FOUR YEAR B. Tech. DEGREE COURSE
Scheme of Instruction and Examination
(Effective from 2023–24)

III Semester - CE — Scheme : 2023

S. No.	Category	Subject	Scheme of Instruction periods/week			Credits	Scheme of Examination Maximum Marks		
			L/D	T	P		CIA	End Exam	Total
I		**Theory**							
1	BS&H	Numerical and Statistical Methods	3	-	-	3	30	70	100
2	BS&H	Universal Human Values	2	1	-	3	30	70	100
3	PC	Strength of Materials	3	-	-	3	30	70	100
4	PC	Surveying	3	-	-	3	30	70	100
5	PC	Fluid Mechanics	3	-	-	3	30	70	100
II		**Practical**							
6	PC	Strength of Materials Lab	-	-	3	1.5	30	70	100
7	PC	Surveying Lab	-	-	3	1.5	30	70	100
8	SC	Building Planning and Drawing	-	1	2	2	30	70	100
9	ES	Design Thinking & Innovation	1	-	2	2	30	70	100
		Total	**15**	**2**	**10**	**22**			

IV Semester - CE — Scheme : 2023

S. No.	Category	Subject	Scheme of Instruction periods/week			Credits	Scheme of Examination Maximum Marks		
			L/D	T	P		CIA	End Exam	Total
I		**Theory**							
1	BS&H	Managerial Economics and Financial Analysis	2	-	-	2	30	70	100
2	PC	Engineering Geology	3	-	-	3	30	70	100
3	PC	Structural Analysis	3	-	-	3	30	70	100
4	PC	Concrete Technology	3	-	-	3	30	70	100
5	PC	Hydraulics & Hydraulic Machinery	3	-	-	3	30	70	100
II		**Practical**							
6	PC	Engineering Geology Lab	-	-	3	1.5	30	70	100
7	PC	Concrete Technology Lab	-	-	3	1.5	30	70	100
8	SC	Soft Skills	-	1	2	2	30	70	100
9	AC	Environmental Science	2	-	-	-	100	-	100
		Total	**16**	**1**	**8**	**19**			
Mandatory Community Service Project Internship of 8 weeks duration during summer vacation									

FOUR YEAR B. Tech. DEGREE COURSE
Scheme of Instruction and Examination
(Effective from 2023–24)

V Semester - CE — Scheme : 2023

S. No.	Category	Subject	Scheme of Instruction periods/week			Credits	Scheme of Examination Maximum Marks		
			L/D	T	P		CIA	End Exam	Total
I		**Theory**							
1	PC	Water Resources Engineering	3	-	-	3	30	70	100
2	PC	Design of Reinforced Concrete Structures	3	-	-	3	30	70	100
3	PC	Geotechnical Engineering	3	-	-	3	30	70	100
4	ES	Introduction to Quantum Technologies and Applications	3	-	-	3	30	70	100
5	PE	Professional Elective - I	3	-	-	3	30	70	100
6	OE	Open Elective - I	3	-	-	3	30	70	100
II		**Practical**							
7	PC	Geotechnical Engineering Lab	-	-	3	1.5	30	70	100
8	PC	Fluid Mechanics & Hydraulic Machines Lab	-	-	3	1.5	30	70	100
9	SC	Estimation, Specification, Costing & Valuation	-	1	2	2	30	70	100
10	ES	Tinkering Lab	-	-	2	1	30	70	100
11		Evaluation of Community Service Internship	-	-	-	2	100	-	100
		Total	**18**	**1**	**10**	**26**			

VI Semester - CE — Scheme : 2023

S. No.	Category	Subject	Scheme of Instruction periods/week			Credits	Scheme of Examination Maximum Marks		
			L/D	T	P		CIA	End Exam	Total
I		**Theory**							
1	PC	Design of Steel Structures	3	-	-	3	30	70	100
2	PC	Highway Engineering	3	-	-	3	30	70	100
3	PC	Environmental Engineering	3	-	-	3	30	70	100
4	PE	Professional Elective - II	3	-	-	3	30	70	100
5	PE	Professional Elective - III	3	-	-	3	30	70	100
6	OE	Open Elective - II	3	-	-	3	30	70	100
II		**Practical**							
7	PC	Highway Engineering Lab	-	-	3	1.5	30	70	100
8	PC	Environmental Engineering Lab	-	-	3	1.5	30	70	100
9	SC	Skills in Civil Engineering Software (CAD/STAADPro)	-	1	2	2	30	70	100
10	AC	Technical Paper Writing & IPR	2	-	-	-	100	-	100
		Total	**20**	**1**	**8**	**23**			
Mandatory Industry Internship of 8 weeks duration during summer vacation									

FOUR YEAR B. Tech. DEGREE COURSE
Scheme of Instruction and Examination
(Effective from 2023–24)

VII Semester - CE — Scheme : 2023

S. No.	Category	Subject	Scheme of Instruction periods/week			Credits	Scheme of Examination Maximum Marks		
			L/D	T	P		CIA	End Exam	Total
I		**Theory**							
1	PC	Finite Element Methods	3	-	-	3	30	70	100
2	BS&H	Management Elective	2	-	-	2	30	70	100
3	PE	Professional Elective - IV	3	-	-	3	30	70	100
4	PE	Professional Elective - V	3	-	-	3	30	70	100
5	OE	Open Elective - III	3	-	-	3	30	70	100
6	OE	Open Elective - IV	3	-	-	3	30	70	100
II		**Practical**							
7	SC	Building Information Modelling	-	1	2	2	30	70	100
8	AC	Gender Sensitization/ Constitution of India	2	-	-	-	100	-	100
9		Evaluation of Industry Internship	-	-	-	2	100	-	100
		Total	**19**	**1**	**2**	**21**			

VIII Semester - CE — Scheme : 2023

S. No.	Category	Subject	Scheme of Instruction periods/week			Credits	Scheme of Examination Maximum Marks		
			L/D	T	P		CIA	End Exam	Total
I		**Theory**							
1	Internship	Internship	-	-	-	4	30	70	100
2	Project	Project Work	-	-	-	8	30	70	100
		Total	-	-	-	**12**			

Professional Electives

Professional Elective – I (in V sem.)	1. Advanced Structural Analysis
	2. Air Pollution and Control
	3. Open Channel Flow
Professional Elective – II (in VI Sem.)	1. Foundation Engineering
	2. Design of Earthquake Resistant Structures
	3. Experimental Stress Analysis
Professional Elective – III (in VI Sem.)	1. Hydraulic Structures
	2. Pres-stressed Concrete
	3. Cost Effective Housing Techniques
	4. Watershed Management
Professional Elective – IV (in VII Sem.)	1. Railway, Airports, Docks and Harbour Engineering
	2. Geo-synthetics and Reinforced Earth Structures
	3. Environmental Impact Assessment
	4. Advanced Structural Design
	5. Design and Drawing of Hydraulic Structures
Professional Elective – V (in VII Sem.)	1. Sanitary Engineering
	2. Geographical Information Systems
	3. Ground Improvement Techniques
	4. Subsurface Investigation and Instrumentation
	5. Transportation Economics

OPEN ELECTIVES

Open Elective – I

S. No.	Course Name	Offering Department	Eligible Branches
1	Green Buildings	CE	All Branches
2	Construction Technology and Management	CE	All Branches Except CE
3	Electrical Safety Practices and Standards	EEE	All Branches Except EEE
4	Sustainable Energy Technologies	ME	All Branches Except ME
5	Electronic Circuits	ECE	All Branches Except ECE
6	Java Programming	CSE	CE,EEE,ME, and ECE
7	Foundation of Artificial Intelligence	CSE	CE,EEE, and ECE
8	Ethical Hacking	CSE	All Branches
9	Mathematics for Machine Learning and AI	HBS	All Branches
10	Materials Characterization Techniques		
11	Chemistry of Energy Systems		
12	English for Competitive Examinations		
13	Entrepreneurship and New Venture Creation		

Open Elective – II

S. No.	Course Name	Offering Department	Eligible Branches
1	Disaster Management	CE	All Branches
2	Sustainability in Engineering Practices	CE	All Branches
3	Renewable Energy Sources	EEE	All Branches Except EEE
4	Automation and Robotics	ME	All Branches Except ME
5	Product Lifecycle Management	ME	All Branches Except CE
6	Digital Electronics	ECE	All Branches Except ECE
7	Foundations of Operating Systems	CSE	CE,EEE,ME, and ECE
8	Foundations of Machine Learning	CSE	CE,EEE, and ECE
9	Web Technologies	CSE	CE,EEE,ME, and ECE
10	Introduction to Information Systems	CSE	CE,EEE,ME, and ECE
11	Optimization Techniques	HBS	All Branches Except ME
12	Physics of Electronic Materials and Devices	HBS	All Branches
13	Chemistry of Polymers and Applications		
14	Academic Writing and Public Speaking		
15	Mathematical Foundation of Quantum Technologies		

Open Elective – III

S. No.	Course Name	Offering Department	Eligible Branches
1	Building Materials and Services	CE	All Branches Except CE
2	Environmental Impact Assessment	CE	All Branches
3	Smart Grid Technologies	EEE	All Branches Except EEE
4	3D Printing Technologies	ME	All Branches Except ME
5	Composite Materials	ME	All Branches
6	Applications of Microprocessors and Microcontrollers	ECE	All Branches Except EEE and ECE
7	Introduction to Data Base Systems	CSE	CE,EEE,ME, and ECE
8	Cyber Security	CSE	CE,EEE,ME, and ECE
9	Modern C++	CSE	All Branches
10	Wavelet Transforms and its Applications	HBS	All Branches
11	Smart Materials and Devices		
12	Green Chemistry and Catalysis for Sustainable Environment		
13	Employability Skills		
14	Introduction to Quantum Mechanics		

Open Elective – IV

S. No.	Course Name	Offering Department	Eligible Branches
1	Geo-Spatial Technologies	CE	All Branches Except CE
2	Solid Waste Management	CE	All Branches
3	Electric Vehicles	EEE	All Branches Except EEE
4	Total Quality Management	ME	All Branches Except ME
5	Safety in Engineering Industry	ME	All Branches
6	Transducers and Sensors	ECE	All Branches Except ECE
7	Drone Technology	ECE	All Branches
8	Introduction to Computer Networks	CSE	CE,EEE,ME, and ECE
9	Internet of Things	CSE	CE,EEE,ME, and ECE
10	Multimedia & Animation	CSE	All Branches
11	Advanced Information Systems	CSE	CE,EEE,ME, and ECE
12	Quantum Computing	CSE	All Branches
13	Financial Mathematics	HBS	All Branches
14	Sensors and Actuators for Engineering Applications		
15	Chemistry of Nanomaterials and Applications		
16	Literary Vibes		

FOUR YEAR B. Tech. DEGREE COURSE
Scheme of Instruction and Examination
(Effective from 2023–24)

III Semester - CE **Scheme : 2023**

S. No.	Category	Subject	Scheme of Instruction periods/week			Credits	Scheme of Examination Maximum Marks		
			L/D	T	P		CIA	End Exam	Total
I		**Theory**							
1	BS&H	Numerical and Statistical Methods	3	-	-	3	30	70	100
2	BS&H	Universal Human Values	2	1	-	3	30	70	100
3	PC	Strength of Materials	3	-	-	3	30	70	100
4	PC	Surveying	3	-	-	3	30	70	100
5	PC	Fluid Mechanics	3	-	-	3	30	70	100
II		**Practical**							
6	PC	Strength of Materials Lab	-	-	3	1.5	30	70	100
7	PC	Surveying Lab	-	-	3	1.5	30	70	100
8	SC	Building Planning and Drawing	-	1	2	2	30	70	100
9	ES	Design Thinking & Innovation	1	-	2	2	30	70	100
		Total	**15**	**2**	**10**	**22**			

NUMERICAL & STATISTICAL METHODS (NSM)

III Semester : CE						**Scheme : 2023**		
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
		L/D	**T**	**P**	**C**	**Continuous Internal Assessment**	**End Exam**	**Total**
BS201	**BS&H**	**3**	**-**	**-**	**3**	**30**	**70**	**100**
Sessional Exam Duration : 2 Hrs						**End Exam Duration: 3 Hrs**		

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

CO1: Utilize Numerical Methods and Principles of least Square Methods.

CO2: Compute interpolating polynomial and Numerical differentiation for the given data.

CO3: Solve ordinary differential equations by numerical methods.

CO4: Apply the test of hypothesis for large samples.

CO5: Analyse the test of hypothesis for small samples.

UNIT – I

Solution of Algebraic & Transcendental Equations and Curve Fitting

Introduction – Bisection method – Iterative method, Regula-Falsi method and Newton Raphson method – Curve fitting: Fitting of straight line, second-degree and exponential curve by method of least squares.

UNIT – II

Interpolation

Finite differences – Operators, relation between the operators – Newton's forward and backward interpolation formulae – Lagrange's and Inverse Lagrange's interpolation formulae – Numerical differentiation.

UNIT – III

Solution of Initial Value Problems to Ordinary Differential Equations

Numerical solution of Ordinary Differential equations: Solution by Taylor's series – Picard'sMethod of successive Approximations – Euler's and modified Euler's methods – Runge-Kutta methods (second and fourth order).

UNIT – IV

Estimation and Testing of Hypothesis, Large Sample Tests

Estimation-parameters, statistics, sampling distribution, point estimation, Formulation of null hypothesis, alternative hypothesis, the critical and acceptance regions, level of significance, two types of errors. Large Sample Tests: Test for single proportion, difference of proportions, test for single mean and difference of means. Confidence interval for parameters in one sample and two sample problems

UNIT – V

Small Sample Tests

Student t-distribution (test for single mean, two means and paired t-test) – Testing of equality of variances (F-test), χ^2 – Test for goodness of fit, χ^2 – Test for independence of attributes.

Text Books

1. S.S. Sastry, *Introductory Methods of Numerical Analysis*, PHI Learning Private Limited.
2. B.S. Grewal, *Higher Engineering Mathematics*, Khanna Publishers, 2017, 44thEdition.
3. Miller and Freunds, *Probability and Statistics for Engineers*, 7/e, Pearson, 2008, India.

Reference Books

1. Erwin Kreyszig, *Advanced Engineering Mathematics*, John Wiley & Sons, 2018, 10th Edition.

2. R.K. Jain and S.R.K. Iyengar, *Advanced Engineering Mathematics*, Alpha Science International Ltd., 2021, 5th Edition (9th reprint).

3. Ronald E. Walpole, *Probability and Statistics for Engineers and Scientists*, PNIE.

4. H.K. Das and Er. Rajnish Verma, *Higher Engineering Mathematics*, S. Chand Publications, 2014, Third Edition (Reprint 2021).

Question Paper Pattern:

Sessional Exam: The question paper for Sessional Examination shall be for 40 marks. The question paper shall consist of Four Questions and all questions are compulsory. Question No.1 contains Five short answer questions (2marks each) for a total of 10 marks. Remaining Three Questions shall be EITHER/OR type descriptive questions for 10 marks each. Each of these descriptive questions may contain sub-questions.

End Exam: The question paper for End Examination shall be for 70 marks. The question paper shall contain Six Questions and all questions are compulsory. Question No.1 shall contain Ten short answer questions (2 marks each) for a total of 20 marks, with Two short answer questions from each unit. Remaining Five Questions (each question covering one unit of syllabus) carrying 10 marks each shall be EITHER/OR type descriptive questions and may contain sub-questions.

UNIVERSAL HUMAN VALUES (UHV)

III Semester : CE						**Scheme : 2023**		
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
		L/D	**T**	**P**	**C**	**Continuous Internal Assessment**	**End Exam**	**Total**
HSM201	**BS&H**	**2**	**1**	**-**	**3**	**30**	**70**	**100**
Sessional Exam Duration : 2 Hrs						**End Exam Duration: 3 Hrs**		

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

CO1: Define the terms like Natural Acceptance, Happiness and Prosperity.

CO2: Identify one's self, and one's surroundings (family, society nature).

CO3: Apply what they have learnt to their own self in different day-to-day settings in real life.

CO4: Relate human values with human relationship and human society.

CO5: Justify the need for universal human values and harmonious existence.

CO6: Develop as socially and ecologically responsible engineers.

UNIT – I

Introduction to Value Education (6 lectures and 3 tutorials for practice session)

Lecture 1: Right Understanding, Relationship and Physical Facility (Holistic Development and the Role of Education)
Lecture 2: Understanding Value Education
Tutorial 1: Practice Session PS1 Sharing about Oneself
Lecture 3: self-exploration as the Process for Value Education
Lecture4: Continuous Happiness and Prosperity – The Basic HumanAspirations
Tutorial 2: Practice Session PS2 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

UNIT – II

Harmony in the Human Being (6 lectures and 3 tutorials for practice session)

Lecture 7: Understanding Human being as the Co-existence of the self and thebody.
Lecture 8: Distinguishing between the Needs of the self and the body
Tutorial 4: Practice Session PS4 Exploring the difference of Needs of self andbody.
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

UNIT – III

Harmony in the Family and Society (6 lectures and 3 tutorials for practice session)

Lecture 13: Harmony in the Family – The Basic Unit of Human Interaction
Lecture 14: 'Trust' – the Foundational Value in Relationship
Tutorial 7: Practice Session PS7 Exploring the Feeling of Trust
Lecture 15: 'Respect' – As the Right Evaluation
Tutorial 8: Practice Session PS8 Exploring the Feeling of Respect
Lecture 16: Other Feelings, Justice in Human-to-Human Relationship

Lecture 17: Understanding Harmony in the Society Lecture 18: Vision for the Universal Human Order Tutorial 9: Practice Session PS9 Exploring Systems to fulfill Human Goal
UNIT – IV
Harmony in the Nature/Existence (4 lectures and 2 tutorials for practice session) 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 PS11 Exploring Co-existence in Existence
UNIT – V
Implications of the Holistic Understanding – a Look at Professional Ethics (6lectures and 3 tutorials for practice session) Lecture 23: Natural Acceptance of Human Values Lecture 24: Definitiveness of (Ethical) Human Conduct Tutorial 12: Practice Session PS12 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 PS14 Exploring Steps of Transition towards Universal Human Order
Practice Sessions for UNIT I – Introduction to Value Education PS1 Sharing about Oneself PS2 Exploring Human Consciousness PS3 Exploring Natural Acceptance
Practice Sessions for UNIT II – Harmony in the Human Being PS4 Exploring the difference of Needs of self and body PS5 Exploring Sources of Imagination in the self PS6 Exploring Harmony of self with the body
Practice Sessions for UNIT III – Harmony in the Family and Society PS7 Exploring the Feeling of Trust PS8 Exploring the Feeling of Respect PS9 Exploring Systems to fulfil Human Goal
Practice Sessions for UNIT IV – Harmony in the Nature (Existence) PS10 Exploring the Four Orders of Nature PS11 Exploring Co-existence in Existence
Practice Sessions for UNIT V – Implications of the Holistic Understanding – a Look at Professional Ethics PS12 Exploring Ethical Human Conduct

PS13 Exploring Humanistic Models in Education
PS14 Exploring Steps of Transition towards Universal Human Order

Text Books and Teacher Manual

a. The Textbook

R.R. Gaur, R Asthana, G P Bagaria, *A Foundation Course in Human Values and Professional Ethics*, 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034-47-1.

b. The Teacher's Manual

R R Gaur, R Asthana, G P Bagaria, *Teachers' Manual for A Foundation Course in Human Values and Professional Ethics,* 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034-53-2.

Reference Books

1. A. Nagaraj, *Jeevan Vidya: Ek Parichaya,* Jeevan Vidya Prakashan, Amarkantak, 1999.
2. A.N. Tripathi, *Human Values,* New Age Intl. Publishers, New Delhi, 2004.
3. *The Story of Stuff* (Book).
4. *The Story of My Experiments with Truth* - Mohandas Karamchand Gandhi
5. *Small is Beautiful* – E. F Schumacher.
6. *Slow is Beautiful* – Cecile Andrews
7. *Economy of Permanence* – J C Kumarappa
8. *Bharat Mein Angreji Raj* – Pandit Sunderlal
9. *Rediscovering India* – Dharampal
10. *Hind Swaraj or Indian Home Rule* – Mohandas K. Gandhi
11. *India Wins Freedom* – Maulana Abdul Kalam Azad
12. *Vivekananda* – Romain Rolland (English)
13. *Gandhi* – Romain Rolland (English)

Mode of Conduct:

Lecture hours are to be used for interactive discussion, placing the proposals about the topics at hand and motivating students to reflect, explore and verify them.

Tutorial hours are to be used for practice sessions.

While analyzing and discussing the topic, the faculty mentor's role is in pointing to essential elements to help in sorting them out from the surface elements. In other words, help the students explore the important or critical elements.

In the discussions, particularly during practice sessions (tutorials), the mentor encourages the student to connect with one's own self and do self-observation, self-reflection and self-exploration.

Scenarios may be used to initiate discussion. The student is encouraged to take up "ordinary" situations rather than "extra-ordinary" situations. Such observations and their analyses are shared and discussed with other students and faculty mentor, in a group sitting.

Tutorials (experiments or practical) are important for the course. The difference is that the laboratory is everyday life, and practical are how you behave and work in real life. Depending on the nature of topics, worksheets, home assignment and/or activity are included. The practice sessions (tutorials) would also provide support to a student in performing actions commensurate to his/her beliefs. It is intended that this would lead to development of commitment, namely behaving and working based on basic human values.

It is recommended that this content be placed before the student as it is, in the form of a basic foundation course, without including anything else or excluding any part of this content. Additional content may be offered in separate, higher courses. This course is to be taught by faculty from every teaching department, not exclusively by any one department. Teacher preparation with a minimum exposure to at least one 8-day Faculty Development Program on Universal Human Values is deemed essential.
Online Resources:
1. https://fdp-si.aicte-india.org/UHV-II%20Class%20Notes%20&%20Handouts/UHV%20Handout%201-Introduction%20to%20Value%20Education.pdf
2. https://fdp-si.aicte-india.org/UHV- II%20Class%20Notes%20&%20Handouts/UHV%20Handout%202-Harmony%20in%20the%20Human%20Being.pdf
3. https://fdp-si.aicte-india.org/UHV- II%20Class%20Notes%20&%20Handouts/UHV%20Handout%203-Harmony%20in%20the%20Family.pdf
4. https://fdp-si.aicte-india.org/UHV%201%20Teaching%20Material/D3-S2%20Respect%20July%2023.pdf
5. https://fdp-si.aicte-india.org/UHV- II%20Class%20Notes%20&%20Handouts/UHV%20Handout%205-Harmony%20in%20the%20Nature%20and%20Existence.pdf
6. https://fdp-si.aicte-india.org/download/FDPTeachingMaterial/3-days%20FDP-SI%20UHV%20Teaching%20Material/Day%203%20Handouts/UHV%203D%20D3- S2A%20Und%20Nature-Existence.pdf
7. https://fdp-si.aicte-india.org/UHV%20II%20Teaching%20Material/UHV%20II%20Lecture%2023-25%20Ethics%20v1.pdf
8. https://www.studocu.com/in/document/kiet-group-of-institutions/universal-human-values/chapter-5-holistic-understanding-of-harmony-on-professional-ethics/62490385
9. https://onlinecourses.swayam2.ac.in/aic22_ge23/preview

STRENGTH OF MATERIALS (SM)

III Semester : CE						**Scheme : 2023**		
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
		L/D	**T**	**P**	**C**	**Continuous Internal Assessment**	**End Exam**	**Total**
CE201	**PC**	**3**	**-**	**-**	**3**	**30**	**70**	**100**
Sessional Exam Duration : 2 Hrs						**End Exam Duration: 3 Hrs**		

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

CO1: Determine the stresses and strains in the members subjected to uniaxial loads and temperature changes.

CO2: Draw the shear force and bending moment diagrams for statically determinate beams subjected to various types of loading.

CO3: Determine the bending stresses and shear stresses across various beam sections and torsional shear stress across circular shaft only.

CO4: Determine slopes and deflections for statically determinate beams using different methods subjected to various types of loading.

CO5: Analyze the short column, long column and the two dimensional stress system at a point.

UNIT – I

Simple Stresses and Strains

Elasticity and plasticity – Types of stresses and strains – Hooke's law – Factor of safety, Poisson's ratio – Relationship between Elastic constants – Bars of varying section – stresses in composite bars – Thermal Stresses.

UNIT – II

Shear Force and Bending Moment

Definition of beam – Types of beams – Concept of shear force and bending moment – Point of contra flexure – Relation between S.F., B.M and rate of loading at a section of a beam; S.F and B.M diagrams for cantilever, simply supported and overhanging beams subjected to point loads, uniformly distributed loads, uniformly varying loads, partial uniformly distributed loads, couple and combination of these loads.

UNIT – III

Flexural and Shear Stresses

Flexural Stresses: Theory of simple bending – Assumptions – Derivation of bending equation – Neutral axis – Determination of bending stresses – Section modulus of rectangular and circular sections (Solid and Hollow), I, T, Angle and Channel sections – Design of simple beams**.**

Shear Stresses: Derivation of formula – Shear stress distribution across various beam sections like rectangular, circular, I, T Angle sections.

Torsion – circular shafts only.

UNIT – IV

Deflection of Beams

Double integration and Macaulay's methods – Determination of slope and deflection for cantilever, simply supported and overhanging beams subjected to point loads, uniformly distributed loads, uniformly varying loads, partial uniformly distributed loads, couple and combination of these loads. Mohr's theorems – Moment area method – Application to simple cases of cantilever.

UNIT – V

Columns:

Introduction – Classification of columns – Axially loaded compression members – Simple concepts of Direct & combined bending stresses – Euler's crippling load theory – Derivation of Euler's critical load formulae for various end conditions – Equivalent length – Slenderness ratio – Euler's critical stress – Limitations of Euler's theory – Rankine-Gordon formula – Eccentric loading and Secant formula.

Analysis of Plane Stress at a Point:

Analysis of two dimensional stress at a point – Principal planes – Principal stresses and strains.

Text Books

1. R. K. Bansal, *Strength of Materials*, Lakshmi Publications, 16th Edition, 2022.
2. B. S. Basavarajaiah and P. Mahadevappa, *Strength of Materials*, Universities Press, 3rd Edition, 2010.
3. J.K. Gupta and S.K. Gupta, *Strength of Materials*, Cengage publications, 2nd edition, 2024.

Reference Books

1. L.S Srinath, *Advanced Mechanics of Solids*, McGraw Hill Education, 2017, 3rd Edition.
2. T.D. Gunneswara Rao and Mudimby Andal, *Strength of Materials – Fundamentals and Applications*, Cambridge University Press, 2018, 1st Edition.
3. Beer and Johnston, *Mechanics of Materials*, McGraw Hill India Pvt. Ltd., 2020, 8th Edition (SI Units).
4. E P Popov, *Mechanics of Solids*, Prentice Hall, 2nd Edition, 2015.
5. R. K. Rajput, *A Textbook of Strength of Materials*, 7e (Mechanics of Solids) SIUnits S. Chand & Co, New Delhi, 7th edition 2022.

Question Paper Pattern:

Sessional Exam: The question paper for Sessional Examination shall be for 40 marks. The question paper shall consist of Four Questions and all questions are compulsory. Question No.1 contains Five short answer questions (2marks each) for a total of 10 marks. Remaining Three Questions shall be EITHER/OR type descriptive questions for 10 marks each. Each of these descriptive questions may contain sub-questions.

End Exam: The question paper for End Examination shall be for 70 marks. The question paper shall contain Six Questions and all questions are compulsory. Question No.1 shall contain Ten short answer questions (2 marks each) for a total of 20 marks, with Two short answer questions from each unit. Remaining Five Questions (each question covering one unit of syllabus) carrying 10 marks each shall be EITHER/OR type descriptive questions and may contain sub-questions.

SURVEYING (SUR)

III Semester : CE						**Scheme : 2023**		
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
		L/D	**T**	**P**	**C**	**Continuous Internal Assessment**	**End Exam**	**Total**
CE202	**PC**	**3**	**-**	**-**	**3**	**30**	**70**	**100**
Sessional Exam Duration : 2 Hrs						**End Exam Duration: 3 Hrs**		

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

CO1: Apply the principles and methods of surveying to measure horizontal and vertical distances and angles using conventional & modern surveying instruments.

CO2: Identify the source of errors and their rectification.

CO3: Apply the surveying principles to determine areas and volumes.

CO4: Design and set out the curves in field.

CO5: Apply the basics of Photogrammetry Surveying in field.

UNIT – I

Introduction and Basic Concepts:

Introduction – Objectives – Classification and principles of surveying – Surveying accessories. Introduction to Compass, Leveling and Plane table surveying.

Linear distances:

Approximate methods – Direct methods – Chains – Tapes, ranging, tape corrections.

***Prismatic Compass*:**

Bearings – Included angles – Local attraction – Magnetic declination and dip – Systems and W.C.B and Q.B systems of locating bearings.

UNIT – II

Leveling:

Types of levels – Methods of levelling, and determination of levels – Effect of curvature of Earth and refraction.

Contouring:

Characteristics and uses of Contours – Methods of contour surveying.

Areas:

Determination of areas consisting of irregular boundary and regular boundary.

Volumes:

Determination of volume of earth work in cutting and embankments for level section, capacity of reservoirs.

UNIT – III

Theodolite Surveying:

Types of Theodolites – Temporary adjustments – Measurement of horizontal angle by repetition method and reiteration method – Measurement of vertical angle –Trigonometrical leveling when base is accessible and inaccessible.

Traversing:

Methods of traversing – Traverse computations and adjustments – Introduction to omitted measurements.

UNIT – IV

Curves:

Types of curves and their necessity – Elements of simple, compound, reverse curves. Introduction to Tacheometric surveying.

UNIT – V

Photogrammetry Surveying:

Introduction – Basic concepts – Perspective geometry of aerial photograph – Relief displacements – Terrestrial photogrammetry.

Modern Surveying Methods:

Principle and types of E.D.M. instruments – Total station – Advantages and applications. Introduction to Global Positioning System, DGPS and Drone survey.

