteria (Clostridium sp.)
12. Bioreactors (cultivation of microorganisms)

TEXT BOOKS

1. Benfield, L.D.; Weand, B.L.; Judkins, J.F. (1982) Process chemistry for water and wastewater. Prentice Hall Inc Englewood Cliffs New Jersey.

2. Weber Jr., W.J. (1972) Physico-chemical Process for Water Quality Control. Wiley Inc. Newyork.

3. Peavy, H.S., Rowe, D.R., Tchobanoglous, G. Environmental Engineering, McGraw Hills, New York, 1985.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	2	2				3	
CO2	2	3				1	
CO3	2		2				
CO4	1		3	3		2	
CO5	1			3	2	1	1
Total	**2**	**1**	**1**	**2**	**1**	**2**	**1**

Note:	Total	0	1-5	6-10	11-15
	Scaled value	0	1	2	3
	Relation	No	Low	Medium	High

Semester	Course Code	Course Name	L	T	P	C
II	YEN201	Transport of Water and Wastewater	3	0	0	3

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

CO1 Understand general hydraulics and need for proper collection and conveyance of water and wastewater

CO2 Design economic diameters of gravity and pumping mains and storage reservoirs

CO3 Design and analysis of water distribution networks and apply computer softwares

CO4 Design sewer networks for various flow conditions

CO5 Estimate the quantity of storm drainage and design proper storm drainage for speedy draining of storm water from the city area.

COURSE CONTENT **HRS.**

UNIT I **TRANSPORT OF WATER** **9**

Water Storage and Transmission, Storage- requirements, impounding reservoirs- intakes, pressure conduits, hydraulics - pumps and pumping units, capacity - selection of water pumps -economic design of pumps and economic design of gravity and pumping mains

UNIT II **MATERIALS FOR PIPES** **9**

Specification for pipes, merits and demerits, pipe appurtenances, types of loads and stresses, water hammer, causes and prevention, control devices, laying, jointing and Testing of pipes.

UNIT III **DISTRIBUTION SYSTEM** 9

Principles of design, analysis of distribution networks, Hardy Cross, equivalent pipe and Newton Raphson methods, computer applications in distributions network analysis, optimal design of networks, maintenance of distribution systems, methods of control and prevention of corrosion, storage, distribution and balancing reservoirs – EPANET - WaterGEM

UNIT IV **STORM DRAINAGE**

Necessity - combined and separate system; Estimation of storm water run-off Formulation of rainfall intensity duration and frequency relationships- Rational methods – Empirical Method

UNIT V **SANITARY SEWERAGE** **9**

Sanitation technology selection - sanitary sewage flow estimation - sewer materials and appurtenances - hydraulics of flow in sanitary sewers - partial flows - sewer design - sewer layouts- LOOP.

TEXT BOOKS

1. **G.S.Bridie & J.S. Bridie, Water Supply and Sanitary Engineering, Dhanpat Rai and Sons, New Delhi, 2010.**
2. **Hammer, M.J. Water & Waste water Technology, John Wiley & Sons, New York, 7TH edition, 2012.**
3. **Garg, S.K., "Environmental Engineering I & II", Khanna Publishers, New Delhi 2007**
4. Manual on Water Supply and Treatment, CPHEEO, Government of India, New Delhi, 2000
5. Manual on Sewage and Sewerage system, CPHEEO, Government of India, New Delhi, 2000

REFERENCES

1. 'Water supply and wastewater Removal' Vol.I. John Wiley and Sons Manual on Water Treatment, CPHEEO, Government of India, New Delhi, 2010
2. Hussain S.K. A Text book of water supply and sanitary Engineering, Oxford and IBH Publishing Co., New, 2010.
3. Larry W. Mays, Mays Larry." Water Distribution System Handbook, "McGraw-Hill Professional Publishing, 1999.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3	2	3	3			1
CO2		3	3	2	3		2
CO3	2	2	3	3	3	2	3
CO4	2	2	3	3	3	2	3
CO5	1	1	3	3	3	2	2
Total	**2**	**2**	**3**	**3**	**3**	**2**	**3**

Note:	**Total**	0	1-5	6-10	11-15
	Scaled value	0	1	2	3
	Relation	No	Low	Medium	High

Semester	Course Code	Course Name	L	T	P	C

II	**YEN202**	**Biological Treatment of Wastewater**	**3**	**0**	**0**	**3**

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

CO1 Understand the principles and significance of various biological treatment systems involved in water and waste water treatment.

CO2 Design various treatment systems of water and wastewater.

CO3 Develop conceptual schematics required for biological treatment of wastewater.

CO4 Translate pertinent criteria into biological treatment system requirements.

CO5 Gain knowledge on operation and maintenance of various treatment units

COURSE CONTENT

UNIT I **INTRODUCTION** **9**

Objectives of biological treatment – significance – Principles of aerobic and anaerobic treatment - kinetics of biological growth – Factors affecting growth – attached and suspended growth - Determination of Kinetic coefficients for organics removal – Biodegradability assessment –selection of process- reactors-batch-continuous type

UNIT II **AEROBIC TREATMENT OF WASTEWATER** **9**

Design of sewage treatment plant units –Activated Sludge process and variations, Sequencing Batch reactors, Membrane Biological Reactors-Trickling Filters-Bio Tower-RBC-Moving Bed Reactors-fluidized bed reactors, aerated lagoons, waste stabilization ponds – nutrient removal systems – natural treatment systems, constructed wet land – Disinfection – disposal options – reclamation and reuse – Flow charts, layout, PID, hydraulic profile, recent trends

UNIT III **ANAEROBIC TREATMENT OF WASTEWATER** 9

Design of units – UASB, up flow filters, Fluidized beds MBR, septic tank and disposal – Nutrient removal systems – Flow chart, Layout and Hydraulic profile – Recent trends.

UNIT IV **SLUDGE TREATMENT AND DISPOSAL** **9**

Design of sludge management facilities, sludge thickening, sludge digestion, biogas generation, sludge dewatering(mechanical and gravity) Layout, PID, hydraulics profile – upgrading existing plants – ultimate residue disposal –

recent advances.

UNIT V **OPERATION AND MAINTENANCE** **9**

Construction and Operational Maintenance problems – Trouble shooting – Planning, Organizing and Controlling of plant operations – capacity building - Retrofitting Case studies – sewage treatment plants – sludge management facilities.

TEXT BOOKS

1. Arceivala, S.J., “Wastewater Treatment for Pollution Control”, Tata Mcgraw Hill, New Delhi, III Edition, 2006.
2. David Hendricks, “Fundamentals of Water Treatment Unit Process”, CRC Press, New York, 2010
3. F.R. Spellman, “Hand Book of Water and Wastewater Treatment Plant operations”, CRC Press, New York, III, Edition, 2013.

REFERENCES

1. Manual on “Sewerage and Sewage Treatment” CPHEEO, Ministry of Urban Development, Government of India,New Delhi, 1999.
2. Metcalf & Eddy, INC, “Wastewater Engineering – Treatment and Reuse”, Fourth Edition, Tata Mc Graw-Hill Publishing Company Limited, New Delhi, 2003.
3. Qasim, S.R. “Wastewater Treatment Plant, Planning, Design & Operation”, Technomic Publications, New York, II Edition, 1998.

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**
CO1	3	3	2		1	1	2
CO2	2	3	2	3	3	2	3
CO3	1	2	1		3	1	2
CO4	1		2	2	2	1	2
CO5	3	1	1	3	2	1	2
Total	**3**	**2**	**2**	**2**	**3**	**2**	**3**

Note:	**Total**	0	1-5	6-10	11-15
	Scaled value	0	1	2	3
	Relation	No	Low	Medium	High

Semester	Course Code	Course Name	L	T	P	C
III	YEN203	Environmental Impact Assessment	3	0	0	3

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

CO1 Understand the necessity of the impacts and risks that will be caused by projects or industries and the methods to overcome these impacts.

CO2 Know about the legal requirements of Environmental Impact and Risk Assessment for projects.

CO3 Gain good knowledge on environmental impact assessment procedures and techniques adopted in the field.

CO4 Understand EIA as a technical, social process used for environmental governance.

CO5 Analyse the environmental impacts of the proposed projects

COURSE CONTENT

UNIT I **UNIT I-INTRODUCTION TO EIA** **12**

Environmental Impact Assessment (EIA)- Environmental Impact Statement – Environmental Risk assessment –Legal and Regulatory aspects in India – Types and limitations of EIA – Terms of reference in EIA – Issues in EIA – National – Cross sectoral – social and cultural.

UNIT II **METHODOLOGIES** 12

Methods of EIA –Check lists – Matrices – Networks – Cost-benefit analysis – Analysis of alternatives – Case Studies.

UNIT III **PREDICTION AND ASSESSMENT** **12**

Assessment of Impact on land, water and air, noise, social, cultural flora and fauna; Mathematical models; public participation – Rapid EIA.

UNIT IV **ENVIRONMENTAL MANAGEMENT PLAN** **12**

Plan for mitigation of adverse impact on environment – options for mitigation of impact on water, air and land, flora and fauna; Addressing the issues related to the Project Affected People – ISO 14000

UNIT V **CASE STUDIES** **12**

EIA for infrastructure projects – Bridges – Stadium – Highways – Dams – Multi-storey Buildings – Water Supply and Drainage Projects

TEXT BOOKS

1. Canter, L.W., "Environmental Impact Assessment", McGraw-Hill, New York. 2006.
2. Lawrence, D.P., "Environmental Impact Assessment – Practical solutions to recurrent problems", Wiley-Interscience, New Jersey 2003.
3. Petts, J., "Handbook of Environmental Impact Assessment", Vol., I and II, Conwell Science London. 2009.