Text Books

1. Duggal S.K., *Surveying (Vol.1&2)*, Tata McGraw Hill Publishing Co. Ltd., New Delhi, 5th edition, 2019.
2. C. Venkatramaiah, *Text Book of Surveying*, Universities Press, 1st Edition, 2011.

Reference Books

1. B. C. Punmia, Ashok Kumar Jain and Arun Kumar Jain, *Surveying (Vol.1)*, Laxmi Publications (P) Ltd., New Delhi, 18th edition, 2024.
2. B. C. Punmia, Ashok Kumar Jain and Arun Kumar Jain, *Surveying (Vol.2)*, Laxmi Publications (P) Ltd., New Delhi, 17th edition, 2022.
3. B. C. Punmia, Ashok Kumar Jain and Arun Kumar Jain, *Surveying (Vol.3)*, Laxmi Publications (P) Ltd., New Delhi, 16th edition, 2023.
4. Chandra A M, *Plane Surveying and Higher Surveying*, New age International Pvt. Ltd., Publishers, New Delhi, 3rd Edition, 2015.
5. N. Basak, *Surveying and Levelling*, Tata McGraw Hill Publishing Co. Ltd., NewDelhi, 4th edition, 2014.
6. Arora K. R., *Surveying (Vol. 1, 2 & 3)*, Standard Book House, Delhi. Edition: 12th edition, 2015.

Question Paper Pattern:

Sessional Exam: The question paper for Sessional Examination shall be for 40 marks. The question paper shall consist of Four Questions and all questions are compulsory. Question No.1 contains Five short answer questions (2marks each) for a total of 10 marks. Remaining Three Questions shall be EITHER/OR type descriptive questions for 10 marks each. Each of these descriptive questions may contain sub-questions.

End Exam: The question paper for End Examination shall be for 70 marks. The question paper shall contain Six Questions and all questions are compulsory. Question No.1 shall contain Ten short answer questions (2 marks each) for a total of 20 marks, with Two short answer questions from each unit. Remaining Five Questions (each question covering one unit of syllabus) carrying 10 marks each shall be EITHER/OR type descriptive questions and may contain sub-questions.

FLUID MECHANCIS (FM)

III Semester : CE						**Scheme : 2023**		
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
CE203	**PC**	**L/D**	**T**	**P**	**C**	**Continuous Internal Assessment**	**End Exam**	**Total**
		3	**-**	**-**	**3**	**30**	**70**	**100**
Sessional Exam Duration : 2 Hrs						**End Exam Duration: 3 Hrs**		

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

CO1: Identify properties of fluids.

CO2: Determine the pressure using laws of fluid statics and pressure measuring devices.

CO3: Analyze the stability of floating bodies using principles of buoyancy.

CO4: Apply the principles of continuity, energy and momentum in fluid flow.

CO5: Analyse the losses in pipes and apply the principles of dimensional analysis.

UNIT – I

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 law of viscosity – Vapor pressure – Boiling point – Surface tension – Capillarity – Bulk modulus of elasticity – Compressibility.

UNIT – II

Fluid Statics

Fluid Pressure: Pressure at a point – Pascal's law – Pressure variation with temperature – Density and altitude. Piezometer, U-Tube manometer, Single column manometer, U Tube differential manometer – Pressure gauges. Hydrostatic pressure and force: horizontal, vertical and inclined surfaces. Buoyancy – Buoyant force and centre of buoyancy – Metacentre and metacentric height – Stability of floating bodies.

UNIT – III

Fluid Kinematics

Classification of fluid flow: steady and unsteady flow; uniform and non-uniform flow; laminar and turbulent flow; rotational and irrotational flow; compressible and incompressible flow; ideal and real fluid flow; one, two and three dimensional flows – Stream line, path line, streak line and stream tube – Stream function, velocity potential function – Vortex Flow – Free and Forced – One, two and three - Dimensional continuity equations in Cartesian coordinates.

UNIT – IV

Fluid Dynamics

Surface and body forces; 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 – Forces exerted by fluid flow on pipe bend.

UNIT – V

Analysis Of Pipe Flow:

Energy losses in pipelines – Darcy-Weisbach equation – Minor losses in pipelines – Hydraulic Grade Line and Total Energy Line – Concept of equivalent length – Pipes in Parallel and Series.

Dimensional Analysis:

Dimensional homogeneity – Rayleigh method and Buckingham π– method (Concept only) –

Dimensionless numbers.

Text Books

1. P. M. Modi and S. M. Seth, *Hydraulics and Fluid Mechanics*, Standard Book House, 22nd edition, 2019.
2. K. Subrahmanya, *Theory and Applications of Fluid Mechanics*, Tata McGraw Hill, 2nd edition, 2018.

Reference Books

1. R.K. Bansal, *A Text Book of Fluid Mechanics and Hydraulic Machines*, Laxmi Publications (P) Ltd., New Delhi 11th edition, 2024.
2. N. Narayana Pillai, *Principles of Fluid Mechanics and Fluid Machines*, Universities Press Pvt. Ltd., Hyderabad, 3rd Edition, 2009.
3. Frank M. White, Henry Xue, *Fluid Mechanics,* Tata McGraw Hill, 9th edition, 2022.
4. C.S.P. Ojha, R. Berndtsson and P.N. Chadramouli, *Fluid Mechanics and Machinery*, Oxford University Press, 2010.
5. S.K. Som, Gautam Biswas, S. Chakraborty, *Introduction to Fluid Mechanics & Fluid Machines*, Tata McGraw Hill, 3rd edition, 2011.

Question Paper Pattern:

Sessional Exam: The question paper for Sessional Examination shall be for 40 marks. The question paper shall consist of Four Questions and all questions are compulsory. Question No.1 contains Five short answer questions (2marks each) for a total of 10 marks. Remaining Three Questions shall be EITHER/OR type descriptive questions for 10 marks each. Each of these descriptive questions may contain sub-questions.

End Exam: The question paper for End Examination shall be for 70 marks. The question paper shall contain Six Questions and all questions are compulsory. Question No.1 shall contain Ten short answer questions (2 marks each) for a total of 20 marks, with Two short answer questions from each unit. Remaining Five Questions (each question covering one unit of syllabus) carrying 10 marks each shall be EITHER/OR type descriptive questions and may contain sub-questions.

STRENGTH OF MATERIALS LAB [SM(P)]

III Semester : CE						Scheme : 2023		
Course Code	Category	Hours / Week			Credits	Maximum Marks		
CE204	PC	L/D	T	P	C	Continuous Internal Assessment	End Exam	Total
		-	-	3	1.5	30	70	100
						End Exam Duration : 3 Hrs		

Course Outcomes: The student shall be able to

CO1: Perform tension test, compression test and shear test on different materials for determining the strength property of the material.

CO2: Conduct bending test on beam for determining the modulus of elasticity of the beam material.

CO3: Conduct torsion test and spring test for determining the modulus of rigidity of material.

CO4: Perform hardness test on various metals for determining the hardness number.

CO5: Conduct impact test for determining the impact strength of the metal specimen.

List of Experiments

1. Tension test
2. Compression test on wood
3. Shear test on metals
4. Bending test on simply supported beam
5. Bending test on overhanging beam
6. Torsion test
7. Charpy Impact test on metals
8. Hardness test
9. Tension test on closely coiled springs
10. Compression test on open coiled springs
11. Bending test on cantilever beam
12. Continuous beam – deflection test

SURVEYING LAB [SUR(P)]

III Semester : CE						Scheme : 2023		
Course Code	Category	Hours / Week			Credits	Maximum Marks		
CE205	PC	L/D	T	P	C	Continuous Internal Assessment	End Exam	Total
		-	-	3	1.5	30	70	100
						End Exam Duration : 3 Hrs		

Course Outcomes: The student shall be able to

CO1: Prepare field notes from survey data.

CO2: Determine distance and angles by using conventional instruments.

CO3: Apply the survey data to calculate areas and volumes of the field.

CO4: Apply techniques to obtain linear and angular measurements using modern surveying instruments.

List of Experiments

1. Chain survey of road profile with offsets in case of road widening.
2. Determination of distance between two inaccessible points by using compass.
3. Fly Levelling: Rise & Fall method.
4. Differential levelling: Height of the instrument method.
5. Determination of level of contours and calculation of volume.
6. Theodolite Survey: Determining the horizontal and vertical angles by repetition method.
7. Theodolite Survey: Finding the distance between two inaccessible points and elevation of far object.
8. Setting out a curve – Linear method.
9. Determination of area using total station.
10. Determination of distance between two inaccessible points by using total station.
11. Plane Table Survey: Finding the area of a given boundary by the method of Radiation.

BUILDING PLANNING AND DRAWING LAB [BPD(P)]

III Semester : CE						Scheme : 2023		
Course Code	Category	Hours / Week			Credits	Maximum Marks		
SCCE01	SC	L/D	T	P	C	Continuous Internal Assessment	End Exam	Total
		-	1	2	2	30	70	100
						End Exam Duration : 3 Hrs		

Course Outcomes: The student shall be able to

CO1: Draw conventional signs and bonds in brick work.

CO2: Draw different building units.

CO3: Plan a residential building as per building bye-laws.

CO4: Draw the plan, elevation and section of Hospital and Industrial building using building bye-laws.

List of Experiments

1. Detailing & Drawing of Sign Conventions.
2. Detailing & Drawing of English Bond.
3. Detailing & Drawing of Flemish Bond.
4. Detailing & Drawing of Doors.
5. Detailing & Drawing of Windows.
6. Detailing & Drawing of Ventilators &Roofs.
7. Drawing of Line Diagram of Residential Buildings by using Building Bye-Laws.
8. Drawing of Plan, Elevation & Section from line diagram for a single Storey Building
9. Drawing of Plan, Elevation & Section for Hospital Building.
10. Drawing of Plan, Elevation & Section for Industrial Building.

Text Books

1. Gurcharan Singh and Jagdish Singh, *Planning, designing and Scheduling*
2. M. Chakraborti, *Building planning and drawing*.
3. M G Shah, C M Kale and S Y Patki, *Building drawing*, Tata McGraw Hill, New Delhi.

Reference Books

1. National Building Code 2016 (Volume- I & II).
2. Principles of Building Drawing, M G Shah and C M Kale, Trinity Publications, New Delhi.
3. Civil Engineering drawing and House planning, B. P. Verma, Khanna publishers, New Delhi.
4. Civil Engineering Building practice, Suraj Singh: CBS Publications, New Delhi, and Chennai.
5. Building Materials and Construction, G. C Saha and Joy Gopal Jana, McGraw Hill Education (P) India Ltd. New Delhi.

DESIGN THINKING & INNOVATION (DTI)

III Semester : CE						**Scheme : 2023**		
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
ESCM01	**ES**	**L/D**	**T**	**P**	**C**	**Continuous Internal Assessment**	**End Exam**	**Total**
		1	**-**	**2**	**2**	**30**	**70**	**100**
Sessional Exam Duration : 2 Hrs						**End Exam Duration: 3 Hrs**		

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

CO1: Define the concepts related to design thinking.

CO2: Explain the fundamentals of Design Thinking and innovation

CO3: Apply the design thinking techniques for solving problems in various sectors.

CO4: Analyse to work in a multidisciplinary environment.

CO5: Evaluate the value of creativity.

CO6: Formulate specific problem statements of real time issues.

UNIT – I

Introduction to Design Thinking

Introduction to elements and principles of design – Basics of design-dot, line, shape, form as fundamental design components – Principles of design – Introduction to design thinking – History of design thinking – New materials in Industry.

UNIT – II

Design Thinking Process

Design thinking process (empathize, analyze, idea & prototype) – Implementing the process in driving inventions – Design thinking in social innovations. Tools of design thinking – person, costumer, journey map, brainstorming, product development.

Activity: Every student presents their idea in three minutes, Every student can present design process in the form of flow diagram or flow chart etc. Every student should explain about product development.

UNIT – III

Innovation

Art of innovation – Difference between innovation and creativity – Role of creativity and innovation in organizations – Creativity to innovation – Teams for innovation – Measuring the impact and value of creativity.

Activity: Debate on innovation and creativity, Flow and planning from idea to innovation, Debate on value-based innovation.

UNIT – IV

Product Design

Problem formation – Introduction to product design – Product strategies – Product value – Product planning – Product specifications – Innovation towards product design – Case studies.

Activity: Importance of modelling, how to set specifications, Explaining their own product design.

UNIT – V

Design Thinking in Business Processes

Design thinking applied in business & strategic innovation – Design thinking principles that

redefine business – Business challenges: Growth, Predictability, Change, Maintaining Relevance, Extreme competition, Standardization. Design thinking to meet corporate needs – Design thinking for startups – Defining and testing business models and business cases – Developing & testing prototypes.

Activity: How to market our own product, About maintenance, Reliability and plan for startup.

Text Books

1. Tim Brown, *Change by Design*, Harper Bollins, 2009.
2. Idris Mootee, *Design Thinking for Strategic Innovation*, John Wiley & Sons, 2013.

Reference Books

1. David Lee, *Design Thinking in the Classroom*, Ulysses press.
2. Shrutin N Shetty, *Design the Future*, Norton Press.
3. William Lidwell, *Universal Principles of Design*- Kritinaholden, Jill Butter.
4. Chesbrough. H, *The Era of Open Innovation -2013*.

Question Paper Pattern:

Sessional Exam: The question paper for Sessional Examination shall be for 40 marks. The question paper shall consist of Four Questions and all questions are compulsory. Question No.1 contains Five short answer questions (2marks each) for a total of 10 marks. Remaining Three Questions shall be EITHER/OR type descriptive questions for 10 marks each. Each of these descriptive questions may contain sub-questions.

End Exam: The question paper for End Examination shall be for 70 marks. The question paper shall contain Six Questions and all questions are compulsory. Question No.1 shall contain Ten short answer questions (2 marks each) for a total of 20 marks, with Two short answer questions from each unit. Remaining Five Questions (each question covering one unit of syllabus) carrying 10 marks each shall be EITHER/OR type descriptive questions and may contain sub-questions.

FOUR YEAR B. Tech. DEGREE COURSE
Scheme of Instruction and Examination
(Effective from 2023–24)

IV Semester - CE **Scheme : 2023**

S. No.	Category	Subject	Scheme of Instruction periods/week			Credits	Scheme of Examination Maximum Marks		
			L/D	T	P		CIA	End Exam	Total
I		**Theory**							
1	BS&H	Managerial Economics and Financial Analysis	2	-	-	2	30	70	100
2	PC	Engineering Geology	3	-	-	3	30	70	100
3	PC	Structural Analysis	3	-	-	3	30	70	100
4	PC	Concrete Technology	3	-	-	3	30	70	100
5	PC	Hydraulics & Hydraulic Machinery	3	-	-	3	30	70	100
II		**Practical**							
6	PC	Engineering Geology Lab	-	-	3	1.5	30	70	100
7	PC	Concrete Technology Lab	-	-	3	1.5	30	70	100
8	SC	Soft Skills	-	1	2	2	30	70	100
9	AC	Environmental Science	2	-	-	-	100	-	100
		Total	**16**	**1**	**8**	**19**			
Mandatory Community Service Project Internship of 8 weeks duration during summer vacation									

MANAGERIAL ECONOMICS AND FINANCIAL ANALYSIS (MEFA)

IV Semester : CE						Scheme : 2023		
Course Code	Category	Hours/Week			Credits	Maximum Marks		
		L/D	T	P	C	Continuous Internal Assessment	End Exam	Total
HSM202	BS&H	2	-	-	2	30	70	100
Sessional Exam Duration : 2 Hrs						End Exam Duration: 3 Hrs		

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

CO1: Adopt the concepts of Managerial Economic for decision making and forward planning in business organizations.

CO2: Apply the Concepts of Production, cost, and revenues for effective Business decision.

CO3: Evaluate different types of business organizations and provide a framework for different Market Structures and the price determination.

CO4: Understand the significance of capital, types of capital and sources of capital and evaluate the capital budgeting techniques for choosing the optimal projects.

CO5: Adopt the principles of accounting to record, classify and summarize various transactions in books of accounts for preparation of final accounts and implement various techniques for assessing the financial position of the business.

UNIT – I

Managerial Economics and Demand Analysis

Introduction – Meaning, nature & scope and uses of managerial economics – Role of managerial economist. Demand – Concepts – Law of demand – Exceptions of law of demand – Law of diminishing marginal utility – Indifference curve. Elasticity of demand – Types, measurement and significance.

UNIT – II

Production and Cost Analysis

Introduction – Production function – Meaning, features and types. Short run and long run production function – Isoquants and Isocosts – Least- cost combination – Cost = Cost concepts and Cost behaviour in Short-run and long-run. Break-Even Analysis (BEA) – Determination of break-even point (Simple Problems).

UNIT – III

Business Organizations and Markets

Introduction – Forms of business organizations – Sole proprietary – Partnership – Joint stock companies. Types of markets – Perfect and imperfect markets – Features of perfect competition, monopoly, monopolistic and oligopoly – Price-Output determination under perfect and monopoly.

UNIT – IV

Capital and its Significance and Capital Budgeting:

Capital and its Significance: Types of capital – Estimation of fixed and working capital requirements – Methods, and sources of raising fixed and working capital.

Capital Budgeting:

Meaning – Significance and complications involved in capital budgeting decisions – Methods of capital budgeting – Traditional methods – Payback period and accounting rate of return methods – Discounted cash flow methods – Net present value method, Internal Rate of return method and Profitability index method (Simple Problems).

UNIT – V

Financial Accounting and Analysis

Introduction – Concepts and conventions – Double-Entry System of book keeping, Journal, ledger, Trial balance – Final accounts (Trading account, profit and loss account and balance sheet with simple adjustments).

Introduction to financial analysis – Analysis and interpretation of liquidity ratios, Activity ratios, and Capital structure ratios and Profitability ratios.

Income tax calculation and filing income tax returns (ITR).

Text Books

1. Varshney & Maheswari, *Managerial Economics*, Sultan Chand
2. A.R. Aryasri, *Managerial Economics and Financial Analysis*, 4/e, MGH

Reference Books

1. Ahuja Hl, *Managerial Economics*, S Chand
2. S.A. Siddiqui and A.S. Siddiqui, *Managerial Economics and Financial Analysis*, New Age International.
3. Joseph G. Nellis and David Parker, *Principles of Business Economics*, Pearson, 2/e, New Delhi.
4. Domnick Salvatore, *Managerial Economics in a Global Economy*, Cengage.

Question Paper Pattern:

Sessional Exam: The question paper for Sessional Examination shall be for 40 marks. The question paper shall consist of Four Questions and all questions are compulsory. Question No.1 contains Five short answer questions (2marks each) for a total of 10 marks. Remaining Three Questions shall be EITHER/OR type descriptive questions for 10 marks each. Each of these descriptive questions may contain sub-questions.

End Exam: The question paper for End Examination shall be for 70 marks. The question paper shall contain Six Questions and all questions are compulsory. Question No.1 shall contain Ten short answer questions (2 marks each) for a total of 20 marks, with Two short answer questions from each unit. Remaining Five Questions (each question covering one unit of syllabus) carrying 10 marks each shall be EITHER/OR type descriptive questions and may contain sub-questions.

ENGINEERING GEOLOGY (EG)

IV Semester : CE					Scheme : 2023			
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
		L/D	**T**	**P**	**C**	**Continuous Internal Assessment**	**End Exam**	**Total**
CE206	**PC**	**3**	**-**	**-**	**3**	**30**	**70**	**100**
Sessional Exam Duration : 2 Hrs					**End Exam Duration: 3 Hrs**			

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

CO1: Understand the significance of geological agents on earth surface and its significance in Civil Engineering.

CO2: Identify the properties of Minerals and Rocks.

CO3: Analyze the groundwater movement and understand geophysical methods.

CO4: Analyze the structural geology problems and assess the geological hazards and necessary precautions to safe guard the civil engineering structures.

CO5: Investigate the project site for mega/mini civil engineering projects and site selection for mega engineering projects like Dams, Reservoirs and Tunnels.

UNIT – I

Introduction

Branches of Geology – Importance of Geology in Civil Engineering with case studies – Weathering of rocks – Geological agents – Weathering process of rock – Rivers and geological work of rivers.

UNIT – II

Mineralogy and Petrology

Definitions of mineral and rock – Different methods of study of mineral and rock. Physical properties of minerals and rocks for megascopic study for the following minerals and rocks. Common rock forming minerals: Feldspar, Quartz Group, Olivine, Augite, Hornblende, Mica Group, Asbestos, Talc, Chlorite, Kyanite, Garnet, Calcite and ore forming minerals are Pyrite, Hematite, Magnetite, Chlorite, Galena, Pyrolusite, Graphite, Chromite, Magnetite and Bauxite. Classification, structures, textures and forms of Igneous rocks, Sedimentary rocks, Metamorphic rocks, and their megascopic study of granite varieties, (pink, gray, green). Pegmatite, Dolerite, Basalt etc., Shale, Sand Stone, Lime Stone, Laterite, Quartzite, Gneiss, Schist, Marble, Khondalite and Slate.

UNIT – III

Structural Geology

Strike, Dip and Outcrop study of common geological structures associating with the rocks such as Folds, Faults, Joints and Unconformities - parts, types, mechanism and their importance in Civil Engineering.

UNIT – IV

Ground Water:

Water table – Cone of depression – Geological controls of ground water movement – Ground water exploration techniques.

Earthquakes and Land Slides:

Terminology – Classification, causes and effects – Shield areas and seismic bells – Richter scale intensity – Precautions of building constructions in seismic areas. Classification of

landslides, causes and effects, measures to be taken prevent their occurrence at landslides.

Geophysics:

Importance of Geophysical methods – Classification – Principles of geophysical study by Gravity method, Magnetic method, Electrical methods, Seismic methods, Radiometric method and Electrical resistivity, Seismic refraction methods and Engineering properties of rocks.

UNIT – V

Geology of Dams, Reservoirs and Tunnels

Types and purpose of dams – Geological considerations in the selection of a dam site. Geology consideration for successful constructions of reservoirs – Life of reservoirs. Purpose of tunnelling, effects, Lining of tunnels. Influence of geology for successful tunnelling.

Text Books

1. N. Chenna Kesavulu, *Engineering Geology*, Laxmi Publications, 2nd edition, 2014.

2. Parbin Singh, *Engineering & General Geology*, Katson educational series, 8th edition, 2023.

Reference Books

1. Subinoy Gangopadhay, *Engineering Geology*, Oxford University Press, 1st edition, 2012.

2. D. Venkat Reddy, *Engineering Geology*, Vikas Publishing, 2nd edition, 2017.

3. Alan E Kehew, *Geology for Engineers and Environmental Society*, 3rd edition, Pearson Publications, 2013.

4. K.S. Valdiya, *Environmental Geology,* 2nd edition, McGraw Hill Publications, 2013.

Question Paper Pattern:

Sessional Exam: The question paper for Sessional Examination shall be for 40 marks. The question paper shall consist of Four Questions and all questions are compulsory. Question No.1 contains Five short answer questions (2marks each) for a total of 10 marks. Remaining Three Questions shall be EITHER/OR type descriptive questions for 10 marks each. Each of these descriptive questions may contain sub-questions.

End Exam: The question paper for End Examination shall be for 70 marks. The question paper shall contain Six Questions and all questions are compulsory. Question No.1 shall contain Ten short answer questions (2 marks each) for a total of 20 marks, with Two short answer questions from each unit. Remaining Five Questions (each question covering one unit of syllabus) carrying 10 marks each shall be EITHER/OR type descriptive questions and may contain sub-questions.

STRUCTURAL ANALYSIS (SA)

IV Semester : CE						Scheme : 2023		
Course Code	Category	Hours/Week			Credits	Maximum Marks		
CE207	PC	L/D	T	P	C	Continuous Internal Assessment	End Exam	Total
		3	-	-	3	30	70	100
Sessional Exam Duration : 2 Hrs						End Exam Duration: 3 Hrs		

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

CO1: Analyze thin cylinders and thick cylinders.

CO2: Analyze beams and trusses using force method.

CO3: Analyze beams and portal frames using displacement methods.

UNIT – I

Thin Cylindrical Shells:

Derivation of formula for longitudinal and circumferential stresses – hoop, wire wound stresses – Longitudinal and volumetric strains – Changes in diameter and volume of thin cylinders.

Thick Cylindrical Shells:

Lames theory for thick cylinders – Derivation of Lames formulae – Distribution of hoop and radial stresses across the thickness – Compound cylinders – Distribution of stresses.

UNIT – II

Energy Theorems:

Introduction – Strain energy in linear elastic system – Expression of strain energy due to axial load, bending moment and shear forces – Castigliano's first theorem – Deflections of simple beams and pin jointed trusses.

***Analysis of Indeterminate Structures*:**

Indeterminate Structural Analysis – Determination of static and kinematic indeterminacies – Analysis of trusses with upto two degrees of internal and external indeterminacies – Castigliano's-II theorem.

UNIT – III

Fixed Beams:

Analysis of fixed beams for uniformly distributed load, central point load, eccentric point load, number of point loads, uniformly varying load, couple and combination of loads – Shear force and Bending moment diagrams – Deflection of fixed beams – Effect of sinking of support – Effect of rotationof a support.

Continuous Beams:

Clapeyron's theorem of three moments – Derivation of theorem – Application to continuous beams – Effect of sinking of supports – Shear force and bending moment diagrams.

UNIT – IV

Slope-Deflection Method:

Introduction – Derivation of slope deflection equations – Application to continuous beams with and without settlement of supports – Analysis of single bay single store portal frames with and without sway.

UNIT – V

Moment Distribution Method:

Introduction to moment distribution method – Application to continuous beams with and without settlement of supports – Analysis of single bay single storey portal frames with and without sway.

Text Books

1. V.N. Vazirani & M.M. Ratwani, *Analysis of Structures-Vol. I&II,* Khanna Publications, New Delhi.
2. C.S. Reddy, *Basic Structural Analysis,* Tata McGraw Hill Publishers, 3rd edition, 2017.
3. R.K. Bansal, *Strength of Materials*, Lakshmi Publications, 16th edition, 2022.
4. B. S. Basavarajaiah and P. Mahadevappa, *Strength of Materials*, Universities Press, 3rd Edition, 2010.

Reference Books

1. Aslam Kassimali, *Structural Analysis*, Cengage publications, 6th edition, 2020.
2. R.Vaidyanathan and P. Perumal, *Structural analysis Vol. I and II*, Laxmi Publications, 3rd edition, 2016.
3. B.D. Nautiyal, *Introduction to Structural Analysis*, New Age international publishers, New Delhi.
4. D.S. Prakasarao, *Structural Analysis*, University press.
5. B.C. Punmia, *Strength of Materials and Mechanics of Structures*, Khanna Publications, New Delhi.

Question Paper Pattern:

Sessional Exam: The question paper for Sessional Examination shall be for 40 marks. The question paper shall consist of Four Questions and all questions are compulsory. Question No.1 contains Five short answer questions (2marks each) for a total of 10 marks. Remaining Three Questions shall be EITHER/OR type descriptive questions for 10 marks each. Each of these descriptive questions may contain sub-questions.

End Exam: The question paper for End Examination shall be for 70 marks. The question paper shall contain Six Questions and all questions are compulsory. Question No.1 shall contain Ten short answer questions (2 marks each) for a total of 20 marks, with Two short answer questions from each unit. Remaining Five Questions (each question covering one unit of syllabus) carrying 10 marks each shall be EITHER/OR type descriptive questions and may contain sub-questions.

CONCRETE TECHNOLOGY (CT)

IV Semester : CE						Scheme : 2023		
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
		L/D	**T**	**P**	**C**	**Continuous Internal Assessment**	**End Exam**	**Total**
CE208	**PC**	**3**	**-**	**-**	**3**	**30**	**70**	**100**
Sessional Exam Duration : 2 Hrs						**End Exam Duration: 3 Hrs**		

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

CO1: Identify and ascertain the characteristics of concrete ingredients based on its properties for field application.

CO2: Identify and ascertain the characteristics of the quality of concrete based on its properties by conducting tests on fresh and hardened concrete.

CO3: Design the concrete mix by using I S code method and understand the concept of special concretes.

UNIT – I

Cement:

Portland cement – Chemical composition – Hydration, Setting of cement, Fineness of cement, Structure of hydrate cement – Test for physical properties – Different grades of cements.

***Admixtures*:**

Mineral and chemical admixtures – accelerators, retarders, air entrainers, plasticizers, super plasticizers, fly ash and silica fume.

Aggregates:

Classification of aggregate – Particle shape & texture – Bond, strength & other mechanical properties of aggregates – Specific gravity, Bulk density, porosity, adsorption & moisture content of aggregate – Bulking of sand –Deleterious substances – Soundness – Alkali aggregate reaction – Thermal properties – Sieve analysis – Fineness modulus – Grading curves – Grading of fine & coarse Aggregates – Maximum aggregate size – Quality of mixing water.

UNIT – II

Fresh Concrete

Steps in manufacture of concrete – proportion, mixing, placing, compaction, finishing, curing – including various types in each stage. Properties of fresh concrete – Workability – Factors affecting workability – Measurement of workability by different tests – Setting times of concrete – Effect of time and temperature on workability – Segregation & bleeding – Mixing and vibration of concrete, Ready mixed concrete, Shotcrete.

UNIT – III

Hardened Concrete

Water / Cement ratio – Abram's Law – Gel/space ratio – Nature of strength of concrete – Maturity concept – Strength in tension & compression – Factors affecting strength – Relation between compression & tensile strength – Curing, Testing of Hardened Concrete: Compression test – Tension test – Factors affecting strength – Flexure test – Splitting test – Non-destructive testing methods – Codal provisions for NDT.

UNIT – IV

Elasticity, Creep & Shrinkage

Modulus of elasticity – Dynamic modulus of elasticity – Poisson's ratio – Creep of concrete – Factors influencing creep – Relation between creep & time – Nature of creep – Effects of creep – Shrinkage – Types of shrinkage.

UNIT – V

Mix Design of Concrete:

Factors in the choice of mix proportions – Quality control of concrete – Statistical methods – Acceptance Criteria – Concepts Proportioning of concrete mixes by IS Code method.

Special Concretes:

Ready mixed concrete – Fibre reinforced concrete – Different types of fibres – Factors affecting properties of FRC, High performance concrete – Self consolidating concrete – Self-healing concrete.

Text Books

1. A.M. Neville, *Properties of Concrete*, Pearson, 4th edition.
2. M.L. Gambhir, *Concrete Technology*, Tata McGraw Hill Publishers, New Delhi 5th edition 2013.
3. Job Thomas, *Concrete Technology*, Cengagae Publications, 1st edition, 2015.

Reference Books

1. P.K. Mehta and Moterio, *Concrete Microstructure, Properties of Materials*, McGraw Hill, 4th edition, 2014.
2. J.J. Brooks and A. M. Neville, *Concrete Technology*, Pearson, 2nd Edition, 2019.
3. M. S. Shetty, *Concrete Technology*, S. Chand & Co., 2004.
4. A.R. Santha Kumar, *Concreted Technology*, Oxford University Press, New Delhi.

Question Paper Pattern:

Sessional Exam: The question paper for Sessional Examination shall be for 40 marks. The question paper shall consist of Four Questions and all questions are compulsory. Question No.1 contains Five short answer questions (2marks each) for a total of 10 marks. Remaining Three Questions shall be EITHER/OR type descriptive questions for 10 marks each. Each of these descriptive questions may contain sub-questions.

End Exam: The question paper for End Examination shall be for 70 marks. The question paper shall contain Six Questions and all questions are compulsory. Question No.1 shall contain Ten short answer questions (2 marks each) for a total of 20 marks, with Two short answer questions from each unit. Remaining Five Questions (each question covering one unit of syllabus) carrying 10 marks each shall be EITHER/OR type descriptive questions and may contain sub-questions.

HYDRAULICS AND HYDRAULIC MACHINERY (HHM)

IV Semester : CE					Scheme : 2023			
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
		L/D	**T**	**P**	**C**	**Continuous Internal Assessment**	**End Exam**	**Total**
CE209	**PC**	**3**	**-**	**-**	**3**	**30**	**70**	**100**
Sessional Exam Duration : 2 Hrs					**End Exam Duration: 3 Hrs**			

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

CO1: Distinguish laminar and turbulent flow in pipes.

CO2: Apply the concepts of uniform flow to design the hydraulically efficient channel sections.

CO3: Solve non-uniform flow problems and analyse hydraulic jump phenomenon in open channel flows.

CO4: Apply the concepts of impact of jets to design the turbines.

CO5: Evaluate the efficiencies and performance of centrifugal pumps.

UNIT – I

Laminar & Turbulent Flow in Pipes

Laminar Flow – Laminar flow through: circular pipes, annulus and parallel plates – Stoke's law – Measurement of viscosity. Reynolds experiment, Transition from laminar to turbulent flow. Resistance to flow of fluid in smooth and rough pipes – Moody's diagram – Introduction to boundary layer theory.

UNIT – II

Uniform Flow in Open Channels:

Open Channel Flow – 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.

Hydraulically Efficient Channel Sections:

Rectangular, trapezoidal and triangular channels – Energy and Momentum correction factors.

UNIT – III

Non-Uniform Flow in Open Channels

Specific energy, critical flow, discharge curve, Specific force, Specific depth, and critical depth – Measurement of discharge and velocity – Gradually varied flow – Dynamic equation of gradually varied flow – Hydraulic jump and classification – Elements and characteristics – Energy dissipation.

UNIT – IV

Impact of Jets:

Hydrodynamic force of jets on stationary and moving flat, inclined and curved vanes – Velocity triangles at inlet and outlet – Work done and efficiency.

Hydraulic Turbines:

Classification of turbines; Pelton wheel and its design – Francis turbine and its design – Efficiency – Draft tube theory – Characteristic curves of hydraulic turbines. Cavitation: causes and effects.

UNIT – V

Pumps

Working principles of a centrifugal pump – Work done by impeller – Heads, losses and efficiencies – Minimum starting speed – Priming – Specific speed – Limitation of suction lift – Net positive suction head (NPSH) – Performance and characteristic curves – Cavitation effects – Multistage centrifugal pumps; troubles and remedies.

Text Books

1. P. M. Modi and S. M. Seth, *Hydraulics and Fluid Mechanics*, Standard Book House 22nd edition, 2019.
2. K. Subrahmanya, *Theory and Applications of Fluid Mechanics*, Tata McGraw Hill, 2nd edition, 2018.

Reference Books

1. R. K. Bansal, *A Text Book of Fluid Mechanics and Hydraulic Machines*, Laxmi Publications (P) Ltd., New Delhi 11th edition, 2024.
2. Frank M. White, Henry Xue, *Fluid Mechanics*, Tata McGraw Hill, 9th edition, 2022.
3. C.S.P. Ojha, R. Berndtsson and P. N. Chadramouli, *Fluid Mechanics and Machinery*, Oxford University Press, 2010.
4. S.K. Som, Gautam Biswas, S.Chakraborty, *Introduction to Fluid Mechanics & Fluid Machines,* 3rd edition, 2011.

Question Paper Pattern:

Sessional Exam: The question paper for Sessional Examination shall be for 40 marks. The question paper shall consist of Four Questions and all questions are compulsory. Question No.1 contains Five short answer questions (2marks each) for a total of 10 marks. Remaining Three Questions shall be EITHER/OR type descriptive questions for 10 marks each. Each of these descriptive questions may contain sub-questions.

End Exam: The question paper for End Examination shall be for 70 marks. The question paper shall contain Six Questions and all questions are compulsory. Question No.1 shall contain Ten short answer questions (2 marks each) for a total of 20 marks, with Two short answer questions from each unit. Remaining Five Questions (each question covering one unit of syllabus) carrying 10 marks each shall be EITHER/OR type descriptive questions and may contain sub-questions.

ENGINEERING GEOLOGY LAB [EG(P)]

IV Semester : CE						Scheme : 2023		
Course Code	**Category**	**Hours / Week**			**Credits**	**Maximum Marks**		
		L	**T**	**P**	**C**	**Continuous Internal Assessment**	**End Exam**	**Total**
CE210	**PC**	**-**	**-**	**3**	**1.5**	**30**	**70**	**100**
						End Exam Duration : 3 Hrs		

Course Outcomes: The student shall be able to

CO1: Identify Megascopic minerals, rocks and their properties.

CO2: Examine the site parameters to identify the topographical features.

CO3: Analyze the structural geology problems.

List of Experiments

1. Physical properties of minerals: Mega-scopic identification of
   a) Rock forming minerals – Quartz group, Feldspar group, Garnet group, Mica group &Talc, Chlorite, Olivine, Kyanite, Asbestos, Tourmelene, Calcite, Gypsum, etc…
   b) Ore forming minerals – Magnetite, Hematite, Pyrite, Pyralusite, Graphite, Chromite,etc…
2. Megascopic description and identification of rocks
   a) Igneous rocks – Types of Granite, Pegmatite, Gabbro, Dolerite, Syenite, Granite Poryphery, Basalt, etc.
   b) Sedimentary rocks – Sand stone, Ferrugineous sand stone, Lime stone, Shale, Laterite,Conglamorate, etc.
   c) Metamorphic rocks – Biotite – Granite Gneiss, Slate, Muscovite & Biotiteschist,Marble, Khondalite, etc.
3. Interpretation and drawing of sections for geological maps showing tilted beds, faults,unconformities etc.
4. Simple Structural Geology problems.
5. Bore hole data.
6. Strength of the rock using laboratory tests.
7. Field work – To identify Minerals, Rocks, Geomorphology & Structural Geology.

CONCRETE TECHNOLOGY LAB [CT(P)]

IV Semester : CE						Scheme : 2023		
Course Code	Category	Hours / Week			Credits	Maximum Marks		
CE211	PC	L/D	T	P	C	Continuous Internal Assessment	End Exam	Total
		-	-	3	1.5	30	70	100
						End Exam Duration : 3 Hrs		

Course Outcomes: The student shall be able to

CO1: Conduct tests on concrete ingredients as per I S Code to assess their quality for field application.

CO2: Conduct tests on properties of fresh and hardened concrete as per I S code to assess the quality of concrete.

List of Experiments

1. **Tests on Cement**
   a) Normal Consistency and Fineness of cement.
   b) Initial setting time and Final setting time of cement.
   c) Specific gravity and soundness of cement.
   d) Compressive strength of cement.

2. **Tests on Fine Aggregates**
   a) Grading and fineness modulus of Fine aggregate by sieve analysis.
   b) Specific gravity of fine aggregate.
   c) Water absorption and Bulking of sand.

3. **Tests on Coarse Aggregates**
   a) Grading of Coarse aggregate by sieve analysis.
   b) Specific gravity of coarse aggregate.
   c) Water absorption of Coarse aggregates.

4. **Tests on fresh Concrete**
   a) Workability of concrete by compaction factor method.
   b) Workability of concrete by slump test.
   c) Workability of concrete by Vee-bee test.

5. **Tests on Hardened Concrete**
   a) Compressive strength of cement concrete and Modulus of rupture.
   b) Young's Modulus and Poisson's Ratio.
   c) Split tensile strength of concrete.
   d) Non-Destructive testing on concrete (for demonstration).

SOFT SKILLS [SS(P)]

<table>
<tr><td colspan="5">IV Semester : Common for all Branches</td><td colspan="4">Scheme : 2023</td></tr>
<tr><td>Course Code</td><td>Category</td><td colspan="3">Hours / Week</td><td>Credits</td><td colspan="3">Maximum Marks</td></tr>
<tr><td rowspan="2">SCCM01</td><td rowspan="2">SC</td><td>L/D</td><td>T</td><td>P</td><td>C</td><td>Continuous Internal Assessment</td><td>End Exam</td><td>Total</td></tr>
<tr><td>-</td><td>1</td><td>2</td><td>2</td><td>30</td><td>70</td><td>100</td></tr>
<tr><td colspan="5"></td><td colspan="4">End Exam Duration : 3 Hrs</td></tr>
<tr><td colspan="9"></td></tr>
<tr><td colspan="9">Course Outcomes: The student shall be able to</td></tr>
<tr><td colspan="9">CO1: Enhance teamwork and professional growth in engineering and related fields through foundational soft skills and practical communication proficiency.</td></tr>
<tr><td colspan="9">CO2: Develop effective presentation skills to meet industry standards, enabling clear and professional communication of ideas and information.</td></tr>
<tr><td colspan="9">CO3: Develop the ability to identify and employ a variety of problem-solving and decision-making methods that is relevant and effective in real-world situations.</td></tr>
<tr><td colspan="9">CO4: Develop and apply emotional intelligence and stress management techniques to enhance personal, professional well-being and emotional well-being.</td></tr>
<tr><td colspan="9">CO5: Understand and develop the corporate etiquette necessary to present themselves in a professional setting.</td></tr>
<tr><td colspan="9"></td></tr>
<tr><td colspan="9">UNIT – I</td></tr>
<tr><td colspan="2">Soft Skills & Communication Skills</td><td colspan="7">Soft Skills - Introduction, Need - Mastering Techniques of Soft Skills – Communication. Skills - Significance, process, types - Barriers of communication - Improving techniques</td></tr>
<tr><td colspan="2">Activities</td><td colspan="7">Intrapersonal Skills- Narration about self- strengths and weaknesses- clarity of thought – self-expression – articulating with felicity. (The facilitator can guide the participants before the activity citing examples from the lives of the great, anecdotes and literary sources) – Stake holders Management.
Interpersonal Skills- Group Discussion – Debate – Team Tasks - Book and film reviews by groups - Group leader presenting views (non-controversial and secular) on contemporary issues or on a given topic.
Verbal Communication- Extempore- brief addresses and speeches convincing- negotiating- agreeing and disagreeing with professional grace.
Non-verbal communication – Public speaking – Mock interviews – presentations with an objective to identify non- verbal clues and remedy the lapses on observation.</td></tr>
<tr><td colspan="9">UNIT – II</td></tr>
<tr><td colspan="2">Presentation Skills</td><td colspan="7">Types of presentations – Delivery techniques – Engaging the audience – Handling Q&A and feedback – Research content – Visual aids and materials.</td></tr>
<tr><td colspan="2">Activities</td><td colspan="7">Poster Presentation
Power Point Presentation
Oral Presentation</td></tr>
<tr><td colspan="9">UNIT – III</td></tr>
</table>

Problem Solving & Decision Making	Meaning & features of Problem Solving – Managing conflict – Conflict resolution – Team building - Effective decision making in teams – Methods & Styles.
Activities	Placing a problem which involves conflict of interests, choice and views – Formulating the problem – Exploring solutions by proper reasoning – Discussion on important professional, career and organizational decisions and initiate debate on the appropriateness of the decision.
UNIT – IV	
Stress Management	Self-awareness – Self-Regulation – Stress factors – Controlling stress – Tips.
Activities	Providing opportunities for the participants to narrate certain crisis and stress – Ridden situations caused by failure, anger, jealousy, resentment and frustration in the form of written and oral presentation, organizing debates.
UNIT – V	
Corporate Etiquette	Etiquette – Introduction, concept, significance – Corporate etiquette - meaning, modern etiquette, benefits – Global and local culture sensitivity – Gender Sensitivity – Etiquette in interaction- e-mail etiquette – Cell phone etiquette – Dining etiquette - Netiquette - Job interview etiquette – Corporate grooming tips – Overcoming challenges.
Activities	Providing situations to take part in the Role Plays where the students will learn about bad and good manners and etiquette – Group Activities to showcase gender sensitivity, dining etiquette etc. – Conducting mock job interviews – Case Study – Business Etiquette Games.
Text Books	
1. Mitra Barun K, *Personality Development and Soft Skills*, Oxford University Press, Pap/Cdr edition, 2012.	
2. Shikha Kapoor, *Personality Development and Soft Skills: Preparing for Tomorrow*, I K International Publishing House, 2018.	
Reference Books:	
1. Sharma, Prashant, *Soft Skills: Personality Development for Life Success*, BPB Publications, 2018.	
2. Alex K, *Soft Skills*, S. Chand &Co., 2012 (Revised edition).	
3. Gajendra Singh Chauhan & Sangeetha Sharma, *Soft Skills: An Integrated Approach to Maximise Personality,* Wiley, 2013.	
4. Pillai, Sabina & Fernandez Agna, *Soft Skills and Employability Skills*, Cambridge University Press, 2018.	
5. Renu Shorey, *Soft Skills for a Big Impact* (English, Paperback), Notion Press.	
6. Rajiv Kumar Jain, Usha Jain, *Life Skills* (Paperback English), Vayu Education of India, 2014.	
Web References:	
1. https://youtu.be/DUlsNJtg2L8?list=PLLy_2iUCG87CQhELCytvXh0E_y-bOO1_q	
2. https://youtu.be/xBaLgJZ0t6A?list=PLzf4HHlsQFwJZel_j2PUy0pwjVUgj7KlJ	

ENVIRONMENTAL SCIENCE (ES)

IV Semester : CE						Scheme : 2023		
Course Code	Category	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	Continuous Internal Assessment	End Exam	Total
AC201	AC	2	-	-	-	100	-	100

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

CO1: Apply the knowledge of environmental issues in area of work. Interpret the need for the conservation of Natural resources for sustainable development.

CO2: Pursue the importance of Ecosystem and conservation of biodiversity.

CO3: Assess the problems due to environmental pollution with remedial measures and issues related to environment.

CO4: Evaluate sustainable development and address environmental issues.

CO5: Interpret the use of IT & related technology to conserve environment & human health.

UNIT – I

Multidisciplinary Nature of Environmental Studies:

Definition, Scope and Importance – Need for Public Awareness.

Natural Resources:

Renewable and non-renewable resources – Natural resources and associated problems. Forest resources – Use and over-exploitation, deforestation, case studies – Timber extraction – Mining, dams and other effects on forest and tribal people. Water resources – Use and over utilization of surface and ground water – Floods, drought, conflicts over water, dams – benefits and problems. 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: solar, wind and nuclear energy resources.

UNIT – II

Ecosystems:

Concept of an ecosystem – Structure and function of an ecosystem – Producers, consumers and decomposers. Energy flow in the ecosystem – Food chains, food webs and ecological pyramids. Introduction, types, characteristic features, structure and functions of the forest and aquatic (pond and ocean) ecosystems.

Biodiversity and its Conservation:

Introduction, Definition: genetic, species and ecosystem diversity. Values of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values. India as a mega-diversity nation – Hot-spots of biodiversity – Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts – Endangered and endemic species of India – Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.

UNIT – III

Environmental Pollution:

Definition, cause, effects and control measures of :

a. Air Pollution.
b. Water pollution
c. Noise pollution

d. 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: floods, earthquake and cyclone.

UNIT – IV

Social Issues and the Environment:

From Unsustainable to Sustainable development – Urban problems related to energy – Water conservation, rain water harvesting – Environmental ethics. Global issues and possible solutions – Climate change, global warming, acid rain and ozone layer depletion – Case Studies. Consumerism and waste products. Environment Protection Acts – Air (Prevention and Control of Pollution) Act – Water (Prevention and control of Pollution) Act – Wildlife Protection Act – Forest Conservation Act. Issues involved in enforcement of environmental legislation – Public awareness.

UNIT – V

Human Population and the Environment:

Population growth, Population explosion – Family Welfare Programmes. – Environment and human health. Value Education – HIV/AIDS – Women and Child Welfare – Role of information Technology in Environment and human health.

Field Work:

Visit to a local area to document environmental assets River/forest/grassland/ hill/mountain – Visit to a local polluted site – Urban/Rural/Industrial/Agricultural study of common plants, insects, and birds – river, hill slopes, etc.

Text Books

1. C. P. Kaushik and Anubha Kaushik, *Environmental Studies*, New Age International (P) Ltd., New Delhi.
2. Erach Bharucha, *Textbook of Environmental Studies for Undergraduate Courses*, University Grants Commission, Universities Press.
3. Y. Anjaneyulu, *Introduction to Environmental Sciences*, BS Publications, Hyderabad.
4. R. Rajagopalan, *Environmental Studies*, Oxford University Press, Chennai.
5. S. Azeem Unnisa, *Environmental Studies*, Academic Publishing Company.

Reference Books

1. Benny Joseph, *Environmental Studies*, Tata McGraw Hill, New Delhi.
2. Decksha Dave and E.Sai Baba Reddy, *Textbook of Environmental Science*, Cengage Publications.
3. M. Anji Reddy, *Text book of Environmental Sciences and Technology*, BS Publication.
4. Palaniswamy, *Environmental Studies*, Pearson Education.
5. J. P. Sharma, *Comprehensive Environmental Studies*, Laxmi Publications.
6. Gilbert M. Masters and Wendell P. Ela, *Introduction to Environmental Engineering and Science*, Prentice Hall of India Private limited.

COMMUNITY SERVICE PROJECT (CSP)

……Experiential learning through community engagement

Introduction

- Community Service Project is an experiential learning strategy that integrates meaningful community service with instruction, participation, learning and community development.
- Community Service Project involves students in community development and service activities and applies the experience to personal and academic development.
- Community Service Project is meant to link the community with the college for mutual benefit. The community will benefit with the focused contribution of the college students for the village/ local development. The college finds an opportunity to develop social sensibility and responsibility among students and emerge as a socially responsible institution.

Objective

Community Service Project should be an integral part of the curriculum, as an alternative to the 2 months of Summer Internships / Apprenticeships / On the Job Training, whenever there is an exigency when students cannot pursue their summer internships. The specific objectives are;

- To sensitize the students to the living conditions of the people who are around them,
- To help students to realize the stark realities of society.
- To bring about an attitudinal change in the students and help them to develop societal consciousness, sensibility, responsibility and accountability
- To make students aware of their inner strength and help them to find new /out of box solutions to social problems.
- To make students socially responsible citizens who are sensitive to the needs of the disadvantaged sections.
- To help students to initiate developmental activities in the community in coordination with public and government authorities.
- To develop a holistic life perspective among the students by making them study culture, traditions, habits, lifestyles, resource utilization, wastages and its management, social problems, public administration system and the roles and responsibilities of different persons across different social systems.

Implementation of Community Service Project

- Every student should put in 6 weeks for the Community Service Project during the summer vacation.
- Each class/section should be assigned with a mentor.
- Specific Departments could concentrate on their major areas of concern. For example, Dept. of Computer Science can take up activities related to Computer Literacy to different sections of people like - youth, women, housewives, etc.
- A logbook must be maintained by each of the students, where the activities undertaken/involved to be recorded.
- The logbook has to be countersigned by the concerned mentor/faculty in charge.
- An evaluation to be done based on the active participation of the student and grade could be awarded by the mentor/faculty member.
- The final evaluation to be reflected in the grade memo of the student.
- The Community Service Project should be different from the regular programs of

NSS/NCC/Green Corps/Red Ribbon Club, etc.

- Minor project reports should be submitted by each student. An internal Viva shall alsobe conducted by a committee constituted by the principal of the college.
- Award of marks shall be made as per the guidelines of Internship/apprentice/ on the job training.

Procedure

- A group of students or even a single student could be assigned for a particular habitation or village or municipal ward, as far as possible, in the near vicinity of their place of stay, to enable them to commute from their residence and return back by evening or so.
- The Community Service Project is a twofold one –
  - First, the student/s could conduct a survey of the habitation, if necessary, in terms of their own domain or subject area. Or it can even be a general survey, incorporating all the different areas. A common survey format could be designed. This should not be viewed as a duplication of work by the Village or Ward volunteers, rather, it could be another primary source of data.
  - Secondly, the student/s could take up a social activity, concerning their domain or subject area. The different areas, could be like –
    - Agriculture
    - Health
    - Marketing and Cooperation
    - Animal Husbandry
    - Horticulture
    - Fisheries
    - Sericulture
    - Revenue and Survey
    - Natural Disaster Management
    - Irrigation
    - Law & Order
    - Excise and Prohibition
    - Mines and Geology
    - Energy
    - Internet
    - Free Electricity
    - Drinking Water

EXPECTED OUTCOMES

BENEFITS OF COMMUNITY SERVICE PROJECT TO STUDENTS

Learning Outcomes

- ✓ Positive impact on students' academic learning
- ✓ Improves students' ability to apply what they have learned in "the real world"
- ✓ Positive impact on academic outcomes such as demonstrated complexity of understanding, problem analysis, problem-solving, critical thinking, and cognitive development.
- ✓ Improved ability to understand complexity and ambiguity.

Personal Outcomes

- Greater sense of personal efficacy, personal identity, spiritual growth, and moral development.
- Greater interpersonal development, particularly the ability to work well with others,and build leadership and communication skills.

Social Outcomes

- Reduced stereotypes and greater inter-cultural understanding
- Improved social responsibility and citizenship skills
- Greater involvement in community service after graduation.

Career Development

- ❖ Connections with professionals and community members for learning and careeropportunities
- ❖ Greater academic learning, leadership skills, and personal efficacy can lead to greateropportunity.

Relationship with the Institution

- Stronger relationships with faculty
- Greater satisfaction with college
- Improved graduation rates

BENEFITS OF COMMUNITY SERVICE PROJECT TO FACULTY MEMBERS

- ✓ Satisfaction with the quality of student learning
- ✓ New avenues for research and publication via new relationships between faculty andcommunity
- ✓ Providing networking opportunities with engaged faculty in other disciplines orinstitutions
- ✓ A stronger commitment to one's research.

BENEFITS OF COMMUNITY SERVICE PROJECT TO COLLEGES ANDUNIVERSITIES

- o Improved institutional commitment.
- o Improved student retention
- o Enhanced community relations

BENEFITS OF COMMUNITY SERVICE PROJECT TO COMMUNITY

- ➢ Satisfaction with student participation
- ➢ Valuable human resources needed to achieve community goals.
- ➢ New energy, enthusiasm and perspectives applied to community work.
- ➢ Enhanced community-university relations.

SUGGESTIVE LIST OF PROGRAMMES UNDER COMMUNITY SERVICEPROJECT

The following the recommended list of projects for Engineering students. The lists are not exhaustive and open for additions, deletions, and modifications. Colleges are expected to focus on specific local issues for this kind of project. The students are expected to carry out these projects with involvement, commitment, responsibility, and accountability. The mentors of a group of students should take the responsibility of motivating, facilitating, and guiding the students. They have to interact with local leadership and people and appraise the objectives and benefits of this kind of project. The project reports shall be placed in the college website for reference. Systematic, Factual, methodical and honest reporting should beensured.

For Engineering Students

1. Water facilities and drinking water availability
2. Health and hygiene
3. Stress levels and coping mechanisms
4. Health intervention programmes
5. Horticulture
6. Herbal plants
7. Botanical survey
8. Zoological survey
9. Marine products
10. Aqua culture
11. Inland fisheries
12. Animals and species
13. Nutrition
14. Traditional health care methods
15. Food habits
16. Air pollution
17. Water pollution
18. Plantation
19. Soil protection
20. Renewable energy
21. Plant diseases
22. Yoga awareness and practice
23. Health care awareness programmes and their impact
24. Use of chemicals on fruits and vegetables
25. Organic farming
26. Crop rotation
27. Floury culture
28. Access to safe drinking water
29. Geographical survey
30. Geological survey
31. Sericulture
32. Study of species
33. Food adulteration
34. Incidence of Diabetes and other chronic diseases
35. Human genetics
36. Blood groups and blood levels
37. Internet Usage in Villages
38. Android Phone usage by different people

39. Utilization of free electricity to farmers and related issues.
40. Gender ration in schooling level- observation.

Complementing the community service project the students may be involved to take up some awareness campaigns on social issues/special groups. The suggested list of programs

Programs for School Children

1. Reading Skill Program (Reading Competition)
2. Preparation of Study Materials for the next class.
3. Personality / Leadership Development
4. Career Guidance for X class students
5. Screening Documentary and other educational films
6. Awareness Program on Good Touch and Bad Touch (Sexual abuse)
7. Awareness Program on Socially relevant themes.

Programs for Women Empowerment

1. Government Guidelines and Policy Guidelines
2. Women's Rights
3. Domestic Violence
4. Prevention and Control of Cancer
5. Promotion of Social Entrepreneurship

General Camps

1. General Medical camps
2. Eye Camps
3. Dental Camps
4. Importance of protected drinking water
5. ODF awareness camp
6. Swatch Bharath
7. AIDS awareness camp
8. Anti Plastic Awareness
9. Programs on Environment
10. Health and Hygiene
11. Hand wash programmes
12. Commemoration and Celebration of important days

Programs for Youth Empowerment

1. Leadership
2. Anti-alcoholism and Drug addiction
3. Anti-tobacco
4. Awareness on Competitive Examinations
5. Personality Development

Common Programs

1. Awareness on RTI

2. Health intervention programmes
3. Yoga
4. Tree plantation
5. Programs in consonance with the Govt. Departments like –
    a) Agriculture
    b) Health
    c) Marketing and Cooperation
    d) Animal Husbandry
    e) Horticulture
    f) Fisheries
    g) Sericulture
    h) Revenue and Survey
    i) Natural Disaster Management
    j) Irrigation
    k) Law & Order
    l) Excise and Prohibition
    m) Mines and Geology
    n) Energy

Role of Students:

- ✓ Students may not have the expertise to conduct all the programmes on their own. Thestudents then can play a facilitator role.
- ✓ For conducting special camps like Health related, they will be coordinating with theGovernmental agencies.
- ✓ As and when required the College faculty themselves act as Resource Persons.
- ✓ Students can work in close association with Non-Governmental Organizations like Lions Club, Rotary Club, etc. or with any NGO actively working in that habitation.
- ✓ And also, with the Governmental Departments. If the program is rolled out, the District Administration could be roped in for the successful deployment of the program.
- ✓ An in-house training and induction program could be arranged for the faculty and participating students, to expose them to the methodology of Service Learning.

Timeline for the Community Service Project Activity

Duration: 8 weeks

1. **Preliminary Survey (One Week)**

- A preliminary survey including the socio-economic conditions of the allotted habitation to be conducted.
- A survey form based on the type of habitation to be prepared before visiting the habitation with the help of social sciences faculty. (However, a template could be designed for different habitations, rural/urban.
- The Governmental agencies, like revenue administration, corporation and municipal authorities and village secretariats could be aligned for the survey.

2. **Community Awareness Campaigns (One Week)**

- Based on the survey and the specific requirements of the habitation, different

awareness campaigns and programmes to be conducted, spread over two weeks of time. The list of activities suggested could be taken into consideration.

3. Community Immersion Programme (Three Weeks)

- Along with the Community Awareness Programmes, the student batch can also work with any one of the below-listed governmental agencies and work in tandem with them. This community involvement programme will involve the students in exposing themselves to experiential learning about the community and its dynamics. Programs could be in consonance with the Govt. Departments.

4. Community Exit Report (One Week)

- During the last week of the Community Service Project, a detailed report of the outcome of the 8 weeks' works to be drafted and a copy shall be submitted to the local administration. This report will be a basis for the next batch of students visiting that habitation. The same report submitted to the teacher-mentor will be evaluated by the mentor and suitable marks are awarded for onward submission to the University. Throughout the Community Service Project, a daily logbook need to be maintained by the students batch, which should be countersigned by the governmental agency representative and the teacher-mentor, who is required to periodically visit the students and guide them.