REFERENCES

1. Biswas, A.K. and Agarwala, S.B.C., "Environmental Impact Assessment for Developing Countries", Butterworth Heinemann, London. 2004.
2. The World Bank Group, "Environmental Assessment Source Book Vol. I, II and III. The World Bank, Washington. 2001.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	2			2	3	2	3
CO2	3					2	2
CO3	3		2	2			
CO4	2		1	2	3	2	1
CO5	1	3	3	2	3	2	1
Total	**3**	**1**	**2**	**2**	**2**	**2**	**2**

Note:	**Total**	0	1-5	6-10	11-15
	Scaled value	0	1	2	3
	Relation	No	Low	Medium	High

Semester	Course Code	Course Name	L	T	P	C
II	**YEN206**	**Environmental Engineering Processes Laboratory**	**0**	**0**	**4**	**2**

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

CO1 Perform common environmental experiments relating to water and wastewater quality, and know which tests are appropriate for given environmental problems.

CO2 Demonstrate and analyze basic reactor types and kinetics.

CO3 Determine the quantity of Sludge

CO4 Demonstrate and analyze basic environmental engineering processes (physical/chemical) for treatment of contaminants, including gas transfer and adsorption.

CO5 Hands on experience with basic methods of environmental analysis.

List of Experiments

1. Coagulation and Flocculation
2. Studies on Filtration- Characteristics of Filter media
3. Disinfection for Drinking water (Chlorination
4. Water Softening – Lime and Caustic Soda Process
5. Sludge volume Index
6. Sedimentation – Settling Column Analysis of Flocculating Particles
7. Adsorption – Colour Removal by Adsorption
8. Heavy Metal Precipitation
9. Kinetics of Activated Sludge Process

TEXT BOOKS

1. Standard Methods for the Examination of Water and Wastewater, 20th Edition.
2. Manual on water supply and Treatment, CPHEEO, Ministry of Urban Development, GOI, New Delhi, 2000.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3	3	3		2		3
CO2		3	3		2		3
CO3		3			3		1
CO4	3	3	3	2	3		2
CO5			3	3	2	3	2
Total	**2**	**3**	**3**	**1**	**3**	**1**	**3**

Note:	**Total**	0	1-5	6-10	11-15
	Scaled value	0	1	2	3
	Relation	No	Low	Medium	High

Semester	Course Code	Course Name	L	T	P	C
II	**YEN207**	**Mini Project**	**0**	**0**	**4**	**2**

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

CO1 Define and discuss an existing problem in Environmental Engineering Systems and summarize the solutions.

CO2 Discover various tools and mathematical/Engineering methods behind the solutions

CO3 Present the problem, objectives, literature and analyze various solutions.

CO4 Solve the problem using existing method by proper tools and produce the results.

CO5 Conclude, compare, report and present the solution proposed and the results obtained.

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**
CO1	3	3			2	1	3
CO2			3	3	1	2	2
CO3		3			3	1	3
CO4	3	3	3		2	2	3
CO5					3	1	3
Total	**2**	**2**	**2**	**1**	**3**	**2**	**3**

Note:	**Total**	0	1-5	6-10	11-15
	Scaled value	0	1	2	3
	Relation	No	Low	Medium	High

Semester	Course Code	Course Name	L	T	P	C
II	**YEN302**	**Dissertation Phase – 1**	**0**	**0**	**20**	**10**

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

CO1 Identify problems and contemporary tools to solve them efficiently.

CO2 Survey recent solutions proposed and outline the objectives and methods.

CO3 Explain the project ideas, findings and demonstrate the same

	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	1	3	3		2	3	1
CO2	1	3			3	3	3
CO3	1	2	3	3	3	2	3
Total	**1**	**2**	**2**	**1**	**2**	**2**	**2**

Note:	**Total**	0	1-5	6-10	11-15
	Scaled value	0	1	2	3
	Relation	No	Low	Medium	High

Semester	Course Code	Course Name	L	T	P	C
IV	**YEN401**	**Dissertation Phase – II**	**0**	**0**	**32**	**16**

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

CO1 Identify, Estimate, Track and cost the human and physical resources required, and make plans to obtain the necessary resources

CO2 Conclude, compare, report and present the solution proposed and the results obtained.

CO3 Extend the findings and develop a research article without any plagiarism and present

	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1				3	3	3	2
CO2	1	1	1	3	3	3	3
CO3	1	1	1	3	3	3	3
Total	**1**	**1**	**1**	**2**	**2**	**2**	**2**

Note:	**Total**	0	1-5	6-10	11-15
	Scaled value	0	1	2	3
	Relation	No	Low	Medium	High