FOUR YEAR B. Tech. DEGREE COURSE
Scheme of Instruction and Examination
(Effective from 2023–24)

V Semester - CE **Scheme : 2023**

S. No.	Category	Subject	Scheme of Instruction periods/week			Credits	Scheme of Examination Maximum Marks		
			L/D	T	P		CIA	End Exam	Total
I		**Theory**							
1	PC	Water Resources Engineering	3	-	-	3	30	70	100
2	PC	Design of Reinforced Concrete Structures	3	-	-	3	30	70	100
3	PC	Geotechnical Engineering	3	-	-	3	30	70	100
4	ES	Introduction to Quantum Technologies and Applications	3	-	-	3	30	70	100
5	PE	Professional Elective - I	3	-	-	3	30	70	100
6	OE	Open Elective - I	3	-	-	3	30	70	100
II		**Practical**							
7	PC	Geotechnical Engineering Lab	-	-	3	1.5	30	70	100
8	PC	Fluid Mechanics & Hydraulic Machines Lab	-	-	3	1.5	30	70	100
9	SC	Estimation, Specification, Costing & Valuation	-	1	2	2	30	70	100
10	ES	Tinkering Lab	-	-	2	1	30	70	100
11		Evaluation of Community Service Internship	-	-	-	2	100	-	100
		Total	**18**	**1**	**10**	**26**			

Abbreviations:

L/D : Lecture / Drawing T : Theory P : Practical
CIA : Continuous Internal Assessment
PC : Professional Core ES : Engineering Science OE : Open Elective
SC : Skill Oriented Course

Professional Elective – I	**Open Elective – I**
1. Advanced Structural Analysis 2. Air Pollution and Control 3. Open Channel Flow	1. Green Buildings 2. Construction Technology and Management 3. Electrical Safety Practices and Standards 4. Sustainable Energy Technologies 5. Electronic Circuits 6. Java Programming 7. Foundation of Artificial Intelligence 8. Ethical Hacking 9. Mathematics for Machine Learning and AI 10. Materials Characterization Techniques 11. Chemistry of Energy Systems 12. English for Competitive Examinations 13. Entrepreneurship and New Venture Creation

WATER RESOURCES ENGINEERING (WRE)

<table>
<tr><td colspan="5">V Semester : CE</td><td colspan="4">Scheme : 2023</td></tr>
<tr><td>Course Code</td><td>Category</td><td colspan="3">Hours/Week</td><td>Credits</td><td colspan="3">Maximum Marks</td></tr>
<tr><td rowspan="2">CE301</td><td rowspan="2">PC</td><td>L/D</td><td>T</td><td>P</td><td>C</td><td>Continuous Internal Assessment</td><td>End Exam</td><td>Total</td></tr>
<tr><td>3</td><td>-</td><td>-</td><td>3</td><td>30</td><td>70</td><td>100</td></tr>
<tr><td colspan="5">Sessional Exam Duration : 2 Hrs</td><td colspan="4">End Exam Duration: 3 Hrs</td></tr>
<tr><td colspan="9"></td></tr>
<tr><td colspan="9">Course Outcomes :At the end of the course the student will be able to</td></tr>
<tr><td colspan="9">CO1: Analyze the measured rainfall data, evaporation, and infiltration over a basin and understand the components of runoff.</td></tr>
<tr><td colspan="9">CO2: Analyze hydrograph, unit hydrograph, and apply groundwater flow parameters for water resource planning.</td></tr>
<tr><td colspan="9">CO3: Estimate Quality of irrigation water, Duty and Delta over a given area.</td></tr>
<tr><td colspan="9">CO4: Design irrigation canals using silt theories.</td></tr>
<tr><td colspan="9">CO5: Design impervious floor of Diversion Head Works using Bligh‘s and Khosla’s theory.</td></tr>
<tr><td colspan="9">UNIT – I</td></tr>
<tr><td colspan="9">Introduction to Hydrology
Engineering hydrology and its applications – Hydrologic cycle – Precipitation – Types and forms – Rainfall measurement – Types of rain gauges – Computation of average rainfall over a basin – Evaporation – Factors affecting evaporation – Measurement of evaporation – Infiltration – Factors affecting infiltration – Measurement of infiltration – Infiltration indices – Run-off – Factors affecting run-off – Components of run-off.</td></tr>
<tr><td colspan="9">UNIT – II</td></tr>
<tr><td colspan="9">Hydrograph Analysis:
Features of hydrograph – Separation of base flow – Direct runoff hydrograph – Unit hydrograph theory – Assumptions and limitations – Construction of unit hydrograph from flood hydrograph and vice-versa – Applications of unit hydrograph.
Ground Water: Introduction – Aquifer, Aquiclude, Aquifuge, Aquifer parameters porosity – Specific yield – Specific retention – Divisions of Sub–surface water – Water table – Types of aquifers – Storage coefficient – Coefficient of permeability and transmissibility.</td></tr>
<tr><td colspan="9">UNIT – III</td></tr>
<tr><td colspan="9">Irrigation and Water Requirement of Crops
Necessity and importance of irrigation – Advantages and ill effects of irrigation – Types of irrigation – Methods of application of irrigation water – Quality of irrigation water – Soil-water-plant relationship – Vertical distribution of soil moisture – Soil moisture tension – Soil moisture stress – Various soil moisture constants – Limiting soil moisture conditions – Depth and frequency of irrigation – Gross command area – Culturable command area – Culturable cultivated and uncultivated area – Kor depth and Kor period – Duty and delta – Relation between duty and delta – Factors affecting duty – Methods of improving duty – Crop seasons – Crop rotation – Irrigation efficiencies.</td></tr>
<tr><td colspan="9">UNIT – IV</td></tr>
<tr><td colspan="9">Channels – Silt Theories:
Classification-inundation canals – Canal alignment – Cross–section of an irrigation channel – Balancing depth – Borrow pit – Spoil bank – Land width – Silt theories – Kennedy’s theory – Kennedy’s method of channel design – Drawbacks in Kennedy‘s theory – Lacey’s regime theory – Lacey’s theory applied to channel design – Defects in Lacey’s theory –</td></tr>
</table>

Comparison of Kennedy's and Lacey's theory.

Water Logging and Canal Lining: Water logging – Effects of water logging – Causes of water logging – Remedial measures – Losses in canal – Lining of irrigation channels – Necessity, advantages and disadvantages – Types of lining.

UNIT – V

Diversion Head Works

Types of diversion head works – Diversion and storage head works – Weirs and barrages – Layouts of diversion head works – Components – Causes and failure of hydraulic structures on permeable foundations – Bligh's creep theory – Khosla's theory – Determination of uplift pressure – Impervious floors using Bligh's and Khosla's theory – Exit gradient.

Text Books

1. Punmia & Lal, *Irrigation and Water Power Engineering*, Laxmi Publications Pvt. Ltd., New Delhi, 17th Edition, 2021.

2. K. Subramanya, *Engineering Hydrology*, The Tata McGraw Hill Company, Delhi, 5th Edition, 2020.

Reference Books

1. S. K. Garg, *Irrigation Engineering and Hydraulic Structures*, Khanna Publishers, Delhi, 36th edition.

2. Jayarami Reddy. P, *Engineering Hydrology*, Laxmi Publications Pvt. Ltd., New Delhi, 3rd edition, 2016.

3. P.N. Modi, *Irrigation and Water Resources & Water Power*, Standard Book House, 6th edition, 2020.

Question Paper Pattern:

Sessional Exam: The question paper for Sessional Examination shall be for 40 marks. The question paper shall consist of Four Questions and all questions are compulsory. Question No.1 contains Five short answer questions (2marks each) for a total of 10 marks. Remaining Three Questions shall be EITHER/OR type descriptive questions for 10 marks each. Each of these descriptive questions may contain sub-questions.

End Exam: The question paper for End Examination shall be for 70 marks. The question paper shall contain Six Questions and all questions are compulsory. Question No.1 shall contain Ten short answer questions (2 marks each) for a total of 20 marks, with Two short answer questions from each unit. Remaining Five Questions (each question covering one unit of syllabus) carrying 10 marks each shall be EITHER/OR type descriptive questions and may contain sub-questions.

DESIGN OF REINFORCED CONCRETE STRUCTURES (DRCS)

V Semester : CE						Scheme : 2023		
Course Code	Category	Hours/Week			Credits	Maximum Marks		
CE302	PC	L/D	T	P	C	Continuous Internal Assessment	End Exam	Total
		3	-	-	3	30	70	100
Sessional Exam Duration : 2 Hrs						End Exam Duration: 3 Hrs		

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

CO1: Understand working stress method, ultimate load method and limit state method along with their advantages.

CO2: Analyze and design singly and doubly reinforced beams, continuous beams, flanged beams, slabs and staircases using the Limit State Method and check serviceability on deflection and cracking.

CO3: Evaluate the behavior of RC members under shear, torsion, and combined loading conditions.

CO4: Design short columns and footings considering axial and eccentric loading conditions.

UNIT – I

Methods of Design of Concrete Structures

Concept of elastic method – Ultimate load method and limit state method – Limit state philosophy as detailed in is code – Advantages of limit state method over other methods – Analysis and design of singly and doubly reinforced rectangular beams by limit state method – Design of continuous beams.

UNIT – II

Limit State Method - Flanged Beam, Shear &Torsion

Analysis and design of flanged beams – Behaviour of RC members in bond and anchorage – Design requirements as per current code – Behaviour of RC beams in shear and torsion – Design of RC members for combined bending, shear and torsion.

UNIT – III

Limit State Design of Slabs

Analysis and design of one way, two way and continuous slabs subjected to uniformly distributed load for various boundary conditions.

Limit State of Serviceability

Limit state design of serviceability for deflection, cracking as per codal provisions.

UNIT – IV

Limit State Design of Columns

Types of columns – Design of short rectangular and circular columns for axial, uniaxial and biaxial bending.

UNIT – V

Limit State Design of Footing

Types of footings – Design of isolated square and rectangular footings.

Limit State Design of Staircases

Types of staircases – Design of dog-legged staircase.

Text Books

1. B. C. Punmia, Ashok Kumar Jain and Arun Kumar Jain, *Limit State Design*, Laxmi

Publications Pvt. Ltd., New Delhi.

2. P. C. Varghese, *Limit State Designed of Reinforced Concrete*, Prentice Hall of India, New Delhi.

Reference Books

1. N. Krishnaraju, *Structural Design and Drawing*, Universities Press Pvt. Ltd., Hyderabad, 4th Edition 2020.
2. N.C. Sinha and S.K. Roy, *Fundamentals of Reinforced Concrete*, S. Chand Publishers.
3. N. Subramanian, *Design of Reinforced Concrete Structures*, Oxford University Press.

Codes/Tables: IS 456-2000 and relevant sheets (Pertaining to columns) of SP 16 Code books to be permitted into the examinations Hall.

NOTE: Assignment on preparation of drawing sheets detailing various RC Elements. All the designs to be taught in Limit State Method. Following plates should be prepared by the students.

1. Reinforcement particulars of T-beams and L-beams.
2. Reinforcement detailing of continuous beams.
3. Reinforcement particulars of columns and footings.
4. Detailing of One-way, Two way and continuous slabs

Question Paper Pattern:

Sessional Exam: The question paper for Sessional Examination shall be for 40 marks. The sessional examination paper should consist of Part A and Part B. Part A consists of Two questions in Design and Drawing out of which one question is to be answered. Part B should consist of Three questions on design out of which Two are to be answered. Weightage for Part-A is 40% and for Part-B is 60%.

End Exam: The question paper for End Examination shall be for 70 marks. The end examination paper should consist of Part A and Part B. Part A consists of two questions in Design and Drawing out of which one question is to be answered. Part-B should consist of five questions on design out of which three are to be answered. Weightage for Part -A is 40% and Part-B is 60%.

GEOTECHNICAL ENGINEERING (GTE)

V Semester : CE					Scheme : 2023			
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
		L/D	**T**	**P**	**C**	**Continuous Internal Assessment**	**End Exam**	**Total**
CE303	**PC**	**3**	**-**	**-**	**3**	**30**	**70**	**100**
Sessional Exam Duration : 2 Hrs					**End Exam Duration: 3 Hrs**			

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

CO1: Apply the functional relations to determine the physical properties of soil.

CO2: Classify the soils based on their physical and index properties.

CO3: Analyze the stresses due to self-weight and due to applied loads.

CO4: Analyze the permeability and seepage in soils.

CO5: Evaluate the compaction and consolidation characteristics of soils.

UNIT – I

Basic Definitions and Functional Relations: Introduction - Soil as a 3-phase system – Basic definitions – Volumetric relationships – Water content – Volume-mass relationships – Volume-weight relationships – Specific gravity – Functional relations in terms of volume and weight.

UNIT – II

Physical Properties of Soils: Determination of specific gravity, water content, in–situ density – Relative Density – Grain size analysis by sieve and hydrometer – Gradation characteristics of soils – Consistency limits – Determination of liquid limit, plastic limit and shrinkage limit – Different Indices – Use of consistency limits.

Soil Classification: Particle size classification – AASHTO classification system – Unified soil classification system – Indian Standard classification system – Plasticity chart.

UNIT – III

Geostatic Stresses: Total, neutral and effective stress in soil deposits – Soil deposits subject to capillary action.

Stresses Due to Applied Loads: Boussinesq's theory – Vertical stress due to concentrated load, line load, strip load, uniformly loaded circular and rectangular areas – Isobar diagram – Newmark's influence chart – Westergaard's theory – Comparison of Boussinesq's and Westergaard's theories – Approximate methods – Contact pressure beneath foundations.

UNIT – IV

Permeability: Darcy's law – Factors affecting permeability – Laboratory methods for determination of permeability – Permeability of stratified soil deposits.

Seepage: Seepage pressure – Quick sand condition – Characteristics and uses of flow net.

UNIT – V

Compaction: Theory of compaction – Optimum moisture content – Standard Proctor test – Modified Proctor test – Compaction of sands – Factors affecting compaction – Effect of compaction on soil properties.

Consolidation: Mechanism of consolidation – Pressure–void ratio curve – Consolidation settlement – Terzaghi's theory of one–dimensional consolidation – Laboratory consolidation test – Coefficient of consolidation – Time fitting methods – Normally and over-consolidated soils.

Text Books

1. K.R.Arora, *Soil Mechanics and Foundation Engg.*, Standard Publishers and

Distributors, Delhi, 7th edition 2009.

2. C. Venkataramiah, *Geotechnical Engineering*, New Age International Pvt. Ltd., (2002).

Reference Books

1. B.C. Punmia, Ashok Kumar Jain and Arun Kumar Jain, *Soil Mechanics and Foundation*, Laxmi Publications Pvt. Ltd., New Delhi, 17th edition, 2017.
2. Iqbal H. Khan, *Geotechnical Engineering*, PHI Publishers, 4th edition.
3. Gopal Ranjan & ASR Rao, *Basic and Applied Soil Mechanics*, New Age International Pvt. Ltd., New Delhi, 3rd edition, 2016.

Question Paper Pattern:

Sessional Exam: The question paper for Sessional Examination shall be for 40 marks. The question paper shall consist of Four Questions and all questions are compulsory. Question No.1 contains Five short answer questions (2marks each) for a total of 10 marks. Remaining Three Questions shall be EITHER/OR type descriptive questions for 10 marks each. Each of these descriptive questions may contain sub-questions.

End Exam: The question paper for End Examination shall be for 70 marks. The question paper shall contain Six Questions and all questions are compulsory. Question No.1 shall contain Ten short answer questions (2 marks each) for a total of 20 marks, with Two short answer questions from each unit. Remaining Five Questions (each question covering one unit of syllabus) carrying 10 marks each shall be EITHER/OR type descriptive questions and may contain sub-questions.

INTRODUCTION TO QUANTUM TECHNOLOGIES AND APPLICATIONS (IQTA)
(Qualitative Treatment)

V Semester : All Branches						**Scheme : 2023**		
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
ESCM03	**ES**	**L/D**	**T**	**P**	**C**	**Continuous Internal Assessment**	**End Exam**	**Total**
		3	**-**	**-**	**3**	**30**	**70**	**100**
Sessional Exam Duration : 2 Hrs						**End Exam Duration: 3 Hrs**		

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

CO1: Explain core quantum principles in a non-mathematical manner.

CO2: Compare classical and quantum information systems.

CO3: Identify theoretical issues in building quantum computers.

CO4: Discuss quantum communication and computing concepts.

CO5: Recognize applications, industry trends, and career paths in quantum technology.

UNIT – I

Introduction to Quantum Theory and Technologies

The transition from classical to quantum physics – Fundamental principles explained conceptually: Superposition, Entanglement, Uncertainty principle, Wave-particle duality, Classical vs. Quantum mechanics – Theoretical comparison, Quantum states and measurement: Nature of observation, Overview of quantum systems: electrons, photons, atoms – The concept of quantization: Discrete energy levels, Why quantum? Strategic, scientific, and technological significance, A snapshot of quantum technologies: Computing, Communication, and Sensing, National and global quantum missions: India's Quantum Mission, EU, USA, China.

UNIT – II

Theoretical Structure of Quantum Information Systems

What is a qubit? Conceptual understanding using spin and polarization – Comparison: classical bits vs. quantum bits – Quantum systems: trapped ions, superconducting circuits, photons (non-engineering view), Quantum coherence and decoherence – intuitive explanation – Theoretical concepts: Hilbert spaces, quantum states, operators – only interpreted in abstract – The role of entanglement and non-locality in systems – Quantum information vs. classical information: principles and differences – Philosophical implications: randomness, determinism, and observer role.

UNIT – III

Building a Quantum Computer – Theoretical Challenges and Requirements

What is required to build a quantum computer (conceptual overview)? – Fragility of quantum systems: decoherence, noise, and control – Conditions for a functional quantum system: Isolation, Error management, Scalability, Stability, Theoretical barriers:
Why maintaining entanglement is difficult – Error correction as a theoretical necessity – Quantum hardware platforms (brief conceptual comparison) – Superconducting circuits, Trapped ions, Photonics, Vision vs. reality: what's working and what remains elusive – The role of quantum software in managing theoretical complexities.

UNIT – IV

Quantum Communication and Computing – Theoretical Perspective

Quantum vs. Classical information – Basics of quantum communication – Quantum Key Distribution (QKD) – Role of Entanglement in communication – The idea of the quantum

internet – Secure global networking – Introduction to quantum computing – Quantum Parallelism (Many States at once) – Classical vs. Quantum Gates, Challenges: Decoherence and error correction – Real-World importance and Future potential.

UNIT – V

Applications, Use Cases, and the Quantum Future

Real-world application domains: Healthcare (drug discovery), Material science, Logistics and optimization – Quantum sensing and precision timing – Industrial case studies: IBM, Google, Microsoft, Psi Quantum, Ethical, societal, and policy considerations – Challenges to adoption: cost, skills, standardization – Emerging careers in quantum: roles, skillsets, and preparation pathways – Educational and research landscape – India's opportunity in the global quantum race.

Text Books

1. Michael A. Nielsen, Isaac L. Chuang, *Quantum Computation and Quantum Information*, Cambridge University Press, 10th Anniversary Edition, 2010.
2. Eleanor Rieffel and Wolfgang Polak, *Quantum Computing: A Gentle Introduction*, MIT Press, 2011.
3. Chris Bernhardt, *Quantum Computing for Everyone*, MIT Press, 2019.

Reference Books

1. David McMahon, *Quantum Computing Explained*, Wiley, 2008.
2. Phillip Kaye, Raymond Laflamme, Michele Mosca, *An Introduction to Quantum Computing*, Oxford University Press, 2007.
3. Scott Aaronson, *Quantum Computing Since Democritus*, Cambridge University Press, 2013.
4. Alastair I.M. Rae, *Quantum Physics: A Beginner's Guide*, One world Publications, Revised Edition, 2005.
5. Eleanor G. Rieffel, Wolfgang H. Polak, *Quantum Computing: A Gentle Introduction*, MIT Press, 2011.
6. Leonard Susskind, Art Friedman, *Quantum Mechanics: The Theoretical Minimum*, Basic Books, 2014.
7. Bruce Rosenblum, Fred Kuttner, *Quantum Enigma: Physics Encounters Consciousness*, Oxford University Press, 2nd Edition, 2011.
8. Giuliano Benenti, Giulio Casati, Giuliano Strini, *Principles of Quantum Computation and Information, Volume I: Basic Concepts*, World Scientific Publishing, 2004.
9. K.B. Whaley et al., *Quantum Technologies and Industrial Applications: European Roadmap and Strategy Document*, Quantum Flagship, European Commission, 2020.
10. Department of Science & Technology (DST), Government of India, *National Mission on Quantum Technologies & Applications – Official Reports and Whitepapers*, MeitY/DST Publications, 2020 onward.

Online Learning Resources

1. IBM Quantum Experience and Qiskit Tutorials
2. Coursera – *Quantum Mechanics and Quantum Computation* by UC Berkeley
3. edX – *The Quantum Internet and Quantum Computers*
4. YouTube – *Quantum Computing for the Determined* by Michael Nielsen
5. Qiskit Textbook – IBM Quantum

Question Paper Pattern:

Sessional Exam: The question paper for Sessional Examination shall be for 40 marks. The question paper shall consist of Four Questions and all questions are compulsory. Question No.1 contains Five short answer questions (2marks each) for a total of 10 marks.

Remaining Three Questions shall be EITHER/OR type descriptive questions for 10 marks each. Each of these descriptive questions may contain sub-questions.

End Exam: The question paper for End Examination shall be for 70 marks. The question paper shall contain Six Questions and all questions are compulsory. Question No.1 shall contain Ten short answer questions (2 marks each) for a total of 20 marks, with Two short answer questions from each unit. Remaining Five Questions (each question covering one unit of syllabus) carrying 10 marks each shall be EITHER/OR type descriptive questions and may contain sub-questions.

GEOTECHNICAL ENGINEERING LAB [GTE(P)]

V Semester : CE						Scheme : 2023		
Course Code	Category	Hours / Week			Credits	Maximum Marks		
CE304	PC	L/D	T	P	C	Continuous Internal Assessment	End Exam	Total
		-	-	3	1.5	30	70	100
						End Exam Duration : 3 Hrs		

Course Outcomes: The student shall be able to

CO1: Determine index properties of soil, including specific gravity, grain size distribution, and consistency limits.

CO2: Conduct field and laboratory compaction tests to evaluate the moisture-density relationship of soil.

CO3: Evaluate permeability and consolidation characteristics of soils.

CO4: Analyze the shear strength and compressibility of soil through direct shear, unconfined compression, and tri-axial tests.

CO5: Integrate test results and engineering judgment to interpret soil behavior and make informed decisions in geotechnical engineering applications.

List of Experiments

1. Determination of specific gravity of soil
2. Determination of grain size distribution – Sieve analysis
3. Determination of liquid limit and plastic limit
4. Determination of shrinkage limit and differential free swell tests

5(a). Determination of field density (core cutter method)

5(b). Determination of field density (sand replacement method)

6. Determination of permeability (constant head method)
7. Determination of permeability (falling head method)
8. Determination of moisture-density relationship using standard Proctor compaction test.
9. Direct shear test on cohesionless soil
10. Unconfined compression test on cohesive soil
11. California bearing ratio test
12. Determination of grain size distribution - Hydrometer analysis
13. Tri-axial compression test on cohesionless soil
14. Laboratory vane shear test on cohesive soil
15. Determination of coefficient of consolidation

Note: Any 10 of the above Experiments.

Text Books

1. Lambe T.W., *Soil testing for Engineers*, John Wiley and Sons, New York, 1951. Digitized 2008.

2. IS Code of Practice (2720) Relevant Parts, as amended from time to time, Bureau of Indian Standards, New Delhi.

Reference Books

1. Saibaba Reddy, E. Ramasastri K., *Measurement of Engineering Properties of Soils*, New

Age International (P) limited publishers, New Delhi, 2008.
2. G.Venkatappa Rao and Goutham .K. Potable, *Geosynthetics Testing – A laboratory Manual*, Sai Master Geoenvironmental Services Pvt. Ltd., 1st edition 2008.
3. Braja M. Das., *Soil Mechanics: Laboratory Manual*, Oxford University Press, Eighth edition, 2012.

FLUID MECHANICS & HYDRAULIC MACHINES LAB [FM&HM(P)]

V Semester : CE					Scheme : 2023			
Course Code	Category	Hours / Week			Credits	Maximum Marks		
CE305	PC	L/D	T	P	C	Continuous Internal Assessment	End Exam	Total
		-	-	3	1.5	30	70	100
					End Exam Duration : 3 Hrs			

Course Outcomes: The student shall be able to

CO1: Verify the Law of Conservation of Energy using Bernoulli's apparatus.

CO2: Determine the coefficient of discharge for orifices, notches, and flow meters.

CO3: Evaluate head losses due to friction and minor losses in pipe flow systems.

CO4: Analyze the impact of jets on vanes.

CO5: Assess the performance characteristics of turbines and pumps.

List of Experiments

1. Verification of Bernoulli's equation
2. Determination of coefficient of discharge for a small orifice by a constant head method.
3. Calibration of Venturimeter/ Orifice Meter
4. Calibration of Triangular / Rectangular/Trapezoidal Notch
5. Determination of Minor Losses in Pipe Flow
6. Determination of Friction Factor of A Pipeline
7. Determination of Manning's and Chezy's Constants for Open Channel Flow
8. Impact of Jet On Vanes
9. Performance Characteristics of A Single Stage / Multistage Centrifugal Pump
10. Performance Characteristics of Pelton Wheel Turbine
11. Performance Characteristics of Francis Turbine
12. Performance Characteristics of Kaplan Turbine
13. Determination of Energy Loss in Hydraulic Jump

Note: Minimum 10 out of the above are to be conducted.

Text Books

1. Desmukh T. S., *A Lab Manual on Fluid Mechanics and Hydraulic Machines*, Laxmi Publications.

2. S.K. Panigrahi, L. Mohanty, *Fluid Mechanics and Hydraulic Machines Laboratory Manual*, S.K. Kataria & Sons, Educational Publisher.

Reference Books

1. N. Kumara Swamy, *Fluid Mechanics and Machinery Laboratory Manual*, Chartor Publications.

2. D. Sathish, Fluid Mechanics and Machinery Lab Manual, BP International Publications.

ESTIMATION, SPECIFICATIONS, COSTING AND VALUATION (ESCV)

V Semester : CE						Scheme : 2023		
Course Code	Category	Hours/Week			Credits	Maximum Marks		
SCCE02	SC	L/D	T	P	C	Continuous Internal Assessment	End Exam	Total
		-	1	2	2	30	70	100
Sessional Exam Duration : 2 Hrs						End Exam Duration: 3 Hrs		

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

CO1: Apply estimation techniques to prepare detailed estimates for construction projects.

CO2: Develop abstract estimates and rate analysis for civil engineering works.

CO3: Analyze the preparation of measurement books and bill preparation as per AP State Government procedures.

CO4: Create detailed specifications and tender documents for construction projects.

CO5: Assess building valuation, cost escalation, and value analysis techniques.

List of Experiments

1. Activity based on learning methods and types of estimates
2. Preparation of detailed estimate for a single-storied residential building using wall to wall method.
3. Preparation of detailed estimate for a single storied residential building using centre line method for earthwork, foundations, super structure, fittings including sanitary and electrical fittings &paintings.
4. Preparation of detailed estimate for a two storied residential building using centre line method for earthwork, foundations, super structure, fittings including sanitary and electrical fittings &paintings.
5. Activity based learning of estimate data and rate analysis.
6. Preparation of abstract estimate for the detailed estimate in exercise No.3.
7. Preparation of abstract estimate for the detailed estimate in exercise No.4.
8. Writing of measurement book and bill preparation as per AP state Govt. procedure for detailed estimate in No. 3 and abstract estimate of No. 6.
9. Writing of detailed specifications for various items of estimate and preparing a model tender document for the work listed in No. 3 and 6.
10. Activity based learning for valuation of buildings, cost escalation procedures and value analysis for any one work.

Text Books

1. B.N. Dutta, *Estimating and Costing in Civil Engineering*, CBS Publishers & Distributors, 28th Revised Edition (2020).
2. Rangwala, *Estimating, Costing and Valuation*, Charotar Publishing House, 2023.

3. D.D. Kohli & R.C. Kohli, *A Textbook of Estimating and Costing (Civil)*, S. Chand Publishing, 2011.
Reference Books
1. M. Chakraborti, *Estimating, Costing, Specification &Valuation in Civil Engineering*, 29th edition (2021).
2. Gurcharan Singh, *Estimating, Costing and Valuation*, Standard Publishers, 2018.
3. V.N. Vazirani& S.P. Chandola, *Civil Engineering Estimating & Costing*, Khanna Publishers, 4th edition (2001).
Question Paper Pattern:

TINKERING LAB [TL(P)]

V Semester : All Branches					Scheme : 2023			
Course Code	Category	Hours/Week			Credits	Maximum Marks		
ESCM02	ES	L/D	T	P	C	Continuous Internal Assessment	End Exam	Total
		-	-	2	1	30	70	100
					End Exam Duration: 3 Hrs			

The aim of tinkering lab for engineering students is to provide a hands-on learning environment where students can explore, experiment, and innovate by building and testing prototypes. These labs are designed to demonstrate practical skills that complement theoretical knowledge.

These labs bridge the gap between academia and industry, providing students with the practical experience. Some students may also develop entrepreneurial skills, potentially leading to start-ups or innovation-driven careers. Tinkering labs aim to cultivate the next generation of engineers by giving them the tools, space, and mind-set to experiment, innovate, and solve real-world challenges.

Course Objectives: The objectives of the course are to	
1	Encourage Innovation and Creativity
2	Provide Hands-on Learning and Impart Skill Development
3	Foster Collaboration and Teamwork
4	Enable Interdisciplinary Learning, Prepare for Industry and Entrepreneurship
5	Impart Problem-Solving mind-set

Course Outcomes: The students will be able to experiment, innovate, and solve real-world challenges.

List of Experiments

1. Make your own parallel and series circuits using breadboard for any application of your choice.
2. Demonstrate a traffic light circuit using breadboard.
3. Build and demonstrate automatic Street Light using LDR.
4. Simulate the Arduino LED blinking activity in Tinkercad.
5. Build and demonstrate an Arduino LED blinking activity using Arduino IDE.
6. Interfacing IR Sensor and Servo Motor with Arduino.
7. Blink LED using ESP32.
8. LDR Interfacing with ESP32.

9. Control an LED using Mobile App.
10. Design and 3D print a Walking Robot.
11. Design and 3D Print a Rocket.
12. Build a live soil moisture monitoring project, and monitor soil moisture levels of a remote plan in your computer dashboard.
13. Demonstrate all the steps in design thinking to redesign a motor bike.
Students need to refer to the following links: 1) https://aim.gov.in/pdf/equipment-manual-pdf.pdf 2) https://atl.aim.gov.in/ATL-Equipment-Manual/ 3) https://aim.gov.in/pdf/Level-1.pdf 4) https://aim.gov.in/pdf/Level-2.pdf 5) https://aim.gov.in/pdf/Level-3.pdf
Question Paper Pattern:

FOUR YEAR B. Tech. DEGREE COURSE
Scheme of Instruction and Examination
(Effective from 2023–24)

VI Semester - CE **Scheme : 2023**

S. No.	Category	Subject	Scheme of Instruction periods/week			Credits	Scheme of Examination Maximum Marks		
			L/D	T	P		CIA	End Exam	Total
I		**Theory**							
1	PC	Design of Steel Structures	3	-	-	3	30	70	100
2	PC	Highway Engineering	3	-	-	3	30	70	100
3	PC	Environmental Engineering	3	-	-	3	30	70	100
4	PE	Professional Elective - II	3	-	-	3	30	70	100
5	PE	Professional Elective - III	3	-	-	3	30	70	100
6	OE	Open Elective - II	3	-	-	3	30	70	100
II		**Practical**							
7	PC	Highway Engineering Lab	-	-	3	1.5	30	70	100
8	PC	Environmental Engineering Lab	-	-	3	1.5	30	70	100
9	SC	Skills in Civil Engineering Software (CAD/STAADPro)	-	1	2	2	30	70	100
	AC	Technical Paper Writing & IPR	2	-	-	-	100	-	100
		Total	**20**	**1**	**8**	**23**			
Mandatory Industry Internship of 8 weeks duration during summer vacation									

Abbreviations:

L/D : Lecture / Drawing T : Theory P : Practical
CIA : Continuous Internal Assessment
PC : Professional Core ES : Engineering Science OE : Open Elective
SC : Skill Oriented Course AC : Audit Course

Professional Elective – II	**Open Elective – II**
1. Foundation Engineering 2. Design of Earthquake Resistant Structures 3. Experimental Stress Analysis **Professional Elective – III** 1. Hydraulic Structures 2. Pres-stressed Concrete 3. Cost Effective Housing Techniques 4. Watershed Management	1. Disaster Management 2. Sustainability in Engineering Practices 3. Renewable Energy Sources 4. Automation and Robotics 5. Product Lifecycle Management 6. Digital Electronics 7. Foundations of Operating Systems 8. Foundations of Machine Learning 9. Web Technologies 10. Introduction to Information Systems 11. Optimization Techniques 12. Physics of Electronic Materials and Devices 13. Chemistry of Polymers and Applications 14. Academic Writing and Public Speaking 15. Mathematical Foundation of Quantum Technologies

DESIGN OF STEEL STRUCTURES (DSS)

VI Semester : CE						Scheme : 2023		
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
		L/D	**T**	**P**	**C**	**Continuous Internal Assessment**	**End Exam**	**Total**
CE306	**PC**	**3**	**-**	**-**	**3**	**30**	**70**	**100**
Sessional Exam Duration : 2 Hrs						**End Exam Duration: 3 Hrs**		

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

CO1: Design the simple bolted and welded connections for structural steel members.

CO2: Design the tension and compression members.

CO3: Design the Slab Base and Gusseted Base for columns.

CO4: Design laterally supported & unsupported beams and welded plate girders.

CO5: Design the continuous beams and portal frames using plastic analysis.

UNIT – I

Introduction to Structural Steel and Design of Connections

General – Types of steel – Properties of structural steel – I.S. rolled sections – Concept of limit state design – Design of simple bolted and welded connections – Types of failure and efficiency of joint.

UNIT – II

Design of Tension Members:

Design of simple members subjected to tension.

Design of Compression Members:

Design of simple and built-up compression members with lacings and battens.

UNIT – III

Design of Column Bases

Design of slab base and gusseted base for columns.

UNIT – IV

Design of Beams

Design of laterally supported and unsupported beams – Design of welded plate girder.

UNIT – V

Plastic Analysis and Design

Introduction to plastic analysis – Theory of plastic analysis – Design of continuous beams and portal frames using plastic design approach.

Text Books

1. Duggal S.K., *Design of Steel Structures*, Tata McGraw Hill, Publishing Co. Ltd., New Delhi, 2010.
2. Bhavikatti S.S, *Design of Steel Structures*, IK International Publishing House, New Delhi, 2017.

Reference Books

1. Gambhir M L, *Fundamentals of Structural Steel Design*, McGraw Hill Education India Pvt. Limited, 2013.
2. Jack C. McCormac & Stephen F. Csernak, *Structural Steel Design*, Pearson, 7th edition, 2023.
3. William T. Segui & Farid Soleimani, *Steel Design*, Cengage, 7th edition, 2023.

4. Sarwar Alam Raz, *Structural Design in Steel*, New Age International Publishers, 2014.
5. Subramanian N, *Design of Steel Structures*, Oxford University Press, New Delhi, 2016.

Question Paper Pattern:

Sessional Exam: The question paper for Sessional Examination shall be for 40 marks. The question paper shall consist of Four Questions and all questions are compulsory. Question No.1 contains Five short answer questions (2marks each) for a total of 10 marks. Remaining Three Questions shall be EITHER/OR type descriptive questions for 10 marks each. Each of these descriptive questions may contain sub-questions.

End Exam: The question paper for End Examination shall be for 70 marks. The question paper shall contain Six Questions and all questions are compulsory. Question No.1 shall contain Ten short answer questions (2 marks each) for a total of 20 marks, with Two short answer questions from each unit. Remaining Five Questions (each question covering one unit of syllabus) carrying 10 marks each shall be EITHER/OR type descriptive questions and may contain sub-questions.

HIGHWAY ENGINEERING (HE)

VI Semester : CE						Scheme : 2023		
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
		L/D	**T**	**P**	**C**	**Continuous Internal Assessment**	**End Exam**	**Total**
CE307	**PC**	**3**	**-**	**-**	**3**	**30**	**70**	**100**
Sessional Exam Duration : 2 Hrs						**End Exam Duration: 3 Hrs**		

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

CO1: Understand the significance, planning, and alignment of highways.

CO2: Design geometric elements of highways, including curves, gradients, and sight distances.

CO3: Analyze traffic flow, speed, capacity and level of service.

CO4: Analyze At-grade and Grade separated intersections with minimum conflict area.

CO5: Design flexible and rigid pavements as per IRC guidelines.

UNIT – I

Highway Development in India

Highway development in India – Necessity for highway planning – Different road development plans – Classification of roads – Road network patterns – Highway alignment – Factors affecting alignment – Engineering surveys.

UNIT – II

Geometric Design of Highways

Importance of geometric design – Design controls and criteria – Highway cross section elements – Sight distance elements – Stopping sight distance, overtaking sight distance and intermediate sight distance – Design of horizontal alignment – Design of super elevation and extra widening – Design of transition curves – Design of vertical alignment – Gradients – Vertical curves.

UNIT – III

Traffic Engineering Studies

Basic parameters of traffic-volume, speed and density – Definitions and their inter relation – Traffic volume and speed studies – Data collection and presentation – Road accidents – Causes and preventive measures – Accident data recording – Condition and collision diagrams – Highway capacity and level of service concept – Factors affecting capacity and level of service – Evaluation of level of service for urban roads as per Indo-HCM.

UNIT – IV

Intersection Design

Conflicts at intersections – Channelization – Objectives – Traffic islands and design criteria – Types of at-grade intersections – Types of grade-separated intersections – Rotary intersection – Concept of rotary and design criteria – Advantages and disadvantages of rotary intersections.

UNIT – V

Pavement Design

Types of pavements – Difference between flexible and rigid pavements – Functions of pavement components – Design factors – CBR method of flexible pavement design (as per IRC 37-2018) – Design of rigid pavements – Critical load positions – Westergaard's stress equations – Stresses in rigid pavements – Design of dowel bars and tie bars (as per IRC 58-2015).

Text Books
1. S.K. Khanna & C.E.G. Justo, *Highway Engineering*, Nemchand & Bros., 10th edition, 2014.
2. C. Venkatramaiah, *Transportation Engineering, Volume-I*, Universities Press, 2015.
Reference Books
1. L.R. Kadiyali, *Principles of Highway Engineering*, Khanna Publishers.
2. L.R. Kadiyali and Lal, *Traffic Engineering and Transportation Planning*, Khanna Publications, 9th edition.
3. S.K. Sharma, *Highway Engineering*, S. Chand Publishers, 2014 edition.
Question Paper Pattern:
Sessional Exam: The question paper for Sessional Examination shall be for 40 marks. The question paper shall consist of Four Questions and all questions are compulsory. Question No.1 contains Five short answer questions (2marks each) for a total of 10 marks. Remaining Three Questions shall be EITHER/OR type descriptive questions for 10 marks each. Each of these descriptive questions may contain sub-questions. **End Exam:** The question paper for End Examination shall be for 70 marks. The question paper shall contain Six Questions and all questions are compulsory. Question No.1 shall contain Ten short answer questions (2 marks each) for a total of 20 marks, with Two short answer questions from each unit. Remaining Five Questions (each question covering one unit of syllabus) carrying 10 marks each shall be EITHER/OR type descriptive questions and may contain sub-questions.

ENVIRONMENTAL ENGINEERING (EE)

VI Semester : CE						Scheme : 2023		
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
		L/D	**T**	**P**	**C**	**Continuous Internal Assessment**	**End Exam**	**Total**
CE308	**PC**	**3**	**-**	**-**	**3**	**30**	**70**	**100**
Sessional Exam Duration : 2 Hrs						**End Exam Duration: 3 Hrs**		

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

CO1: Understand water sources, quality standards, and waterborne diseases.

CO2: Design unit processes of water treatment plants.

CO3: Analyze water distribution networks and pumping stations.

CO4: Design sewerage systems, including storm water and sanitary sewers.

CO5: Assess sewage treatment methods and advanced wastewater management techniques.

UNIT – I

Water Supply

Sources of surface and subsurface water resources – Predicting demand for water – Impurities of water and their significance – Physical, chemical and bacteriological analysis – Waterborne diseases – Standards for potable water – Intake of water – Pumping and gravity schemes.

UNIT – II

Water Treatment

Objectives – Principles, functions, and design of water treatment plant units – Aerators of flash mixers – Sedimentation – Coagulation and flocculation – Sand filters – Disinfection – Softening – Removal of iron and manganese – Defluoridation.

UNIT – III

Water Storage and Distribution

Storage and balancing reservoirs – Types, location and capacity – Distribution system – layout – Hydraulics of pipe lines – Pipe fittings, valves including check and pressure reducing valves, meters – Analysis of distribution systems – Leak detection – Maintenance of distribution systems – Pumping stations and their operations – House service connections.

UNIT – IV

Planning and Design of the Sewerage System

Characteristics and composition of sewage – Population equivalent – Sanitary sewage flow estimation – Sewer materials – Hydraulics of flow in sanitary sewers – Sewer design – Storm drainage – Storm runoff estimation – Sewer appurtenances – Drainage in buildings – Plumbing systems for drainage.

UNIT – V

Sewage Treatment and Disposal

Objectives – Selection of treatment methods – Principles, functions – Activated sludge process and extended aeration systems – Trickling filters – Sequencing batch reactor (SBR) – UASB – Waste stabilization ponds – Reclamation and reuse of sewage – Recent advances in sewage treatment – Discharge standards – Sludge treatment – Disposal of sludge.

Text Books

1. H. S Peavy, D. R. Rowe, G. Tchobanoglous, *Environmental Engineering*, McGraw Hill Education (India) Pvt. Ltd., 2014.

2. B.C. Punmia, *Environmental Engineering - I and II*, Standard Publications.

Reference Books

1. S.K. Garg, *Environmental Engineering - I and II*, Khanna Publications.
2. C.S. Rao, *Environmental Pollution and Control Engineering*, Wiley Publications.
3. Metcalf and Eddy, *Waste water engineering*, McGraw Hill, 2015.
4. D. P. Sincero and G.A Sincero, *Environmental Engineering*, Pearson 2015.
5. Mark J Hammar and Mark J. Hammar Jr., *Water and Waste Water Technology*, Wiley, 2007.

Question Paper Pattern:

Sessional Exam: The question paper for Sessional Examination shall be for 40 marks. The question paper shall consist of Four Questions and all questions are compulsory. Question No.1 contains Five short answer questions (2marks each) for a total of 10 marks. Remaining Three Questions shall be EITHER/OR type descriptive questions for 10 marks each. Each of these descriptive questions may contain sub-questions.

End Exam: The question paper for End Examination shall be for 70 marks. The question paper shall contain Six Questions and all questions are compulsory. Question No.1 shall contain Ten short answer questions (2 marks each) for a total of 20 marks, with Two short answer questions from each unit. Remaining Five Questions (each question covering one unit of syllabus) carrying 10 marks each shall be EITHER/OR type descriptive questions and may contain sub-questions.

HIGHWAY ENGINEERING LAB [HE(P)]

VI Semester : CE						Scheme : 2023		
Course Code	**Category**	**Hours / Week**			**Credits**	**Maximum Marks**		
		L/D	**T**	**P**	**C**	**Continuous Internal Assessment**	**End Exam**	**Total**
CE309	**PC**	**-**	**-**	**3**	**1.5**	**30**	**70**	**100**
						End Exam Duration : 3 Hrs		

Course Outcomes: The student shall be able to

CO1: Determine the physical properties of coarse aggregates, such as water absorption and shape characteristics.

CO2: Evaluate the mechanical properties of aggregates, including abrasion resistance, impact strength, and crushing value.

CO3: Analyze the traffic volume and spot speed of vehicles at urban mid-block sections.

CO4: Perform Marshall Stability tests and assess the optimum binder content for bituminous mixes.

CO5: Interpret test results to assess the suitability of aggregates and bitumen for pavement construction.

List of Experiments

Test on Aggregates

1. Determination of Impact Value and Water Absorption Capacity of Coarse Aggregate.
2. Determination of Elongation Index of Coarse Aggregate.
3. Determination of Flakiness Index of Coarse Aggregate.
4. Determination of Aggregate Crushing Value of Coarse Aggregate.

Test on Bitumen

5. Penetration Test on Bitumen.
6. Viscosity Determination of Bituminous Binder.
7. Determination of Softening Point of The Asphalt/Bitumen Sample.
8. Determination of Ductility Value of the Bitumen Sample.

Field Studies

9. Traffic Volume study
10. Spot speed study by speed gun

Demonstration

11. Determination of Abrasion Value of Course Aggregate.
12. Determination of Marshall Stability and flow values of bituminous mixes.
13. Bitumen Extraction Test.

Text Books

1. Khanna, Justo and Veera Raghavan, *Highway Material Testing Manual*, Nemchand Brothers.

Reference Books

1. IS 1201-1220 (2022) — Methods for testing tars and bituminous materials.
2. MS-2 Manual for Marshalls Mix design, 2014.
3. IS 383:2016 — Specification for Coarse and Fine Aggregates from Natural Sources for Concrete.

ENVIRONMENTAL ENGINEERING LAB [EE(P)]

VI Semester : CE						Scheme : 2023		
Course Code	Category	Hours / Week			Credits	Maximum Marks		
CE310	PC	L/D	T	P	C	Continuous Internal Assessment	End Exam	Total
		-	-	3	1.5	30	70	100
						End Exam Duration : 3 Hrs		

Course Outcomes: The student shall 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: Statistically analyze and interpret laboratorial results.

CO3: Understand and use the water and wastewater sampling procedures and sample preservations.

CO4: Demonstrate the ability to write clear technical laboratorial reports.

CO5: Able to maintain safety standards in the laboratory.

List of Experiments

1. Determination of Various forms of Acidity.
2. Determination of Various forms of Alkalinity.
3. Determination of Hardness
4. Determination of Chlorides.
5. Determination of Sulphates.
6. Determination of Dissolved Oxygen.
7. Determination of various forms of solids.
8. Determination of pH, Turbidity and Electrical Conductivity.
9. Determination of Optimum Coagulant Dose.
10. Determination of Residual Chlorine.
11. Determination of Biochemical Oxygen Demand (BOD)
12. Determination of Chemical Oxygen Demand (COD)
13. Sampling and preservation methods for water and wastewater (Demonstration only)
14. Determination of fluoride in water by spectrophotometric method /ISE

Note: Minimum 10 out of the above experiments are to be carried out.

Text Books

1. *Manual on Water Supply and Treatment*, Ministry of Urban Development, New Delhi.

2. *Manual on Sewerage and Sewage Treatment Systems- Part A, B & C*, Central Public Health and Environmental Engineering Organization, Ministry of Urban Development.

Reference Books

1. S.K. Panigrahi, L. Mohanty, *Environmental Engineering Laboratory Manual,* S.K. Kataria & Sons.

Skills in Civil Engineering Software -
STAADPRO/CAD/TEK LA/ETABS

VI Semester : CE						Scheme : 2023		
Course Code	Category	Hours / Week			Credits	Maximum Marks		
SCCE03	SC	L/D	T	P	C	Continuous Internal Assessment	End Exam	Total
		-	1	2	2	30	70	100
						End Exam Duration : 3 Hrs		

Course Outcomes: The student shall be able to

CO1: Create 2D floor plan of Residential Building using AutoCAD.

CO2: Develop structural detailing drawings for Beams, Columns, Slabs and Footings using AutoCAD.

CO3: Analyze multi-story residential building using STAAD Pro for Gravity and Lateral loads.

CO4: Analyze the simple Truss using STAAD Pro.

List of Experiments

1. Determination of Basic Drawing and Editing Commands in AutoCAD.
2. Creation of a 2D Floor Plan for a Residential Building in AutoCAD.
3. Development of Structural Detailing for Beams and Columns in AutoCAD.
4. Application of Reinforcement Detailing for Slabs and Footings in AutoCAD.
5. Introduction of STAAD Pro software.
6. Analysis of a Simply Supported, Fixed and Continuous Beam in STAAD Pro.
7. Analysis of a simple plan of a Residential Building in STAAD Pro.
8. Analysis of a building for wind Load in STAAD Pro.
9. Analysis of a building for seismic Load in STAAD Pro.
10. Analysis of a simple truss in STAAD Pro.

Text Books

1. George Omura, Brian C. Benton, *Mastering AutoCAD 2025 and AutoCAD LT 2025*, Wiley, 2025 Edition.
2. *TEKLA Structural Designer 2023 Engineers Hand Book*, Trimble Solutions Corporation.

Reference Books

1. Phil Read, Eddy Krygiel, James Vandezande, *BIM Handbook: A Guide to Building Information Modeling for Owners, Designers, Engineers, and Contractors*, John Wiley & Sons, 4th Edition, 2023.
2. Nighat Yasmin Ph.D., *Introduction to AutoCAD 2025 for Civil Engineering Applications*, SDC Publications, 2024 Edition.

TECHNICAL PAPER WRITING & IPR (TPW&IPR)

<table>
<tr><td colspan="5">VI Semester : All Branches</td><td colspan="4">Scheme : 2023</td></tr>
<tr><td>Course Code</td><td>Category</td><td colspan="3">Hours/Week</td><td>Credits</td><td colspan="3">Maximum Marks</td></tr>
<tr><td rowspan="2">AC301</td><td rowspan="2">AC</td><td>L/D</td><td>T</td><td>P</td><td>C</td><td>Continuous Internal Assessment</td><td>End Exam</td><td>Total</td></tr>
<tr><td>2</td><td>-</td><td>-</td><td>0</td><td>100</td><td>-</td><td>100</td></tr>
<tr><td colspan="5">Sessional Exam Duration : 2 Hrs</td><td colspan="4"></td></tr>
<tr><td colspan="9"></td></tr>
<tr><td colspan="9">Course Outcomes : At the end of the course the student will be able to</td></tr>
<tr><td colspan="9">CO1: Develop precise and ethical technical writing with logical structure and critical analysis.</td></tr>
<tr><td colspan="9">CO2: Formulate and present structured research content and synopsis.</td></tr>
<tr><td colspan="9">CO3: Understand and apply the principles of publishing, journal types, indexing with proper citation and plagiarism standards.</td></tr>
<tr><td colspan="9">CO4: Understand fundamental knowledge of intellectual property rights, international frameworks and registration of trademarks.</td></tr>
<tr><td colspan="9">CO5: Understand the fundamentals of laws of copyrights and patents, intellectual property audits.</td></tr>
<tr><td colspan="9">UNIT – I</td></tr>
<tr><td colspan="9">Principles of Technical Writing
Styles in technical writing; clarity, precision, coherence and logical sequence in writing, avoiding ambiguity, repetition, and vague language, highlighting your findings, discussing your limitations, hedging and criticizing, plagiarism and paraphrasing.</td></tr>
<tr><td colspan="9">UNIT – II</td></tr>
<tr><td colspan="9">Technical Research Paper Writing
Abstract, Objectives, Limitations, Review of Literature, Problems and Framing Research Questions, Synopsis.</td></tr>
<tr><td colspan="9">UNIT – III</td></tr>
<tr><td colspan="9">Process of Research: Publication Mechanism
Types of journals, indexing, seminars, conferences, proof reading, plagiarism style; seminar & conference paper writing; Methodology, discussion, results and citation rules.</td></tr>
<tr><td colspan="9">UNIT – IV</td></tr>
<tr><td colspan="9">Introduction to Intellectual Property
Introduction, types of intellectual property, International organizations, agencies and treaties, importance of intellectual property rights Trade Marks: Purpose and function of trademarks, acquisition of trade mark rights, protectable matter, selecting and evaluating trade mark, trade mark registration processes.</td></tr>
<tr><td colspan="9">UNIT – V</td></tr>
<tr><td colspan="9">Law of Copy Rights:
Fundamentals of copy right law, originality of material, rights of reproduction, rights to perform the work publicly, copy right ownership issues, copy right registration, notice of copy right, international copy right law
Law of Patents:
Foundation of patent law, patent searching process, ownership rights and transfer. Patent law, intellectual property audits.</td></tr>
<tr><td colspan="9">Text Books</td></tr>
</table>

1. Deborah. E. Bouchoux, *Intellectual Property Rights*, Cengage Learning India, 2013.
2. Meenakshi Raman, Sangeeta Sharma, *Technical Communication: Principles and Practices*, Oxford.
Reference Books
1. R. Myneni, *Law of Intellectual Property*, 9th edition, Asia law House, 2019.
2. Prabuddha Ganguli, *Intellectual Property Rights,* Tata McGraw Hill, 2001.
3. Adrian Wallwork, *English for Writing Research Papers*, 2nd edition. Springer Cham Heidelberg, New York, 2016.
Online Resources
1. https://theconceptwriters.com.pk/principles-of-technical-writing/
2. https://lawbhoomi.com/intellectual-property-rights-notes/
3. https://www.extension.purdue.edu/extmedia/ec/ec-723.pdf

FOUR YEAR B. Tech. DEGREE COURSE
Scheme of Instruction and Examination
(Effective from 2023–24)

VII Semester - CE **Scheme : 2023**

S. No.	Category	Subject	Scheme of Instruction periods/week			Credits	Scheme of Examination Maximum Marks		
			L/D	T	P		CIA	End Exam	Total
I		**Theory**							
1	PC	Finite Element Methods	3	-	-	3	30	70	100
2	BS&H	Management Elective	2	-	-	2	30	70	100
3	PE	Professional Elective - IV	3	-	-	3	30	70	100
4	PE	Professional Elective - V	3	-	-	3	30	70	100
5	OE	Open Elective - III	3	-	-	3	30	70	100
6	OE	Open Elective - IV	3	-	-	3	30	70	100
II		**Practical**							
7	SC	Building Information Modelling	-	1	2	2	30	70	100
8	AC	Gender Sensitization/ Constitution of India	2	-	-	-	100	-	100
9		Evaluation of Industry Internship	-	-	-	2	100	-	100
		Total	**19**	**1**	**2**	**21**			

Professional Elective – IV	**Professional Elective – V**	**Management Elective**
1. Railway, Airports, Docks and Harbour Engineering 2. Geo-synthetics and Reinforced Earth Structures 3. Environmental Impact Assessment 4. Advanced Structural Design 5. Design and Drawing of Hydraulic Structures	1. Sanitary Engineering 2. Geographical Information Systems 3. Ground Improvement Techniques 4. Subsurface Investigation and Instrumentation 5. Transportation Economics	1. Project Management 2. Business Ethics and Corporate Governance 3. E- Business 4. Management Science

Open Elective – III	**Open Elective – IV**
1. Building Materials and Services 2. Environmental Impact Assessment 3. Smart Grid Technologies 4. 3D Printing Technologies 5. Composite Materials 6. Applications of Microprocessors and Microcontrollers 7. Introduction to Data Base Systems 8. Cyber Security 9. Modern C++ 10. Wavelet Transforms and its Applications 11. Smart Materials and Devices 12. Green Chemistry and Catalysis for Sustainable Environment 13. Employability Skills 14. Introduction to Quantum Mechanics	1. Geo-Spatial Technologies 2. Solid Waste Management 3. Electric Vehicles 4. Total Quality Management 5. Safety in Engineering Industry 6. Transducers and Sensors 7. Drone Technology 8. Introduction to Computer Networks 9. Internet of Things 10. Multimedia & Animation 11. Advanced Information Systems 12. Quantum Computing 13. Financial Mathematics 14. Sensors and Actuators for Engineering Applications 15. Chemistry of Nanomaterials and Applications 16. Literary Vibes

FINITE ELEMENT METHODS (FEM)

VII Semester : CE						Scheme : 2023		
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
		L/D	**T**	**P**	**C**	**Continuous Internal Assessment**	**End Exam**	**Total**
CE401	**PC**	**3**	**-**	**-**	**3**	**30**	**70**	**100**
Sessional Exam Duration : 2 Hrs						**End Exam Duration: 3 Hrs**		

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

CO1: Analyze stiffness matrices for 1D elements.

CO2: Derive shape functions and stiffness matrices for beam elements.

CO3: Analyze stiffness matrices for Truss and Frames.

CO4: Develop a parametric formulation for 2D elements such as CST and LST.

UNIT – I

Introduction to Finite Element Method

Basic equations in elasticity, stress – strain equation – Concept of plane stress – Plane strain advantages and disadvantages of FEM, Finite element analysis (FEA) – One-dimensional problems – Bar element – Shape functions stiffness matrix – Stress – strain relation.

UNIT – II

FEA of Beam Elements

Stiffness Matrix – Boundary conditions – Evaluation of displacements and bending moments.

UNIT – III

FEA of Trusses

Stiffness matrix formulation – Coordinate transformation – Global matrix – Assembly – Solution for displacements and forces.

UNIT – IV

FEA of Frame Structures

Stiffness matrix formulation – Assembly – Application of boundary conditions – Analysis of axial forces – Shear forces – Bending moments.

UNIT – V

FEA of 2D Problems

Formulation of stiffness matrix using Constant Strain Triangle (CST) and Linear Strain Triangle (LST) elements – Evaluation of displacements and stresses.

Text Books

1. Daryl L. Logan, *A First Course in Finite Element Method*, 5th edition, Cengage Learning India Pvt. Ltd.

2. Tirupathi R. Chandrupatla, and Ashok D. Belegundu, *Introduction to Finite Elements in Engineering*, Prentice Hall of India.

Reference Books

1. P. Seshu, *Finite Element Analysis*, PHI Learning Private Limited.

2. Robert D. Cook et al., *Concepts and Applications of Finite Element Analysis*, Wiley India Pvt. Ltd.

3. G. Ramamurty, *Applied Finite Element Analysis*, I.K. International Publishing House Pvt. Ltd.

Question Paper Pattern:

Sessional Exam: The question paper for Sessional Examination shall be for 40 marks. The question paper shall consist of Four Questions and all questions are compulsory. Question No.1 contains Five short answer questions (2marks each) for a total of 10 marks. Remaining Three Questions shall be EITHER/OR type descriptive questions for 10 marks each. Each of these descriptive questions may contain sub-questions.

End Exam: The question paper for End Examination shall be for 70 marks. The question paper shall contain Six Questions and all questions are compulsory. Question No.1 shall contain Ten short answer questions (2 marks each) for a total of 20 marks, with Two short answer questions from each unit. Remaining Five Questions (each question covering one unit of syllabus) carrying 10 marks each shall be EITHER/OR type descriptive questions and may contain sub-questions.

BUILDING INFORMATION MODELING (BIM)

(Skill Oriented Course)

VII Semester : CE						**Scheme : 2023**		
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
SCCE04	**SC**	**L/D**	**T**	**P**	**C**	**Continuous Internal Assessment**	**End Exam**	**Total**
		0	**1**	**2**	**2**	**30**	**70**	**100**
Sessional Exam Duration : 2 Hrs						**End Exam Duration: 3 Hrs**		

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

CO1: Explain the fundamentals of BIM and Autodesk Revit's interface and workflow.

CO2: Use basic drawing, editing, and modification tools in Revit for creating and modifying models.

CO3: Model various architectural elements such as walls, doors, windows, floors, ceilings, and roofs.

CO4: Construct structural elements including grids, columns, stairs, railings, and ramps.

CO5: Generate 3D views, sections, and elevations for visualization and detailing purposes.

List of Experiments

1. INTRODUCTION to BIM & AUTODESK REVIT - About Autodesk and Autocad, Workflow and BIM, Revit Terms, Overview of The Interface, Starting Projects, Viewing Commands.
2. BASIC DRAWING and EDITING to OLS - Using General Drawing tools, Editing Elements, Working With Modification tools.
3. SETTING UP LEVELS and GRIDS - Setting up Levels and Grids, Creating Structural Grids, Adding Columns, Linking and Importing CAD files.
4. MODELING WALLS Modelling Walls, Modifying Walls, Model Exterior Shell, Add Interior Walls.
5. WORKING WITH DOORS and WINDOWS Inserting Doors and Windows, Loading Door and Window Types From Library, Creating Additional Door and Window Sizes.
6. WORKING WITH CURTAIN WALLS Creating Curtain Walls, Adding Curtain Grids, Working With Curtain Wall Panels, Attaching Mullions to Curtain Grids.
7. WORKING WITH VIEWS Setting The View Display, Duplicating Views, Adding Callout Views, Elevations and Sections.
8. ADDING COMPONENTS Adding Component, Modifying Component, Working With Elements.
9. MODELING FLOORS Modelling & Modifying Floors, Joining Geometry, Creating Shaft Openings, Creating Sloped Floors.
10. MODELING CEILINGS & ROOFS Modelling Ceilings, Adding Ceiling Fixtures, Creating Ceiling Soffits, Modelling Roofs.
11. MODELING STAIRS and RAILING Creating Component Stairs, Modifying Component Stairs, Working With Railings, Sketching Custom Stairs, Creating Ramps.

Text Books

1. Chuck Eastman, Paul Teicholz, Rafael Sacks, Kathleen Liston, *BIM Hand Book*, Wiley, 2nd Edition, 2011.

2. Wing, Eric, *Autodesk Revit Architecture 2017*: No Experience Required. Indianapolis: John Wiley & Sons, 2016.
Reference Books
1. Kim, Marcus, Lance Kirby, and Eddy Krygiel. *Mastering Autodesk Revit 2017 for Architecture*, 1st ed. INpolis, IN: John Wiley & Sons, 2016.
2. Garber, Richard. *BIM Design: Realizing the Creative Potential of Building Information Modeling*. AD Smart 02. Chichester, U.K.: Wiley, 2004.
3. Peter B. and Nigel D., *BIM in Principle and in Practice*, 1st Edition, ICE Publishing, 2014.
4. Chuck Eastman, Paul Teicholz, Rafael Sacks and Kathleen Liston, *BIM Handbook: A Guide to Building Information Modeling for Owners, Managers, Designers, Engineers and Contractors,* John Wiley & Sons, 2008.
5. Brad Hardin, Sybex, *BIM and Construction Management: Proven Tools, Methods*, *and Workflows*, 2009.
6. Karen Kensek and Douglas Noble, *Building Information Modeling: BIM in Current and Future Practice*, Wiley, First Edition, 2014.
Question Paper Pattern:

GENDER SENSITIZATION (GS)

VII Semester : All Branches					Scheme : 2023			
Course Code	Category	Hours/Week			Credits	Maximum Marks		
		L/D	T	P	C	Continuous Internal Assessment	End Exam	Total
AC401	AC	2	-	-	-	100	-	100

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

CO1: Understand the basic concepts of gender and its related terminology.

CO2: Identify the biological, sociological, psychological and legal aspects of gender.

CO3: Analyze the gendered division of labour and its relation to politics and economics.

CO4: Understand how gender discrimination operates in our society and how to counter it.

CO5: Appraise how the various mass/ electronic and print media perpetuate gender stereotypes of men and women to the detriment of the well-being of society.

UNIT – I

Understanding Gender: Introduction: Definition of gender – Basic ender concepts and terminology – Exploring attitudes towards gender – Construction of gender-socialization: Making Women, Making Men – Preparing for womanhood. Growing up male. First lessons in caste.

UNIT – II

Gender Roles and Relations: Two or Many? – Struggles with discrimination – Gender roles and relations – Types of gender roles – Gender roles and relationships matrix-missing women-sex selection and its consequences- declining sex ratio – Demographic consequences – Gender spectrum.

UNIT – III

Gender and Labour: Division and valuation of labour – Housework: the invisible labor- my mother doesn‘t work. – Share the load -work: its politics and economics – Fact and fiction – Unrecognized and unaccounted work – Gender development issues – Gender, governance and sustainable development – Gender and human rights – Gender and mainstreaming.

UNIT – IV

Gender-Based Violence: The concept of violence – Types of gender-based violence – Gender-based violence from a human rights perspective – Sexual harassment – Domestic violence – Different forms of violence against women – Causes of violence – Impact of violence against women – Consequences of gender-based violence.

UNIT – V

Gender And Culture: Gender and film – Gender and electronic media – Gender and advertisement – Gender and popular literature – Gender development issues – Gender issues – Gender sensitive language – Just relationships.

Text Books

1. A. Suneetha, Uma Bhrugubanda, et al. *Towards a World of Equals: A Bilingual Textbook on Gender*, Telugu Akademi, Telangana, 2015.

2. Butler, Judith. *Gender Trouble: Feminism and the Subversion of Identity*. UK Paperback Edition, March 1990.

Reference Books

1. Wtatt, Robin and Massood, Nazia, Broken Mirrors, *The dowry Problems in India*,

London : Sage Publications, 2011.

2. Datt, R. and Kornberg, J.(eds), *Women in Developing Countries, Assessing Strategies for Empowerment*, London: Lynne Rienner Publishers, 2002.

3. Brush, Lisa D., *Gender and Governance*, New Delhi, Rawat Publication, 2007.

4. Singh, Direeti, *Women and Politics World Wide*, New Delhi, Axis Publications, 2010.

5. Raj Pal Singh, Anupama Sihag, *Gender Sensitization: Issues and Challenges* (English, Hardcover), Raj Publications, 2019.

6. A. Revathy & Murali, Nandini, *A Life in Trans Activism* (Lakshmi Narayan Tripathi). The University of Chicago Press, 2016.

Question Paper Pattern:

CONSTITUTION OF INDIA (CI)

VII Semester : All Branches						Scheme : 2023		
Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	Continuous Internal Assessment	End Exam	Total
AC402	AC	2	-	-	-	100	-	100

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

CO1: Understand the formation and principles of Indian Constitution.

CO2: Understand structure and functions of Union government and State executive. Duties of President, Vice president, Prime Minister, Governor, Chief Minister cabinet and State legislature.

CO3: Understand constitutional amendments of 42, 44,74,76,86 and 91. Central-State relations, President rule.

CO4: Understand Indian social structure and languages in India. Rights of women, SC, ST and then weaker section.

CO5: Understand the structure of Judiciary, Role and functions of Supreme Court, High court and Subordinate courts, Judicial review.

UNIT – I

Historical back ground – Significance of Constitution – Making of the constitution – Role of the Constituent Assembly – Salient features – Preamble – Citizenship – Procedure for amendment of Constitution – Fundamental rights – Derivative Principles of state policy – Elections in India.

UNIT – II

Union Executive: Structure of the Union Government & its functions – President – Vice-President – Prime Minister – Cabinet – Parliament.

State Executive: Structure and functions – Governor – Chief Minister – Cabinet – State Legislature.

UNIT – III

Central-State Relations, President's Rule – Constitutional Amendments [42, 44, 74, 76, 86 & 91] – Constitutional functionaries – Working of Parliamentary system in India.

UNIT – IV

Indian Social Structure – Languages in India – Political Parties & Pressure groups – Rights of Women – S.Cs, S.Ts & other weaker sections.

UNIT – V

Judiciary: Structure, Organisation of Judiciary – Independence of the Judiciary – Role and functions of Supreme Court, High Courts & Sub ordinate Courts – Judicial Review.

Text Books :

1. Durga Das Basu, *Introduction to the Constitution of India*, Wadwa & Company
2. Macivel, Page, *An Introduction Analysis* Society
3. M.V. Pylee, *Indian Constitution*, S. Chand Publications
4. Subhash C Kashyap, *Our Constitution*, National Book Trust of India.
5. S.M. Rajan ,*Constitutional Law of India*

Reference Books :

1. *The Constitution of India*, By the Ministry of Law and Justice, Govt. of India.
2. C. Kashyap Subhasah, *Constitutional Law of India*
3. M.P. Jain, *Indian Constitution Law*
4. H.M. Seervai, *Constitutional Law of India*
Web References:
1. https://www.india.gov.in/my-government/constitution-india

Professional Electives

Professional Elective – I (in V sem.)	1. Advanced Structural Analysis
	2. Air Pollution and Control
	3. Open Channel Flow
Professional Elective – II (in VI Sem.)	1. Foundation Engineering
	2. Design of Earthquake Resistant Structures
	3. Experimental Stress Analysis
Professional Elective – III (in VI Sem.)	1. Hydraulic Structures
	2. Pres-stressed Concrete
	3. Cost Effective Housing Techniques
	4. Watershed Management
Professional Elective – IV (in VII Sem.)	1. Railway, Airports, Docks and Harbour Engineering
	2. Geo-synthetics and Reinforced Earth Structures
	3. Environmental Impact Assessment
	4. Advanced Structural Design
	5. Design and Drawing of Hydraulic Structures
Professional Elective – V (in VII Sem.)	1. Sanitary Engineering
	2. Geographical Information Systems
	3. Ground Improvement Techniques
	4. Subsurface Investigation and Instrumentation
	5. Transportation Economics

Professional Electives

Professional Elective – I (in V sem.)	1. Advanced Structural Analysis
	2. Air Pollution and Control
	3. Open Channel Flow

ADVANCED STRUCTURAL ANALYSIS (ASA)

V Semester : CE					Scheme : 2023			
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
		L/D	**T**	**P**	**C**	**Continuous Internal Assessment**	**End Exam**	**Total**
CE311	**PE**	**3**	**-**	**-**	**3**	**30**	**70**	**100**
Sessional Exam Duration : 2 Hrs					**End Exam Duration: 3 Hrs**			

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

CO1: Analyze three-hinged and two-hinged arches for concentrated loads and uniformly distributed loads.

CO2: Analyze continuous beams with and without settlement of supports and portal frames with and without side sway using Kani's Method.

CO3: Analyse the frames using approximate method of analysis.

CO4: Analyze continuous beams with and without settlement of supports using the flexibility method and stiffness method.

CO5: Analyze the effects of moving loads on simply supported beams by influence line diagrams.

UNIT – I

Arches

Linear arches – Eddy's theorem – Analysis of three hinged and two hinged parabolic arches – Determination of horizontal thrust, bending moment, normal thrust and radial shear.

UNIT – II

Kani's Method

Analysis of continuous beams with and without settlement of supports – Single bay single storey portal frames with and without side sway.

UNIT – III

Approximate Methods of Analysis of Frames

Substitute frame method for vertical loads – Portal and cantilever methods for horizontal loads – Assumptions and limitations.

UNIT – IV

***Flexibility Method*:**

Flexibility method – Introduction – Application to continuous beams.

Stiffness Method:

Stiffness method – Introduction – Application to continuous beams including support settlements

UNIT – V

Moving Loads:

Maximum shear force and bending moment for loads on simply supported beams – Curves for maximum bending moment and shear force for single point load, two point loads, UDL longer than span, UDL shorter than span and several point loads.

Influence Lines:

Influence lines for reaction, bending moment and shear force in simply supported beams.

Text Books

1. Vazrani & Ratwani, *Analysis of Structures*, Khanna Publications.
2. Ramamuratam, *Theory of Structures,* Jain Book Depot., New Delhi.

Reference Books

1. R.S. Khurmi, *Structural Analysis*, S. Chand Publications, New Delhi.
2. K.U. Muthuetal, *Basic Structural Analysis*, I.K. International Publishing House Pvt. Ltd.
3. Gupta SP, GS Pundit, and R Gupta, *Theory of Structures -Vol*. II, Tata McGraw Hill Publications Company Ltd.
4. D. S. Prakash Rao, *Structural Analysis: A Unified Approach,* Universities Press.

Question Paper Pattern:

Sessional Exam: The question paper for Sessional Examination shall be for 40 marks. The question paper shall consist of Four Questions and all questions are compulsory. Question No.1 contains Five short answer questions (2marks each) for a total of 10 marks. Remaining Three Questions shall be EITHER/OR type descriptive questions for 10 marks each. Each of these descriptive questions may contain sub-questions.

End Exam: The question paper for End Examination shall be for 70 marks. The question paper shall contain Six Questions and all questions are compulsory. Question No.1 shall contain Ten short answer questions (2 marks each) for a total of 20 marks, with Two short answer questions from each unit. Remaining Five Questions (each question covering one unit of syllabus) carrying 10 marks each shall be EITHER/OR type descriptive questions and may contain sub-questions.

AIR POLLUTION AND CONTROL (APC)

V Semester : CE					Scheme : 2023			
Course Code	Category	Hours/Week			Credits	Maximum Marks		
CE312	PE	L/D	T	P	C	Continuous Internal Assessment	End Exam	Total
		3	-	-	3	30	70	100
Sessional Exam Duration : 2 Hrs					End Exam Duration: 3 Hrs			

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

CO1: Explain the sources, classification, and global effects of air pollution.

CO2: Analyze meteorological parameters affecting air pollution dispersion.

CO3: Design control systems for particulate matter using appropriate removal techniques.

CO4: Apply suitable technologies for gaseous pollutant removal through adsorption, absorption, and combustion.

CO5: Evaluate vehicular and indoor air pollution sources and suggest mitigation strategies.

UNIT – I

Air Pollution

Definition – Sources &Classification of Air Pollutants – Effects of Air Pollution On Humans, Plants and Materials – Global Effects – Air Quality and NAAQS – National Clean Air Programme – Sampling of Pollutants in Ambient Air – Stack Sampling

UNIT – II

Meteorology and Air Pollution

Factors influencing air pollution – Wind rose – Mixing depths – Lapse rates and dispersion – Atmospheric stability – Plume rise and dispersion – Prediction of air quality – Box model – Gaussian model – Dispersion coefficient – Application of tall chimney for pollutant dispersion.

UNIT – III

Control of Particulate Pollutants

Properties of particulate pollution – Particle size distribution – Control mechanism – Dust removal equipment – Design and operation of settling chambers – Cyclones – Wet dust scrubbers – Fabric filters &esp.

UNIT – IV

Control of Gaseous Pollutants

Process and equipment for the removal by chemical methods – Design and operation of absorption and adsorption equipment – Combustion and condensation equipment.

UNIT – V

Automobile and Indoor Pollution

Vehicular pollution – Sources and types of emission – Effect of operating conditions – Alternate fuels and emissions – Emission controls and standards – Strategies to control automobile pollution – Causes of indoor air pollution – Changes in indoor air quality – Control and air cleaning systems – Indoor air quality.

Text Books

1. Rao, M. N. and Rao H. V. N., *Air Pollution*, Tata McGraw-Hill, New Delhi, 2007.
2. Khare M, Sharma P, Kota, S.H, Sumanth C, *Air Pollution Science Engineering and Management Fundamentals*, CRC Press, 2024.
3. Noel, D. N., *Air Pollution Control Engineering*, Tata McGraw Hill Publishers, 1999.

Reference Books
1. B.S.N. Raju, *Funda mentals of Air Pollution*, Oxford & I.B.H.
2. Nevers, *Air Pollution Control Engineering*, McGraw-Hill, Inc., 2000.
3. Rao, C.S., *Environmental Pollution Control Engineering*, New Age International, New Delhi, 2006.
4. Mahajan S. P., *Pollution Control in Process Industries*, Tata McGraw Hill Publishing Company, New Delhi, 1991.
5. Peavy H.S., Rowe D.R. and Tchobanoglous G., *Environmental Engineering*, McGraw Hill, New York, 1985.
Question Paper Pattern:
Sessional Exam: The question paper for Sessional Examination shall be for 40 marks. The question paper shall consist of Four Questions and all questions are compulsory. Question No.1 contains Five short answer questions (2marks each) for a total of 10 marks. Remaining Three Questions shall be EITHER/OR type descriptive questions for 10 marks each. Each of these descriptive questions may contain sub-questions. **End Exam:** The question paper for End Examination shall be for 70 marks. The question paper shall contain Six Questions and all questions are compulsory. Question No.1 shall contain Ten short answer questions (2 marks each) for a total of 20 marks, with Two short answer questions from each unit. Remaining Five Questions (each question covering one unit of syllabus) carrying 10 marks each shall be EITHER/OR type descriptive questions and may contain sub-questions.

OPEN CHANNEL FLOW (OCF)

V Semester : CE						Scheme : 2023		
Course Code	Category	Hours/Week			Credits	Maximum Marks		
CE313	PE	L/D	T	P	C	Continuous Internal Assessment	End Exam	Total
		3	-	-	3	30	70	100
Sessional Exam Duration : 2 Hrs						End Exam Duration: 3 Hrs		

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

CO1: Describe the fundamental principles of fluid flow in pipelines and networks under steady and unsteady conditions.

CO2: Solve problems related to uniform and varied flow in open channels using theoretical and computational approaches.

CO3: Analyze the impact of unsteady flow phenomena such as surges and dam breaks in open channels.

CO4: Evaluate sediment transport processes and their influence on river morphology and hydraulic structures.

CO5: Develop and validate hydraulic models for flow measurement and physical modeling applications in fluid mechanics.

UNIT – I

Hydraulics of Pipelines and Pipe Networks

Review of fluid mechanics – Reynolds transport theorem and applications – Steady flow analysis of pipe network systems – Unsteady flows – Basic equations of water hammer – Solution by method of characteristics – Network analysis.

UNIT – II

Steady Varied Flows in Open Channels

Basic concepts of uniform flow – Specific energy and specific force concepts – Dynamic equation for spatially varied flows – Flow profile computations – Introduction to Hec-Ras – Spatially varied flows and rapidly varied flows – Applications.

UNIT – III

Unsteady Flows in Open Channels

Equations of motion – Uniformly progressive wave – Rapidly varied unsteady flow – Positive and negative surges – Dam break problem.

UNIT – IV

Sediment Transport

Sediment properties – Inception of sediment motion – Bed forms – Bed load, suspended load – Total sediment transport – Design of stable channels and regime channels – Reservoir sedimentation and trap efficiency.

UNIT – V

Flow Measurements and Hydraulic Modeling

Sharp-crested weirs – Broad-crested weirs – Critical depth flumes – Recent advancement in open channel flow measurements – Physical modeling in hydraulics – Dimensional analysis – Modeling closed flows and free surface flows – Distorted models – Design of physical models.

Text Books

1. Subramanya K., *Flow in Open Channels*, Tata McGraw Hill Pub., New Delhi 2015.
2. Rajesh Srivastava, *Flow through Open Channels*, Oxford Univ. Press. N Delhi, 2011.

3. Chow, V.T., *Open Channel Hydraulics*, McGraw Hill Inc., New York, 1979.

Reference Books

1. French, R.H., *Open Channel Hydraulics*, McGraw Hill Pub. Co., New York, 1986.
2. Terry Sturm, *Open Channel Hydraulics*, Tata McGraw Hill Pub. New Delhi, 2011.

Question Paper Pattern:

Sessional Exam: The question paper for Sessional Examination shall be for 40 marks. The question paper shall consist of Four Questions and all questions are compulsory. Question No.1 contains Five short answer questions (2marks each) for a total of 10 marks. Remaining Three Questions shall be EITHER/OR type descriptive questions for 10 marks each. Each of these descriptive questions may contain sub-questions.

End Exam: The question paper for End Examination shall be for 70 marks. The question paper shall contain Six Questions and all questions are compulsory. Question No.1 shall contain Ten short answer questions (2 marks each) for a total of 20 marks, with Two short answer questions from each unit. Remaining Five Questions (each question covering one unit of syllabus) carrying 10 marks each shall be EITHER/OR type descriptive questions and may contain sub-questions.

Professional Electives

Professional Elective – II (in VI Sem.)	1. Foundation Engineering
	2. Design of Earthquake Resistant Structures
	3. Experimental Stress Analysis
Professional Elective – III (in VI Sem.)	1. Hydraulic Structures
	2. Pres-stressed Concrete
	3. Cost Effective Housing Techniques
	4. Watershed Management

FOUNDATION ENGINEERING (FE)

VI Semester : CE						Scheme : 2023		
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
		L/D	**T**	**P**	**C**	**Continuous Internal Assessment**	**End Exam**	**Total**
CE314	**PE**	**3**	**-**	**-**	**3**	**30**	**70**	**100**
Sessional Exam Duration : 2 Hrs						**End Exam Duration: 3 Hrs**		

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

CO1: Assess the shear strength of soils using direct shear, unconfined and triaxial compression test.

CO2: Apply the principles of soil investigation and analyze the stability of slopes.

CO3: Evaluate the earth pressure to analyze the stability of retaining walls.

CO4: Evaluate the bearing capacity of shallow foundations using theoretical and field methods.

CO5: Analyze the pile foundations for their load carrying capacity and settlement.

UNIT – I

***Shear Strength*:** Mohr-Coulomb failure criterion – Shear parameters – Direct shear test – Triaxial compression test – Types of shear tests based on drainage conditions – Unconfined compression test – Shear strength characteristics of cohesive and cohesionless soils.

UNIT – II

Soil Investigation: Planning and execution of soil exploration – Reconnaissance – Depth of exploration – Methods of soil exploration – Soil samples – Soil investigation report.

Stability of Slopes: Types of slope failures – Stability analysis of infinite and finite slopes – Swedish circle method – Bishop's simplified method of slices – Friction circle method – Taylor's stability number.

UNIT – III

Lateral Earth Pressure: Active and passive earth pressure – Earth pressure at rest – Rankine's theory – Active and Passive earth pressure for cohesionless and cohesive soils – Coulomb's theory – Rebhann's and Culmann's graphical method.

UNIT – IV

Bearing Capacity of Soils: Definition of bearing capacity – Terzaghi's, Meyerhof's and Skempton's theories of bearing capacity – Bearing capacity of square, circular and rectangular footings – Effect of water table on bearing capacity – I.S. code recommendations for bearing capacity – Safe bearing pressure based on N value – Plate load test.

UNIT – V

Pile Foundations: Classification of piles – Pile driving methods – Load carrying capacity of single pile – Dynamic formulae – Static formulae – Load test on pile – Pile groups – Load carrying capacity of pile groups – Settlement of pile groups – Negative skin friction – Under reamed piles.

Text Books

1. C. Venkataramaiah, *Geotechnical Engineering*, New Age Publications, 2002.
2. K.R. Arora, *Soil Mechanics and Foundation Engineering*, Standard Publishers and Distributors, Delhi, 7th edition, 2009.

3. B.C.Punmia, Ashok Kumar Jain and Arun Kumar Jain, *Soil Mechanics and Foundations*, Laxmi publications Pvt. Ltd., New Delhi, 17th edition, 2017.

Reference Books

1. Purushtoma Raj, *Soil Mechanics and Foundation Engineering*, Pearson Publications, 2nd edition, 2013.

2. Das, B.M., *Principles of Foundation Engineering*, Thomson Engineering, 6th edition (Indian edition), 1999.

3. Varghese P.C., *Foundation Engineering,* Prentice Hall of India., New Delhi.

4. V.N.S. Murthy, *Foundation Engineering*, CRC Press, New Delhi.

Question Paper Pattern:

Sessional Exam: The question paper for Sessional Examination shall be for 40 marks. The question paper shall consist of Four Questions and all questions are compulsory. Question No.1 contains Five short answer questions (2marks each) for a total of 10 marks. Remaining Three Questions shall be EITHER/OR type descriptive questions for 10 marks each. Each of these descriptive questions may contain sub-questions.

End Exam: The question paper for End Examination shall be for 70 marks. The question paper shall contain Six Questions and all questions are compulsory. Question No.1 shall contain Ten short answer questions (2 marks each) for a total of 20 marks, with Two short answer questions from each unit. Remaining Five Questions (each question covering one unit of syllabus) carrying 10 marks each shall be EITHER/OR type descriptive questions and may contain sub-questions.

DESIGN OF EARTHQUAKE RESISTANT STRUCTURES (DERS)

VI Semester : CE						Scheme : 2023		
Course Code	Category	Hours/Week			Credits	Maximum Marks		
CE315	PE	L/D	T	P	C	Continuous Internal Assessment	End Exam	Total
		3	-	-	3	30	70	100
Sessional Exam Duration : 2 Hrs						End Exam Duration: 3 Hrs		

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

CO1: Understand earthquake mechanisms, seismic waves, and seismic zones, including measuring techniques and instruments.

CO2: Analyze vibratory systems, single-degree-of-freedom (SDOF) models.

CO3: Evaluate seismic design requirements- Analysis- Equivalent lateral force method - Lateral distribution of base shear.

CO4: Apply IS code provisions and lateral force methods for seismic design of masonry buildings.

CO5: Assess earthquake protective systems- base isolation systems.

UNIT – I

Engineering Seismology

Earthquake phenomenon – Cause of earthquakes – Faults- plate tectonics – Seismic waves – Terms associated with earthquakes – Magnitude/ intensity of an earthquake – Energy released – Earthquake measuring instruments – Seismogram, seismoscope, seismograph – Strong ground motions – Seismic zones of India.

UNIT – II

Theory of Vibrations

Free vibration of single degree of freedom (SDOF) system – Undamped and damped – Critical damping – Logarithmic decrement – Forced vibrations.

UNIT – III

Introduction to Earthquake Resistant Design

Seismic design requirements – Regular and irregular configurations – Basic assumptions – Design earthquake loads – Basic load combinations – Permissible stresses – Seismic methods of analysis – Factors in seismic analysis – Equivalent lateral force method – Lateral distribution of base shear.

UNIT – IV

Masonry Buildings

Introduction – Elastic properties of masonry assemblage – Categories of masonry buildings – Behaviour of unreinforced and reinforced masonry walls – Behavior of walls – Box action and bands – Behaviour of infill walls – Improving seismic behaviour of masonry buildings.

UNIT – V

Earthquake Protective Systems

Introduction to base isolation systems – Types of base isolators – Elastomeric, sliding, hybrid – Materials used – rubber, lead, and steel – Applications in seismic design of structures.

Text Books

1. S. K. Duggal, *Earthquake Resistant Design of structures*, Oxford University Press.
2. Pankaj Agarwal and Manish Shrikhande, *Earthquake Resistant Design of structures*,

Prentice Hall of India Pvt. Ltd.

Reference Books

1. T. Paulay and M.J.N. Priestly, *Seismic Design of Reinforced Concrete and Masonry Building*, John Wiley & Sons.

2. Vinod Hosur, *Eartquake Resistant Design of Building structures*, Wiley India Pvt. Ltd.

3. R.N. Iyengar, *Elements of Mechanical Vibration*, I.K. International Publishing House Pvt. Ltd.

4. Anand S. Arya, *Masory and Timber Structures including Earthquake Resistant Design*, Nemchand & Bros.

5. C.V.R. Murthy, *Earthquake Tips – Learning Earthquake Design and Construction*.

6. BIS Codes: (i) IS 1893(Part-1):2016 or Latest codes, (ii) IS 13920:2016, (iii) IS 4326, (iv) IS 456:2000 or latest.

Question Paper Pattern:

Sessional Exam: The question paper for Sessional Examination shall be for 40 marks. The question paper shall consist of Four Questions and all questions are compulsory. Question No.1 contains Five short answer questions (2marks each) for a total of 10 marks. Remaining Three Questions shall be EITHER/OR type descriptive questions for 10 marks each. Each of these descriptive questions may contain sub-questions.

End Exam: The question paper for End Examination shall be for 70 marks. The question paper shall contain Six Questions and all questions are compulsory. Question No.1 shall contain Ten short answer questions (2 marks each) for a total of 20 marks, with Two short answer questions from each unit. Remaining Five Questions (each question covering one unit of syllabus) carrying 10 marks each shall be EITHER/OR type descriptive questions and may contain sub-questions.

EXPERIMENTAL STRESS ANALYSIS (ESA)

VI Semester : CE						Scheme : 2023		
Course Code	Category	Hours/Week			Credits	Maximum Marks		
CE316	PE	L/D	T	P	C	Continuous Internal Assessment	End Exam	Total
		3	-	-	3	30	70	100
Sessional Exam Duration : 2 Hrs						End Exam Duration: 3 Hrs		

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

CO1: Explain the principles and merits of experimental stress analysis.

CO2: Demonstrate strain measurement using various strain gauge techniques.

CO3: Analyze strain rosette data and evaluate concrete structures using NDT methods.

CO4: Apply the theory of photoelasticity to determine stress distributions in materials.

CO5: Utilize two-dimensional photoelasticity techniques for experimental stress analysis.

UNIT – I

Principles of Experimental Approach

Merits of experimental analysis introduction – Uses of experimental stress analysis – Advantages of experimental stress analysis – Different methods – Simplification of problems.

UNIT – II

Strain Measurement Using Strain Gauges

Definition of strain and its relation of experimental determinations properties of strain – Gauge systems – Types of strain gauges – Mechanical, acoustic and optical strain gauges – Introduction to electrical strain gauges – Inductance strain gauges – LVDT – Resistance strain gauges – Various types – Gauge factor – Materials of adhesion base.

UNIT – III

Strain Rossettes and Non–Destructive Testing of Concrete

Introduction – The three elements rectangular rosette – The delta rosette corrections for transverse strain gauge – Ultrasonic pulse velocity method – Application to concrete – Hammer test – Application to concrete.

UNIT – IV

Theory of Photoelasticity

Introduction – Temporary double refraction – The stress optic law – Effects of stressed model in a polar scope for various arrangements – Fringe sharpening – Brewster's stress optic law.

UNIT – V

Two Dimensional Photoelasticity

Introduction – Isochramic fringe patterns – Isoclinic fringe patterns passage of light through plane polariscope and circular polariscope – Isoclinic fringe patterns – Compensation techniques – Calibration methods – Separation methods – Scaling model to prototype stresses – Materials for photo-elasticity – Properties of photoelastic materials.

Text Books

1. J.W. Dally and W.F. Riley, *Experimental Stress Analysis*, College House Enterprises, 2005.
2. Sadhu Singh, *Experimental Stress Analysis*, Khanna Publishers, 4th edition.

Reference Books

1. U.C. Jindal, *Experimental Stress Analysis*, Pearson Publications, 2012 edition.

2. L.S. Srinath, *Experimental Stress Analysis*, McGraw Hill Company Publishers.

Question Paper Pattern:

Sessional Exam: The question paper for Sessional Examination shall be for 40 marks. The question paper shall consist of Four Questions and all questions are compulsory. Question No.1 contains Five short answer questions (2marks each) for a total of 10 marks. Remaining Three Questions shall be EITHER/OR type descriptive questions for 10 marks each. Each of these descriptive questions may contain sub-questions.

End Exam: The question paper for End Examination shall be for 70 marks. The question paper shall contain Six Questions and all questions are compulsory. Question No.1 shall contain Ten short answer questions (2 marks each) for a total of 20 marks, with Two short answer questions from each unit. Remaining Five Questions (each question covering one unit of syllabus) carrying 10 marks each shall be EITHER/OR type descriptive questions and may contain sub-questions.

HYDRAULIC STRUCTURES (HS)

VI semester : CE					Scheme : 2023			
Course Code	Category	Hours/Week			Credits	Maximum Marks		
CE317	PE	L	T	P	C	Continuous Internal Assessment	End Exam	Total
		3	-	-	3	30	70	100
Sessional Exam Duration:2 Hrs					End Exam Duration: 3 Hrs			

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

CO1: Estimate the design flood by using flood routing method.

CO2: Analyze the factors governing selection of site, storage capacity and yield of reservoir.

CO3: Analyze the stability of gravity dams.

CO4: Analyze seepage pattern in earthen dam, discharge characteristics of an Ogee spillway.

CO5: Analyze selection of suitable type of cross drainage works and canal regulation works.

UNIT – I

Design Flood: Introduction – Estimation of design flood – Rational Method – Flood frequency analysis.

Flood Routing: Introduction – Basics of hydrologic & hydraulic modelling – Reservoir Routing – Channel Routing.

UNIT – II

Reservoir Planning: Introduction – Types of flood control reservoirs- Investigations for reservoir planning – Selection of site – Zones of storage – Storage capacity and yield – Relation between capacity and yield--Determination of yield – Fixation of storage capacity – Sedimentation of reservoirs – Density currents – Trap efficiency – Capacity – Inflow ratio – Useful life of a reservoir -- Control of sedimentation.

UNIT – III

Dams - General: Classification – Factors governing selection of type of dam – Selection of site for a dam.

***Gravity Dams*:** Forces acting – Modes of failure – Stability requirements – Principal and shear stresses – Stability analysis – Elementary and practical profiles – Limiting height – Galleries – Keys, joints and water seals.

UNIT – IV

Earthern Dams: Types – Causes of failures – Criteria for safe design –Seepage analysis – Slope protection – Seepage control measures – Rockfill dams.

Spillways: Introduction – Types of spillways – Profile and discharge equation of Ogee spillway – Dynamic force on spillway – Crest gates-types.

UNIT – V

Cross Drainage Works: Types – Selection of suitable type – Classification – Features of design of cross drainage works – Aqueducts – Syphon aqueduct.

Canal Regulation Works: Canal Outlets – Types of outlets – Definitions – Canal Fall – Necessity and location – Classification – Head regulator and cross regulator.

Text Books

1. B.C. Punmia & B.B. Lal, *Irrigation and Water power Engineering,* Laxmi Publications (P) Ltd.
2. P.N. Modi, *Irrigation and water Resources Engineering*, 11th Edition 2020, Standard Book House.
3. S.K. Garg, *Irrigation Engineering and Hydraulic Structures*, Khanna Publishers, 38th

Revised Edition, 2023

Reference Books

1. K.B. Khushalani & M. Khushalani, *Irrigation Practice and Design*, Oxford & IBH.

Question Paper Pattern:

Sessional Exam: The question paper for Sessional Examination shall be for 40 marks. The question paper shall consist of Four Questions and all questions are compulsory. Question No.1 contains Five short answer questions (2marks each) for a total of 10 marks. Remaining Three Questions shall be EITHER/OR type descriptive questions for 10 marks each. Each of these descriptive questions may contain sub-questions.

End Exam: The question paper for End Examination shall be for 70 marks. The question paper shall contain Six Questions and all questions are compulsory. Question No.1 shall contain Ten short answer questions (2 marks each) for a total of 20 marks, with Two short answer questions from each unit. Remaining Five Questions (each question covering one unit of syllabus) carrying 10 marks each shall be EITHER/OR type descriptive questions and may contain sub-questions.

PRESTRESSED CONCRETE (PSC)

VI Semester : CE						Scheme : 2023		
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
		L/D	**T**	**P**	**C**	**Continuous Internal Assessment**	**End Exam**	**Total**
CE318	**PE**	**3**	**-**	**-**	**3**	**30**	**70**	**100**
Sessional Exam Duration : 2 Hrs						**End Exam Duration: 3 Hrs**		

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

CO1: Understand the principles and methods of prestressing and the need for high-strength materials.

CO2: Determine the losses in pre-tensioned and post-tensioned members.

CO3: Analyse the prestressed concrete beams with straight, concentric and eccentric tendons.

CO4: Design prestressed concrete beams for flexure and shear.

CO5: Determine deflections in prestressed beams and suggest control measures.

UNIT – I

Introduction

Principles of pre-stressing – Pre-stressing systems – Pre-tensioning and post tensioning – Advantages and limitations of prestressed concrete – Need for high strength materials – Methods of pre-stressing – Pre-tensioning (Hoyer system) and post-tensioning methods (Freyssinet system and Gifford- Udall system).

UNIT – II

Losses of Pre-stress

Loss of pre-stress in pre-tensioned and post-tensioned members due to elastic shortening – Shrinkage and creep of concrete – Relaxation of stress in steel – Anchorage slip and frictional losses.

UNIT – III

Analysis of Beams for Flexure

Analysis of beams for flexure – Beams pre-stressed with straight, concentric, eccentric, bent and parabolic tendons – Kern line – Cable profile.

UNIT – IV

Design of Beams for Flexure and Shear

Design criteria as per I.S. Code – Design of simple rectangular and I-sections for flexure – Design for shear.

UNIT – V

Deflections

Control of deflections – Factors influencing deflections – Short term deflections of uncracked beams – Prediction of long time deflections.

Text Books

1. N. Krishna Raju, *Prestressed Concrete*, Tata McGraw Hill Publications, 6th edition, 2018.
2. N. Rajagopalan, *Prestressed concrete*, Narosa Publishing House, 2nd edition, 2017.

Reference Books

1. T.Y. Lin & Ned H. Burns, *Design of Prestressed Concrete Structures*, John Wiley & Sons, 3rd edition, 2010.

2. Praveen Nagrajan, *Prestressed Concrete Design*, Pearson Publications, 2013.

3. Ramamuratam, *Prestressed Concrete*, Dhanpatrai Publications, 2020 edition.

4. BIS code on Prestressed Concrete, IS: 1343 to be permitted into the examination Hall.

Question Paper Pattern:

Sessional Exam: The question paper for Sessional Examination shall be for 40 marks. The question paper shall consist of Four Questions and all questions are compulsory. Question No.1 contains Five short answer questions (2marks each) for a total of 10 marks. Remaining Three Questions shall be EITHER/OR type descriptive questions for 10 marks each. Each of these descriptive questions may contain sub-questions.

End Exam: The question paper for End Examination shall be for 70 marks. The question paper shall contain Six Questions and all questions are compulsory. Question No.1 shall contain Ten short answer questions (2 marks each) for a total of 20 marks, with Two short answer questions from each unit. Remaining Five Questions (each question covering one unit of syllabus) carrying 10 marks each shall be EITHER/OR type descriptive questions and may contain sub-questions.

COST EFFECTIVE HOUSING TECHNIQUES (CEHT)

VI Semester : CE						Scheme : 2023		
Course Code	Category	Hours/Week			Credits	Maximum Marks		
CE319	PE	L/D	T	P	C	Continuous Internal Assessment	End Exam	Total
		3	-	-	3	30	70	100
Sessional Exam Duration : 2 Hrs						End Exam Duration: 3 Hrs		

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

CO1: Examine the current status of urban and rural housing and analyze the role of finance and planning in housing development.

CO2: Evaluate and recommend cost-effective construction techniques, including prefabrication and innovative roofing/ flooring systems.

CO3: Assess the feasibility of alternative building materials and infrastructure solutions for low-cost housing.

CO4: Analyze traditional rural housing methods and propose modern techniques for improving rural housing quality.

CO5: Design housing solutions for disaster-prone areas by incorporating earthquake, cyclone, and flood-resistant strategies.

UNIT – I

Housing scenario including the introduction, status of urban housing, and status of rural housing. Housing finance covering introduction, existing finance system in India, government role as facilitator, status of rural housing finance, and impediments in housing finance and related issues. Land use and physical planning for housing including introduction, planning of urban land, Urban Land Ceiling and Regulation Act, efficiency of building bye-laws, and residential densities. Housing the urban poor including introduction, living conditions in slums, and approaches and strategies for housing urban poor.

UNIT – II

Development and adoption of low-cost resilient housing technology including introduction, adoption of innovative cost-effective construction techniques, adoption of precast elements in partial prefabrication, adoption of total prefabrication for mass housing in India, general remarks on precast roofing/flooring systems, economical wall systems including single brick thick load-bearing wall, 19 cm thick load-bearing masonry walls, half brick thick load-bearing wall, fly ash-gypsum blocks for masonry, stone block masonry, and adoption of precast RCC plank and joist system for roof/floor in the building.

UNIT – III

Alternative building materials for low-cost housing including introduction, substitutes for scarce materials, ferrocement, gypsum boards, timber substitutions, industrial wastes, and agricultural wastes. Low-cost infrastructure services including introduction, present status, technological options, low-cost sanitation, domestic waste management, water supply, and energy.

UNIT – IV

Rural housing including introduction, traditional practices of rural housing, continuous mud housing technology, mud roofs, characteristics of mud, fire treatment for thatch roofs, soil stabilization, and rural housing programs.

UNIT – V

Housing in disaster-prone areas including introduction, earthquake damages to houses,

traditional disaster-prone areas, types of damages and failures of non-engineered buildings, repair and restoration of earthquake-damaged non-engineered buildings, recommendations for future construction, requirements of structural safety of thin precast roofing units against earthquake forces, status of R&D in earthquake strengthening measures, and housing strategies for floods, cyclones, and future safety.

Text Books

1. International council for building research studies and documentation, *Building Materials for Low – Income Houses.*
2. A.K. Lal, *Hand Book of Low Cost Housing*, New Age International Publishers.
3. G.C. Mathur, *Low Cost Housing*, South Asia Books.

Reference Books

1. Neville A.M., *Properties of concrete*, Pitman Publishing Limited, London.
2. Rudhai. G, *Light weight concrete*, Academic Kiado, Publishing Home of Hungarian Academy of Sciences, 1963.
3. A.G. Madhava Rao, D.S. Rama Chandra Murthy & G. Annamalai E., *Modern trends in Housing in Developing Countries*, & F. N. Spon Publishers.

Question Paper Pattern:

Sessional Exam: The question paper for Sessional Examination shall be for 40 marks. The question paper shall consist of Four Questions and all questions are compulsory. Question No.1 contains Five short answer questions (2marks each) for a total of 10 marks. Remaining Three Questions shall be EITHER/OR type descriptive questions for 10 marks each. Each of these descriptive questions may contain sub-questions.

End Exam: The question paper for End Examination shall be for 70 marks. The question paper shall contain Six Questions and all questions are compulsory. Question No.1 shall contain Ten short answer questions (2 marks each) for a total of 20 marks, with Two short answer questions from each unit. Remaining Five Questions (each question covering one unit of syllabus) carrying 10 marks each shall be EITHER/OR type descriptive questions and may contain sub-questions.

WATERSHED MANAGEMENT (WSM)

VI Semester : CE					Scheme : 2023			
Course Code	Category	Hours/Week			Credits	Maximum Marks		
CE320	PE	L/D	T	P	C	Continuous Internal Assessment	End Exam	Total
		3	-	-	3	30	70	100
Sessional Exam Duration : 2 Hrs					End Exam Duration: 3 Hrs			

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

CO1: Explain watershed management concepts, pollution control strategies and environmental policies related to water quality.

CO2: Analyze erosion processes, wetland water budgets, and sediment transport models to assess land degradation and conservation needs.

CO3: Evaluate surface and groundwater interactions, wetland treatment efficiency, and hydrological models for integrated water resource management.

CO4: Apply water harvesting techniques, hydrologic modeling, and wetland design methods for sustainable watershed management.

CO5: Assess irrigation water management strategies, drought mitigation policies, and the role of water foot print in agricultural sustainability.

UNIT – I

Concept of watershed – Introduction to watershed management – Different stakeholders and their relative importance – Watershed management policies and decision making – Watershed management practices in arid and semiarid regions – Short term and long term strategic planning – Types and sources of pollution – E nvironmental guidelines for water quality – Perspective on recycle and reuse.

UNIT – II

Morphometry – Soil erosion – Factors affecting erosion – Effects of erosion on land fertility and land capability – Soil erosion modelling – Erosivity and Erodibility – Sediment yield and sedimentation – Wetland definitions and the role of water in wetland structure and function – Introduction to wetland water budgets and hydro-period – Components of the water budget: inflows, outflows, and storage, precipitation and runoff, evapotranspiration.

UNIT – III

Surface water flows: Structures and channels – Groundwater-surface water exchange in wetlands – Surface water flows ii and wetland hydrology case studies – Flow and mixing in wetlands – Wetland water quality information: nutrients, organic/inorganic contaminants – Sediments and colloids – Wetland transport models i: plug flow, Cstrs and Cstrs in series – Intro to method of moments.

UNIT – IV

Wetland Hydrologic Assessment: Physical and biological processes – Anthropogenic and climate change impacts on wetland hydrology – Modeling wetland hydrology – Hydraulics, and hydrodynamics – Introduction to wetland treatment systems design – Water harvesting: rainwater harvesting – Catchment harvesting – Harvesting structures – Model watershed – Government and NGO projects.

UNIT – V

Rain water management – Planning and operation of irrigation systems – Conjunctive use of water – Participatory irrigation management and integrated water resources management (IWRM) – Water management policy during droughts – Predicting effect of water shortage

on crops – Introduction to water footprint of crops and its applications – Blue, green and grey water foot print.

Text Books

1. T. O. Randhir, *Watershed Management: Issues and Approaches*, IWA Publishing, 2006.
2. J. V. S. Murty, *Watershed Management*, New Age International, 2013.

Reference Books

1. D. K. Majumdar, *Irrigation Water Management*, Prentice Hall, 2014.
2. K. N. Brooks, P. F. Folliott, J. A. Magner, *Hydrology and the Management of Watersheds*, Wiley-Blackwell, Fourth edition, 2012.
3. E. M. Tideman, *Watershed Management: Guidelines for Indian Conditions*, Omega Scientific Publishers, 1996.
4. R. Rajora, *Integrated Watershed Management: Field Manual for Equitable, Productive and Sustainable Development*, Rawat Publications, 2019.

Question Paper Pattern:

Sessional Exam: The question paper for Sessional Examination shall be for 40 marks. The question paper shall consist of Four Questions and all questions are compulsory. Question No.1 contains Five short answer questions (2marks each) for a total of 10 marks. Remaining Three Questions shall be EITHER/OR type descriptive questions for 10 marks each. Each of these descriptive questions may contain sub-questions.

End Exam: The question paper for End Examination shall be for 70 marks. The question paper shall contain Six Questions and all questions are compulsory. Question No.1 shall contain Ten short answer questions (2 marks each) for a total of 20 marks, with Two short answer questions from each unit. Remaining Five Questions (each question covering one unit of syllabus) carrying 10 marks each shall be EITHER/OR type descriptive questions and may contain sub-questions.

Professional Electives

Professional Elective – IV (in VII Sem.)	1. Railway, Airports, Docks and Harbour Engineering
	2. Geo-synthetics and Reinforced Earth Structures
	3. Environmental Impact Assessment
	4. Advanced Structural Design
	5. Design and Drawing of Hydraulic Structures
Professional Elective – V (in VII Sem.)	1. Sanitary Engineering
	2. Geographical Information Systems
	3. Ground Improvement Techniques
	4. Subsurface Investigation and Instrumentation
	5. Transportation Economics

RAILWAYS, AIRPORTS AND HARBOUR ENGINEERING (RAHE)

VII Semester : CE						Scheme : 2023		
Course Code	Category	Hours/Week			Credits	Maximum Marks		
CE402	PE	L/D	T	P	C	Continuous Internal Assessment	End Exam	Total
		3	-	-	3	30	70	100
Sessional Exam Duration : 2 Hrs						End Exam Duration: 3 Hrs		

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

CO1: Understand railway track components, functions, and requirements.

CO2: Apply geometric design principles to railway track layout and interlocking systems.

CO3: Evaluate airport planning aspects, including site selection and terminal planning.

CO4: Design runways and taxiways based on geometric standards and safety regulations.

CO5: Assess the ports and harbour structures, including docks, breakwaters, and navigation aids.

UNIT – I

Railway Engineering

Introduction – Permanent way components – Cross section of permanent way – Functions and requirements of rails, sleepers and ballast – Types of gauges – Creep of rails – Theories related to creep – Coning of wheels – Adzing of sleepers – Rail fastenings.

UNIT – II

Geometric Design of Railway Track

Gradients – Grade compensation – Cant and negative super elevation – Cant deficiency – Degree of curves – Safe speed on railway track – Points and crossings – Layout and functioning of left hand turn out and right hand turn outs – Station yards – Signaling and interlocking.

UNIT – III

Airport Engineering

Airport site selection – Factors affecting site selection and surveys – Terminal area – Layout and functions – Concepts of terminal building – Simple building, linear concept, pier concept and satellite concept – Typical layouts.

UNIT – IV

Geometric Design of Runways and Taxiways

Aircraft characteristics – Influence of characteristics on airport planning and design – Geometric design elements of runway – Standards and specifications - Runway orientation – Wind rose diagram – Basic runway length – Correction for runway length functions of taxiways – Taxiway geometric design – Geometric elements and standard specifications – Runway and taxiway lighting.

UNIT – V

Ports and Harbours

Harbours – Requirements of ports and harbours – Types of ports – Classification of harbours – Docks and types of docks – Dry docks, wharves and jetties – Breakwaters: layouts of different types of harbours and docks – Dredging operations – Navigation aids.

Text Books

1. S.C. Saxena and S. Arora, *A Text Book of Railway Engineering*, Dhanpatrai and Sons, New Delhi, 2018.
2. K.P. Subramanian, *Highway, Railway, Airport and Harbour Engineering*, Scitech Publishers, 2021.

Reference Books

1. R. Srinivasan, *Harbour, Dock and Tunnel Engineering*, Charotar Publishing House Pvt. Limited, 2022.
2. J.S. Mundrey, *Railway Track Engineering*, McGraw Hill Education, 5th edition 2017.
3. S.P. Chandola, *A Text book of Transportation Engineering*, S. Chand & Co. Ltd., 2008.

Question Paper Pattern:

Sessional Exam: The question paper for Sessional Examination shall be for 40 marks. The question paper shall consist of Four Questions and all questions are compulsory. Question No.1 contains Five short answer questions (2marks each) for a total of 10 marks. Remaining Three Questions shall be EITHER/OR type descriptive questions for 10 marks each. Each of these descriptive questions may contain sub-questions.

End Exam: The question paper for End Examination shall be for 70 marks. The question paper shall contain Six Questions and all questions are compulsory. Question No.1 shall contain Ten short answer questions (2 marks each) for a total of 20 marks, with Two short answer questions from each unit. Remaining Five Questions (each question covering one unit of syllabus) carrying 10 marks each shall be EITHER/OR type descriptive questions and may contain sub-questions.

GEO-SYNTHETICS AND REINFORCED EARTH STRUCTURES (GRES)

VII Semester : CE						Scheme : 2023		
Course Code	Category	Hours/Week			Credits	Maximum Marks		
		L/D	T	P	C	Continuous Internal Assessment	End Exam	Total
CE403	PE	3	-	-	3	30	70	100
Sessional Exam Duration : 2 Hrs						End Exam Duration: 3 Hrs		

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

CO1: Explain the fundamentals of reinforced earth and analyze the effects of reinforcement on soil properties.

CO2: Compare different types of geosynthetics, their functions, and durability aspects in geotechnical applications.

CO3: Design reinforced earth retaining walls considering stability mechanisms and reinforcement layouts.

CO4: Evaluate reinforced embankments and foundation mattresses with respect to settlement and load-bearing capacity.

CO5: Design and analyze reinforced pavements and soil beds using standard methodologies.

UNIT – I

Reinforced Earth

Concept – Effects of reinforcement on soils – Equal confining and pseudo cohesion concepts – Materials – Friction coefficient – Definition – Laboratory determination – Factors affecting fiction coefficient – Application of reinforced earth.

UNIT – II

Geosynthetics

Advantages over conventional materials – Classification based on material type and function – Types of geosynthetics – Functions of geosynthetics – Tests on geosynthetics – Durability aspects of geosynthetics – Applications of geosynthetics.

UNIT – III

Reinforced Earth Retaining Walls

Introduction – Stability mechanisms – Design of reinforced earth retaining wall – Selection of materials – Geotechnical analysis – Reinforcement layout and spacing – Stability analysis – Advantages over conventional retaining walls.

UNIT – IV

Reinforced Embankments

Introduction – Design of reinforced embankment – Foundation mattress below the embankment – Purpose and function of foundation mattresses – Components of reinforced mattress – Design of reinforced mattress – Design calculations for settlement control – Bearing capacity, and long-term performance – Field implementation and monitoring techniques.

UNIT – V

Reinforced Soil Beds

Introduction – Factors affecting the behavior of reinforced soil beds – Analysis and design of reinforced pavements: benefits of placing reinforcement in flexible pavement layers – Design of reinforced pavements by Giroud and Noiray approach and modified CBR method.

Text Books

1. G.L. Siva Kumar Babu, *An Introduction to Soil Reinforcement and Geosynthetics*, University Press.

2. Sanjay Kumar Shukla and Jian-Hua Yin, *Fundamentals of Geosynthetics Engineering,* CRC Press, 2017, 1st edition.

3. Swami Saran, *Reinforced Soil and its Engineering Applications,* I.K. International Publishing House Pvt. Ltd., 2019, 1st edition.

Reference Books

1. Robert M Koerner, R.M., *Designing with Geosynthetics*, Pearson Education Inc., 2012, 6th edition.

2. G. Venkatapparao, *Advances in Geosynthetics*, Sai Master Geo-environmental Services Pvt. Ltd. Publications.

3. IS:13162-1992; IS:14293& 94-1995; IS:14324-1995; IS:14714-1999, *Geotextiles – Methods of Tests.*

4. IRC: SP:102-2014: *Guidelines for Design and Construction of Reinforced Soil Walls*.

Question Paper Pattern:

Sessional Exam: The question paper for Sessional Examination shall be for 40 marks. The question paper shall consist of Four Questions and all questions are compulsory. Question No.1 contains Five short answer questions (2marks each) for a total of 10 marks. Remaining Three Questions shall be EITHER/OR type descriptive questions for 10 marks each. Each of these descriptive questions may contain sub-questions.

End Exam: The question paper for End Examination shall be for 70 marks. The question paper shall contain Six Questions and all questions are compulsory. Question No.1 shall contain Ten short answer questions (2 marks each) for a total of 20 marks, with Two short answer questions from each unit. Remaining Five Questions (each question covering one unit of syllabus) carrying 10 marks each shall be EITHER/OR type descriptive questions and may contain sub-questions.

ENVIRONMENTAL IMPACT ASSESSMENT (EIA)

VII Semester : CE						Scheme : 2023		
Course Code	Category	Hours/Week			Credits	Maximum Marks		
		L/D	T	P	C	Continuous Internal Assessment	End Exam	Total
CE404	PE	3	-	-	3	30	70	100
Sessional Exam Duration : 2 Hrs						End Exam Duration: 3 Hrs		

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

CO1: Apply various methodologies for conducting Environmental Impact Assessments.

CO2: Analyze the impact of land-use changes on soil, water, and air quality.

CO3: Evaluate the environmental impact on vegetation, wildlife, and conduct risk assessments.

CO4: Develop environmental audit reports and assess compliance with environmental policies.

CO5: Interpret and apply environmental acts and regulations related to EIA.

UNIT – I

Concepts and Methodologies of EIA

Initial environmental examination – Elements of EIA – Factors affecting EIA – Impact evaluation and analysis – Preparation of environmental base map – Classification of environmental parameters – Criteria for the selection of EIA methodology – EIA methods – Ad-hoc methods – Matrix methods – Network method – Environmental media quality index method – Overlay methods and cost/benefit analysis.

UNIT – II

Impact of Developmental Activities and Land Use

Introduction and methodology for the assessment of soil and ground water – Delineation of study area – Identification of actives – Procurement of relevant soil quality – Impact prediction – Assessment of impact significance – Identification and incorporation of mitigation measures – EIA in surface water – Air and biological environment – Methodology for the assessment of impacts on surface water environment – Air pollution sources – Generalized approach for assessment of air pollution impact.

UNIT – III

Assessment of Impact on Vegetation, Wildlife and Risk Assessment

Introduction – Assessment of impact of development activities on vegetation and wildlife, environmental impact of deforestation – Causes and effects of deforestation – Risk assessment and treatment of uncertainty – Key stages in performing environmental risk assessment – Advantages of environmental risk assessment.

UNIT – IV

Environmental Audit

Introduction – Environmental audit – Environmental legislation – Objectives of environmental audit – Types of environmental audit – Audit protocol – Stages of environmental audit – Onsite activities – Evaluation of audit data and preparation of audit report.

UNIT – V

Environmental Acts and Notifications

The environmental protection act – The water preservation act – The air (prevention &

control of pollution act) – Wild life act – Provisions in the EIA notification – Procedure for environmental clearance – Procedure for conducting environmental impact assessment report – Evaluation of EIA report – Environmental legislation objectives – Evaluation of audit data and preparation of audit report – Post audit activities – concept of ISO and ISO 14000.

Text Books

1. Y. Anjaneyulu, *Environmental Impact Assessment Methodologies*, B. S. Publication, Hyderabad 2nd edition 2011.

2. Canter Larry W., *Environmental Impact Assessment*, McGraw-Hill education, Edi (1996).

Reference Books

1. Peavy, H. S, Rowe, D. R, Tchobanoglous, G., *Environmental Engineering*, McGraw Hill International Editions, New York 1985.

2. Suresh K. Dhaneja, S.K., *Environmental Science and Engineering*, Katania & Sons Publication, New Delhi.

3. J. Glynn and Gary W. Hein Ke, *Environmental Science and Engineering*, Prentice Hall Publishers.

4. H. S. Bhatia, *Environmental Pollution and Control*, Galgotia Publication (P) Ltd., Delhi.

Question Paper Pattern:

Sessional Exam: The question paper for Sessional Examination shall be for 40 marks. The question paper shall consist of Four Questions and all questions are compulsory. Question No.1 contains Five short answer questions (2marks each) for a total of 10 marks. Remaining Three Questions shall be EITHER/OR type descriptive questions for 10 marks each. Each of these descriptive questions may contain sub-questions.

End Exam: The question paper for End Examination shall be for 70 marks. The question paper shall contain Six Questions and all questions are compulsory. Question No.1 shall contain Ten short answer questions (2 marks each) for a total of 20 marks, with Two short answer questions from each unit. Remaining Five Questions (each question covering one unit of syllabus) carrying 10 marks each shall be EITHER/OR type descriptive questions and may contain sub-questions.

ADVANCED STRUCTURAL DESIGN (ASD)

VII Semester : CE						Scheme : 2023		
Course Code	Category	Hours/Week			Credits	Maximum Marks		
CE405	PE	L	T	P	C	Continuous Internal Assessment	End Exam	Total
		3	-	-	3	30	70	100
Sessional Exam Duration: 2 Hrs						End Exam Duration: 3 Hrs		

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

CO1: Design a flat slab

CO2: Design a combined footing by limit state method.

CO3: Design the cantilever retaining walls by limit state method.

CO4: Design the water tanks.

CO5: Design the deck slab bridge and bridge bearings.

UNIT – I

Flat Slab: Advantages & Disadvantages of flat slab – Methods of designs – Direct design method – Interior panel only – IS Code Recommendations.

UNIT – II

Combined Footing: Design of rectangular combined footing by limit state method.

UNIT – III

Retaining Walls: Design of cantilever retaining walls by limit state method.

UNIT – IV

Concept of Working Stress Method:

R.C. Circular Water Tanks:

Design of circular water tank resting on ground with rigid and flexible bases using concept of working stress method.

R.C Rectangular Water Tanks: Design of rectangular water tank resting on ground (working stress method).

UNIT – V

R.C. Bridges: I.R.C. loading and impact factor – Deck slab bridges by effective width method for Class AA tracked vehicle using concept of working stress method.

Bridge bearings: Types of bearings – Design of R.C. bearings and neoprene bearings.

Text Books:

1. N. Krishna Raju, *Reinforced Concrete Design IS:456–2000 Principles and Practice*, New Age International (P) Limited.
2. Ashok K.Jain, *Reinforced Concrete Limit State Design*, Nem Chand & Bros.
3. B.C. Punmia, Ashok Kumar Jain and Arun Kumar Jain, *Limit state design of Reinforced Concrete (As per IS 456:2000)*, Laxmi Publications (P) Ltd.

Reference Books:

1. N. Krishnaraju, *Design of Bridges,* Oxford IBH.
2. H.J. Shah, *R.C.Structures,* Charoter Publications.
3. I.C. Syal and Goel, *Reinforced Concrete Structures*, S. Chand & Co.
4. S.S. Bhavikatti, *Advanced R.C.C. Design–RCC Vol. II*, New Age International.

5. N. Krishnaraju, *Advanced RCC,* CBS Publications, New Delhi.

6. M.L. Gambhir, *Design of RCC structures*, PHI Publishers, New Delhi.

Question Paper Pattern:

Sessional Exam: The question paper for Sessional Examination shall be for 40 marks. The question paper shall consist of Four Questions and all questions are compulsory. Question No.1 contains Five short answer questions (2marks each) for a total of 10 marks. Remaining Three Questions shall be EITHER/OR type descriptive questions for 10 marks each. Each of these descriptive questions may contain sub-questions.

End Exam: The question paper for End Examination shall be for 70 marks. The question paper shall contain Six Questions and all questions are compulsory. Question No.1 shall contain Ten short answer questions (2 marks each) for a total of 20 marks, with Two short answer questions from each unit. Remaining Five Questions (each question covering one unit of syllabus) carrying 10 marks each shall be EITHER/OR type descriptive questions and may contain sub-questions.

DESIGN AND DRAWING OF HYDRAULIC STRUCTURES (DDHS)

VII Semester : CE						Scheme : 2023		
Course Code	Category	Hours/Week			Credits	Maximum Marks		
CE406	PE	L	T	P	C	Continuous Internal Assessment	End Exam	Total
		3	-	-	3	30	70	100
Sessional Exam Duration: 2 Hrs						End Exam Duration: 3 Hrs		

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

CO1: Design the components of tank sluice and surplus work of a tank.

CO2: Design the canal drop and canal regulator cum road bridge.

CO3: Draw the features of surplus weir and sluice of a tank.

CO4: Design abutments, wing walls and return walls of irrigation structures.

CO5: Analyze the stability of side wall of a sluice barrel and pier of a canal regulator.

CO6: Draw the features of canal drop, canal regulator cum road bridge and under tunnel.

UNIT – I

Design of

Surplus Weir: Introduction – Estimation of flood discharge – Selection of type of work – Length of surplus Weir – Crest width – Base width – Abutments – Wings – Returns – Aprons.

Tank Sluice with Tower Head: Ventway design – Sluice barrel – R.C. Slab – Earth pressure – Stability analysis – Tower head design – Cistern.

Canal Drop (Notch Type): Trapezoidal notch – Length of drop wall between abutments – Profile of drop wall – Notch pier – Protective works.

Canal Regulator cum Road Bridge: Vent way design – Drowning ratio method – Roadway –Piers – Shutters – Abutments – Wing walls – Return walls – Solid apron for regulator – Revetments – Energy dissipation.

Under Tunnel: Design of barrel roof – Abutment pressure under Pier – Fixing maximum flood levels – Tail channel – Afflux over drop wall – Loss of head calculation – Depth of foundations of returns – Wing walls and returns - Uplift – Creep lost in percolation.

UNIT – II

Design and Drawing of

1) Surplus weir
2) Tank sluice with tower head
3) Canal drop (Notch type)
4) Canal regulator cum road bridge
5) Under tunnel

Text Books:

1. C. Satyanarayana Murthy, *Water Resources Engineering Principles and practice*, New Age International Publishers, New Delhi.

Reference Books:

1. S.K. Garg, *Irrigation and Hydraulic structures,* Khanna Publishers.

Question Paper Pattern:

Sessional Exam:

1. The question paper shall consist of TWO questions related to design and drawing. The student shall answer ONE question.

End Exam:

1. The question paper shall consist of TWO units with TWO questions in each unit. The student shall answer any ONE question from each unit.

2. First unit shall have questions related to theory and design aspects only for 20 marks from the Unit - I of the syllabus. Second unit shall have design and drawing question from Unit-II of the syllabus for 50 marks.

SANITARY ENGINEERING (SE)

VII Semester : CE						Scheme : 2023		
Course Code	Category	Hours/Week			Credits	Maximum Marks		
CE407	PE	L	T	P	C	Continuous Internal Assessment	End Exam	Total
		3	-	-	3	30	70	100
Sessional Exam Duration: 2 Hrs						End Exam Duration: 3 Hrs		

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

CO1: Estimate the quantity of sanitary and storm sewage.

CO2: Understand the essential features of various types of sewers and sewer appurtenances.

CO3: Identify the physical, chemical and biological properties of waste water.

CO4: Analyze and design the unit operations for waste water treatment.

CO5: Acquire an ability to manage Municipal Solid Waste.

UNIT – I

Introduction: Systems of sanitation–Classification of sewerage systems – Principles of house drainage – Plumbing systems.

Estimation of Sewage: Estimation of quantity of sewage – Fluctuations in quantity of sewage – Storm water quantity estimation – Time of concentration and its significance in the design of storm sewer.

UNIT – II

Design of Sewerage System

Preliminary survey and preparation of plans for a sewerage scheme – Selection of site for out fall – Design of sewers – Hydraulics of partially flowing sewer – Self cleaning velocity – Shield expression for self cleaning velocity – Permissible velocities and gradients – Shapes and materials of sewers

UNIT – III

Characteristics of Domestic Waste Water: Cycles of decomposition – Sampling and analysis of domestic waste water for Physical and chemical Characteristics – B.O.D equation.

Disposal of Domestic Waste Water: Disposal by dilution – Self purification of water bodies - Zones of river pollution – Dissolved oxygen sag curve and its significance – On land disposal, sewage farming – Sewage sickness and remedial measures.

UNIT – IV

Primary Treatment: Layout and general outline of various units in a domestic waste water treatment plant – Principle, working and design of screens, grit chambers, sedimentation tanks.

Biological Treatment: Principle, working and design of trickling filters (standard and high rate) – Activated sludge process – Oxidation ditch – Oxidation ponds – Working and design of septic tank– Sludge digestion tank – Sludge utilisation and disposal.

UNIT – V

Urban Solid Waste Management

Types, sources, quantity and composition of urban solid waste – Collection, transportation, recovery & reuse – Disposal methods such as composting, incineration, sanitary landfill.

Text Books:

1. Santosh Kumar Garg, *Environmental Engineering Vol.2*, Khanna Publishers.

2. P.N.Modi, *Sewage Treatment and Disposal and Waste Water Engineering*, Standard book house.

3. H.W.Peavy, D.G. Rowe and George Tchobanoglaus, *Environmental Engineering*, Tata McGraw Hill.

Reference Books:

1. Metcalf and Eddy, *Waste Water treatment, Disposal and Reuse*, Tata McGraw Hill.

2. Sawyer and McCarthy, *Chemistry for Environmental Engineering*, Tata McGraw Hill.

3. *CPHEEO*, Ministry of Urban Development, *Manual on Sewerage and Sewage Treatment*, New Delhi.

4. Mark J. Hammer & Mark J. Hammer Jr., *Water and Waste Water Technology*, Prentice Hall India (P) Ltd, New Delhi.

Question Paper Pattern:

Sessional Exam: The question paper for Sessional Examination shall be for 40 marks. The question paper shall consist of Four Questions and all questions are compulsory. Question No.1 contains Five short answer questions (2marks each) for a total of 10 marks. Remaining Three Questions shall be EITHER/OR type descriptive questions for 10 marks each. Each of these descriptive questions may contain sub-questions.

End Exam: The question paper for End Examination shall be for 70 marks. The question paper shall contain Six Questions and all questions are compulsory. Question No.1 shall contain Ten short answer questions (2 marks each) for a total of 20 marks, with Two short answer questions from each unit. Remaining Five Questions (each question covering one unit of syllabus) carrying 10 marks each shall be EITHER/OR type descriptive questions and may contain sub-questions.

GEOGRAPHICAL INFORMATION SYSTEMS (GIS)

<table>
<tr><td colspan="5">VII Semester : CE</td><td colspan="4">Scheme : 2023</td></tr>
<tr><td>Course Code</td><td>Category</td><td colspan="3">Hours/Week</td><td>Credits</td><td colspan="3">Maximum Marks</td></tr>
<tr><td rowspan="2">CE408</td><td rowspan="2">PE</td><td>L</td><td>T</td><td>P</td><td>C</td><td>Continuous Internal Assessment</td><td>End Exam</td><td>Total</td></tr>
<tr><td>3</td><td>-</td><td>-</td><td>3</td><td>30</td><td>70</td><td>100</td></tr>
<tr><td colspan="5">Sessional Exam Duration: 2 Hrs</td><td colspan="4">End Exam Duration: 3 Hrs</td></tr>
<tr><td colspan="9"></td></tr>
<tr><td colspan="9">Course Outcomes : At the end of the course the student will be able to</td></tr>
<tr><td colspan="9">CO1: Analyze the Photogrammetry, EDM and Total station techniques for aerial and land surveying.</td></tr>
<tr><td colspan="9">CO2: Understand the remote sensing techniques and interpretation methods.</td></tr>
<tr><td colspan="9">CO3: Understand the importance of maps and map projections.</td></tr>
<tr><td colspan="9">CO4: Analyze data models and spatial analysis techniques for diverse applications.</td></tr>
<tr><td colspan="9">CO5: Understand the principles used in GNSS and Drone surveying, data collection methods, error in observations and corrections.</td></tr>
<tr><td colspan="9">UNIT – I</td></tr>
<tr><td colspan="9">Aerial Photogrammetry: Stereoscopy – 3-D Model – Height determination using Parallax Bar – Digital Elevation Model (DEM) – Slope.
Land Surveying: Various Levels – Levelling methods – Total Station – EDM – Working principle – Parts of Total Station – Capabilities and applications of Total Station – Traversing – Triangulation and Trilateration.</td></tr>
<tr><td colspan="9">UNIT – II</td></tr>
<tr><td colspan="9">Remote Sensing: Basic concept – Electromagnetic spectrum – Spectral signature – Resolutions – Spectral. Spatial, Temporal and Radiometric – Platforms and Sensors – Remote Sensing Data Products – PAN – Multispectral, Microwave, Thermal, Hyper spectral – Visual and digital interpretation methods.</td></tr>
<tr><td colspan="9">UNIT – III</td></tr>
<tr><td colspan="9">Maps: Importance of maps to engineering projects – Types of maps – Scales and uses – Plotting accuracy – Map sheet numbering – Coordinate systems – Cartesian and geographical, map projections, map datum – MSL, Geoid, Spheroid, WGS-84.</td></tr>
<tr><td colspan="9">UNIT – IV</td></tr>
<tr><td colspan="9">GIS: Introduction – Data Sources – Data Models and Data Structures – Algorithms, DBMS – Creation of Databases (spatial and non-spatial) – Spatial analysis – Interpolation – Buffer, Overlay – Terrain Modelling and Network analysis.
Remote Sensing and GIS Applications: Land use / Land cover classification – Rainfall-runoff studies – Flood and drought impact assessment and monitoring – Regional and urban planning and management – GIS based highway alignment.</td></tr>
<tr><td colspan="9">UNIT – V</td></tr>
<tr><td colspan="9">GNSS: Principle used – Components of GNSS – Data collection methods – DGPS – Errors in observations and corrections.
Drone Surveying: Working principle – Benefits of drones in surveying – Applications – Interior and exterior drone surveying – Calculation of length, area and stockpile volume.</td></tr>
<tr><td colspan="9">Text Books:</td></tr>
<tr><td colspan="9">1. M. Anji Reddy, Text Book of Remote Sensing and Geographic Information System, B S</td></tr>
</table>

Publication.
2. Lo C.P. & Yeung A.K.W., *Concepts and Techniques of GIS*, Prentice Hall of India, New Delhi.
3. Thomas Lillesand, Ralph W Kiefer and Jonathan Chipman, *Remote Sensing and Image Interpretation*, John Wiley & Sons, India.
4. Hofmann-Wellenhof, Lichtennegger and Wasle, *GNSS: Global Navigation Satellite Systems*, Springer -Verlag Wein, New York.

Reference Books:

1. B. Bhatta, *Remote sensing and Geographic Information System*, Oxford Publications.
2. Siddiqui M.A., *Introduction to Geographical Information System*, Sharda Pustak Bhavan, Allahabad.
3. Curran, Paul J, *Principles of Remote Sensing*, Longman, London.
4. Floyd F Sabins Jr., *Remote Sensing Principles and Interpretation*, Freeman and Co., San Francisco.

Web References:

1. https://nptel.ac.in/courses/105/101/105101206/
2. https://nptel.ac.in/courses/105107155
3. https://nptel.ac.in/courses/105/107/105107194/

Question Paper Pattern:

Sessional Exam: The question paper for Sessional Examination shall be for 40 marks. The question paper shall consist of Four Questions and all questions are compulsory. Question No.1 contains Five short answer questions (2marks each) for a total of 10 marks. Remaining Three Questions shall be EITHER/OR type descriptive questions for 10 marks each. Each of these descriptive questions may contain sub-questions.

End Exam: The question paper for End Examination shall be for 70 marks. The question paper shall contain Six Questions and all questions are compulsory. Question No.1 shall contain Ten short answer questions (2 marks each) for a total of 20 marks, with Two short answer questions from each unit. Remaining Five Questions (each question covering one unit of syllabus) carrying 10 marks each shall be EITHER/OR type descriptive questions and may contain sub-questions.

GROUND IMPROVEMENT TECHNIQUES (GIT)

<table>
<tr><td colspan="5">VII Semester : CE</td><td colspan="4">Scheme : 2023</td></tr>
<tr><td>Course Code</td><td>Category</td><td colspan="3">Hours/Week</td><td>Credits</td><td colspan="3">Maximum Marks</td></tr>
<tr><td rowspan="2">CE409</td><td rowspan="2">PE</td><td>L/D</td><td>T</td><td>P</td><td>C</td><td>Continuous Internal Assessment</td><td>End Exam</td><td>Total</td></tr>
<tr><td>3</td><td>-</td><td>-</td><td>3</td><td>30</td><td>70</td><td>100</td></tr>
<tr><td colspan="5">Sessional Exam Duration : 2 Hrs</td><td colspan="4">End Exam Duration: 3 Hrs</td></tr>
<tr><td colspan="9"></td></tr>
<tr><td colspan="9">Course Outcomes : At the end of the course the student will be able to</td></tr>
<tr><td colspan="9">CO1: Explain the methods of dewatering and grouting and their importance in foundation engineering.</td></tr>
<tr><td colspan="9">CO2: Analyze densification techniques for granular and cohesive soils to enhance soil strength.</td></tr>
<tr><td colspan="9">CO3: Evaluate the effectiveness of soil stabilization methods for different ground conditions.</td></tr>
<tr><td colspan="9">CO4: Apply reinforced earth principles and geosynthetics for soil retention and foundation stability.</td></tr>
<tr><td colspan="9">CO5: Assess expansive soil problems, their identification methods, and suitable foundation techniques like under-reamed piles.</td></tr>
<tr><td colspan="9">UNIT – I</td></tr>
<tr><td colspan="9">Expansive Soils
Problems of expansive soils – Tests for identification – Methods of determination of swell pressure – Improvement of expansive soils – Foundation techniques in expansive soils – Under reamed piles.</td></tr>
<tr><td colspan="9">UNIT – II</td></tr>
<tr><td colspan="9">Dewatering:
Methods of dewatering – Sumps and interceptor ditches – Single, multi stage well points – Vacuum well points – Horizontal wells – Foundation drains – Blanket drains – Criteria for selection of fill material around drains – Electro-osmosis .
Grouting:
Objectives of grouting – Grouts and their p roperties – Grouting methods – Ascending, descending and stage grouting – Hydraulic fracturing in soils and rocks – Post grout test.</td></tr>
<tr><td colspan="9">UNIT – III</td></tr>
<tr><td colspan="9">Densification Methods in Granular Soils:
In-situ densification methods in granular soils – Vibration at the ground surface – Impact at the ground surface – Vibration at depth – Impact at depth.
Densification Methods in Cohesive Soils:
In- situ densification methods in cohesive soils – P reloading or dewatering – V ertical drains – Sand drains – Sand wick geodrains – Stone and lime columns – Thermal methods.</td></tr>
<tr><td colspan="9">UNIT – IV</td></tr>
<tr><td colspan="9">Stabilization
Methods of stabilization – Mechanical – Cement – Lime – Bituminous – Chemical stabilization with calcium chloride, sodium silicate and gypsum.</td></tr>
<tr><td colspan="9">UNIT – V</td></tr>
<tr><td colspan="9">Reinforced Earth:
Principles – Components of reinforced earth – Factors governing design of reinforced earth walls – Design principles of reinforced earth walls.</td></tr>
</table>

Geosynthetics:
Geotextiles – Types, functions and applications – Geogrids and Geo-membranes – Functions and applications.

Text Books

1. Haussmann M.R., *Engineering Principles of Ground Modification*, McGraw Hill International Edition (1990).
2. P. Purushotham Raj, *Ground Improvement Techniques*, Laxmi Publications, New Delhi, University Science Press, New Delhi, 2nd edition 2016.

Reference Books

1. Moseley M.P. Blackie Academic and Professional, *Ground Improvement*, Boca Taton, Florida, USA, (1993).
2. Nihar Ranajan Patra, *Ground Improvement Techniques,* Vikas Publications, New Delhi.
3. Xanthakos P.P, Abramson, L.W and Brucwe, D.A, *Ground Control and Improvement*, John Wiley and Sons, New York, USA, (1994).

Question Paper Pattern:

Sessional Exam: The question paper for Sessional Examination shall be for 40 marks. The question paper shall consist of Four Questions and all questions are compulsory. Question No.1 contains Five short answer questions (2marks each) for a total of 10 marks. Remaining Three Questions shall be EITHER/OR type descriptive questions for 10 marks each. Each of these descriptive questions may contain sub-questions.

End Exam: The question paper for End Examination shall be for 70 marks. The question paper shall contain Six Questions and all questions are compulsory. Question No.1 shall contain Ten short answer questions (2 marks each) for a total of 20 marks, with Two short answer questions from each unit. Remaining Five Questions (each question covering one unit of syllabus) carrying 10 marks each shall be EITHER/OR type descriptive questions and may contain sub-questions.

SUBSURFACE INVESTIGATION AND INSTRUMENTATION (SII)

<table>
<tr><td colspan="5">VII Semester : CE</td><td colspan="4">Scheme : 2023</td></tr>
<tr><td>Course Code</td><td>Category</td><td colspan="3">Hours/Week</td><td>Credits</td><td colspan="3">Maximum Marks</td></tr>
<tr><td rowspan="2">CE410</td><td rowspan="2">PE</td><td>L/D</td><td>T</td><td>P</td><td>C</td><td>Continuous Internal Assessment</td><td>End Exam</td><td>Total</td></tr>
<tr><td>3</td><td>-</td><td>-</td><td>3</td><td>30</td><td>70</td><td>100</td></tr>
<tr><td colspan="5">Sessional Exam Duration : 2 Hrs</td><td colspan="4">End Exam Duration: 3 Hrs</td></tr>
<tr><td colspan="9"></td></tr>
<tr><td colspan="9">Course Outcomes : At the end of the course the student will be able to</td></tr>
<tr><td colspan="9">CO1: Explain soil formation processes, classification methods, and stratification phenomena.</td></tr>
<tr><td colspan="9">CO2: Analyze soil exploration methods and sampling techniques for various geotechnical applications.</td></tr>
<tr><td colspan="9">CO3: Evaluate borehole logging, groundwater observations, and their influence on soil properties.</td></tr>
<tr><td colspan="9">CO4: Apply field testing procedures, including penetration tests and geophysical methods, to assess subsurface conditions.</td></tr>
<tr><td colspan="9">CO5: Assess soil exploration report writing and field instrumentation techniques for site investigations.</td></tr>
<tr><td colspan="9">UNIT – I</td></tr>
<tr><td colspan="9">Introduction
Soil formation – Types of soils – Physical and chemical weathering – Soil transport – Deposition and stratification phenomena and soil classification.</td></tr>
<tr><td colspan="9">UNIT – II</td></tr>
<tr><td colspan="9">Methods of Soil Exploration
Methods of boring – Auguring and drilling – Machinery used for drilling – Types of augers and their usage for various projects – Soil sampling – Sampling methods – Types of samples – Storage of samples and their transport – Sample preparation – Sample sizes – Types of sampler’s specifications for testing.</td></tr>
<tr><td colspan="9">UNIT – III</td></tr>
<tr><td colspan="9">Borehole Logging
Logging of boreholes – Logging methods – Groundwater observations – Water table fluctuations and effects – Preparation of soil profiles and exploration report.</td></tr>
<tr><td colspan="9">UNIT – IV</td></tr>
<tr><td colspan="9">Field Testing of Soils
Methods and specifications – Visual identification tests – Standard Penetration Test (SPT) – Plate Load Test (PLT) – Pressure Meter Test (PMT) – Dilatometer Test (DMT) – Vane Shear Test (VST) – Cone Penetration Test (CPT) – Becker Penetration Test (BPT), Analysis of test results – Geophysical methods of soil exploration – Seismic refraction, Electrical resistivity – Cross hole test.</td></tr>
<tr><td colspan="9">UNIT – V</td></tr>
<tr><td colspan="9">Report Writing
Soil exploration reports – Identification, calculations and preparation – Field instrumentation: strain gauges, piezometer, pressure cells, inclinometers, proving ring, load cells, displacement gauges.</td></tr>
<tr><td colspan="9">Text Books</td></tr>
</table>

1. Clayton C. R., Matthews M. C and Simons N. E., *Site Investigation,* Blackwell Science, 2005.
2. John Dunn Cliff, *Geotechnical Instrumentation for Monitoring Field Performance*, Wiley Interscience, 2008.

Reference Books

1. A.S. Rao and Gopal Ranjan, *Basic and Applied Soil Mechanics*, New Age International.
2. IS:1892 - *Code of Practice for subsurface investigation for foundation*, 1979.
3. IS: SP36 Part 1- Compendium of India Standards on Soil Engineering-Laboratory. Testing of Soils for Civil Engineering Purposes, 1987.
4. IS: SP36 Part 2 - Compendium of India Standards on Soil Engineering-Field Testing of Soils for Civil Engineering Purposes, 1988.

Question Paper Pattern:

Sessional Exam: The question paper for Sessional Examination shall be for 40 marks. The question paper shall consist of Four Questions and all questions are compulsory. Question No.1 contains Five short answer questions (2marks each) for a total of 10 marks. Remaining Three Questions shall be EITHER/OR type descriptive questions for 10 marks each. Each of these descriptive questions may contain sub-questions.

End Exam: The question paper for End Examination shall be for 70 marks. The question paper shall contain Six Questions and all questions are compulsory. Question No.1 shall contain Ten short answer questions (2 marks each) for a total of 20 marks, with Two short answer questions from each unit. Remaining Five Questions (each question covering one unit of syllabus) carrying 10 marks each shall be EITHER/OR type descriptive questions and may contain sub-questions.

TRANSPORTATION ECONOMICS (TEco)

VII Semester : CE						Scheme : 2023		
Course Code	Category	Hours/Week			Credits	Maximum Marks		
		L/D	T	P	C	Continuous Internal Assessment	End Exam	Total
CE411	PE	3	-	-	3	30	70	100
Sessional Exam Duration : 2 Hrs						End Exam Duration: 3 Hrs		

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

CO1: Describe the overall process of transportation project development and financial planning.

CO2: Analyze transportation cost structures, including demand and supply elasticity.

CO3: Evaluate vehicle operating costs and traffic congestion pricing strategies.

CO4: Apply economic analysis techniques to assess the feasibility of transportation projects.

CO5: Assess financial models, PPP strategies, and risk analysis for road projects.

UNIT – I

Transportation Decision Making Concept

Overall transportation project development – Budgeting – Financial planning – The process of transportation project development – Models associated with transportation impact evaluation professional ethics.

UNIT – II

Transportation Costs

Classification of transportation costs – Transportation agency costs – Transportation user costs – General structure and behavior of cost functions and road pricing – Estimating transportation demand and supply – Supply equilibration – Dynamics of transportation demand and supply – Elasticity of travel demand and supply – Classification of elasticity.

UNIT – III

Vehicle Operating Costs

Fuel costs – Maintenance and spares – Depreciation – Crew costs – Value of travel time savings – Accident costs – Economics of traffic congestion – Pricing policy.

UNIT – IV

Economic Analysis of Projects

Principles of economic analysis – Methods of evaluation – Cost-benefit ratio, first year rate of return, net present value, and internal-rate of return methods – Indirect costs and benefits of transport projects.

UNIT – V

Financing of Road Projects

Methods – Private Public Partnership (PPP) – Toll collection – Economic viability of design – Build-Operate-Transfer (BOT) schemes – Risk analysis – Value for money analysis – Case studies.

Text Books

1. Winfrey, *Economic Analysis for Highways*, International Textbook Company, Pennsylvania.

2. Sarkar, P. K., and Maitri, V., *Economics in Highway and Transportation Planning*, Standard Publisher, New Delhi, 2010.

Reference Books

1. IRC, *Manual on Economic Evaluation of Highway Projects in India*, SP30, 2024.
2. David, H., and Brewer, A., *Transport: An Economics and Management Perspective*, Oxford University Press, UK, 2000.
3. Quinet, E., and Vickerman, R., *Principles of Transport Economics*, Edward Elgar Publication, 2005.
4. Button, K. J., *Transport Economics*, Elgar, 2010.

Question Paper Pattern:

Sessional Exam: The question paper for Sessional Examination shall be for 40 marks. The question paper shall consist of Four Questions and all questions are compulsory. Question No.1 contains Five short answer questions (2marks each) for a total of 10 marks. Remaining Three Questions shall be EITHER/OR type descriptive questions for 10 marks each. Each of these descriptive questions may contain sub-questions.

End Exam: The question paper for End Examination shall be for 70 marks. The question paper shall contain Six Questions and all questions are compulsory. Question No.1 shall contain Ten short answer questions (2 marks each) for a total of 20 marks, with Two short answer questions from each unit. Remaining Five Questions (each question covering one unit of syllabus) carrying 10 marks each shall be EITHER/OR type descriptive questions and may contain sub-questions.

Open Elective – I

S. No.	Subject Code	Course Name	Offering Department	Eligible Branches
1	OE501	Green Buildings	CE	All Branches
2	OE502	Construction Technology and Management	CE	All Branches Except CE
3	OE503	Electrical Safety Practices and Standards	EEE	All Branches Except EEE
4	OE504	Sustainable Energy Technologies	ME	All Branches Except ME
5	OE505	Electronic Circuits	ECE	All Branches Except ECE
6	OE506	Java Programming	CSE	CE,EEE,ME, and ECE
7	OE507	Foundation of Artificial Intelligence	CSE	CE,EEE, and ECE
8	OE508	Ethical Hacking	CSE	All Branches
9	OE509	Mathematics for Machine Learning and AI	HBS	All Branches
10	OE510	Materials Characterization Techniques		
11	OE511	Chemistry of Energy Systems		
12	OE512	English for Competitive Examinations		
13	OE513	Entrepreneurship and New Venture Creation		

GREEN BUILDINGS (GB)

<table>
<tr><td colspan="5">V Semester : All Branches</td><td colspan="4">Scheme : 2023</td></tr>
<tr><td>Course Code</td><td>Category</td><td colspan="3">Hours/Week</td><td>Credits</td><td colspan="3">Maximum Marks</td></tr>
<tr><td rowspan="2">OE501</td><td rowspan="2">OE-I</td><td>L/D</td><td>T</td><td>P</td><td>C</td><td>Continuous Internal Assessment</td><td>End Exam</td><td>Total</td></tr>
<tr><td>3</td><td>-</td><td>-</td><td>3</td><td>30</td><td>70</td><td>100</td></tr>
<tr><td colspan="5">Sessional Exam Duration : 2 Hrs</td><td colspan="4">End Exam Duration: 3 Hrs</td></tr>
<tr><td colspan="9"></td></tr>
<tr><td colspan="9">Course Outcomes: At the end of the course the student will be able to</td></tr>
<tr><td colspan="9">CO1: Understand the importance of green buildings, their necessity, and sustainable features.</td></tr>
<tr><td colspan="9">CO2: Analyze various green building practices, rating systems, and their impact on environmental sustainability.</td></tr>
<tr><td colspan="9">CO3: Apply principles of green building design to enhance energy efficiency and incorporate renewable energy sources.</td></tr>
<tr><td colspan="9">CO4: Evaluate HVAC systems, energy-efficient air conditioning techniques, and their role in sustainable building design.</td></tr>
<tr><td colspan="9">CO5: Assess material conservation techniques, waste reduction strategies, and indoor air quality in green buildings.</td></tr>
<tr><td colspan="9">UNIT – I</td></tr>
<tr><td colspan="9">Introduction to Green Building
Necessity of green buildings – Benefits of green buildings – Green building materials and equipment in India – Key requisites for constructing a green building – Important sustainable features for green buildings.</td></tr>
<tr><td colspan="9">UNIT – II</td></tr>
<tr><td colspan="9">Green Building Concepts and Practices:
Indian green building council – Green building movement in India – Benefits experienced in green buildings – Green building rating systems – Residential sector – Market transformation.

Green Building Opportunities and Benefits:
Opportunities of green buildings – Green building features – Material and resources – Water efficiency – Optimum energy efficiency – Typical energy-saving approaches in buildings – LEED India rating system, and energy efficiency.</td></tr>
<tr><td colspan="9">UNIT – III</td></tr>
<tr><td colspan="9">Green Building Design
Introduction – Reduction in energy demand – Onsite sources and sinks – Maximizing system efficiency – Steps to reduce energy demand and use onsite sources and sinks – Use of renewable energy sources – Eco-friendly captive power generation for factories – Building requirements.</td></tr>
<tr><td colspan="9">UNIT – IV</td></tr>
<tr><td colspan="9">Air Conditioning
Introduction – CII Godrej green business centre – Design philosophy – Design interventions – Energy modeling – HVAC system design – Chiller selection – Pump selection – Selection of cooling towers – Selection of air handling units – Pre-cooling of fresh air – Interior lighting systems – Key features of the building – Eco-friendly captive power generation for factories – Building requirements.</td></tr>
</table>

UNIT – V

***Material Conservation**:*
Handling of non-process waste – Waste reduction during construction – Materials with recycled content – Local materials – Material reuse – Certified wood – Rapidly renewable building materials and furniture.

Indoor Environment Quality and Occupational Health:
Air conditioning – Indoor air quality – Sick building syndrome – Tobacco smoke.

Text Books

1. Handbook on Green Practices published by Indian Society of Heating Refrigerating and Air conditioning Engineers, 2009.
2. Tomwoolley and Samkimings, *Green Building Hand Book*, 2009.

Reference Books

1. Trish Riley, *Complete Guide to Green Buildings*.
2. Kent Peterson, *Standard for the Design for High Performance Green Buildings*, 2009.
3. Energy Conservation Building Code–ECBC-2020, Published by BEE.
4. K S Jagadeesh, B V Venkata Rama Reddy & K S Nanjunda Rao, *Alternative Building Materials and Technologies*, New Age International Publishers .
5. D S Chauhan and S K Sreevasthava, *Non-conventional Energy Resources*, New Age International Publishers.

Online Learning Resources

1. https://archive.nptel.ac.in/courses/105/102/105102195/
2. {"https://igbc.in/resources"}, {http://grihaindia.org}

Question Paper Pattern:

Sessional Exam: The question paper for Sessional Examination shall be for 40 marks. The question paper shall consist of Four Questions and all questions are compulsory. Question No.1 contains Five short answer questions (2marks each) for a total of 10 marks. Remaining Three Questions shall be EITHER/OR type descriptive questions for 10 marks each. Each of these descriptive questions may contain sub-questions.

End Exam: The question paper for End Examination shall be for 70 marks. The question paper shall contain Six Questions and all questions are compulsory. Question No.1 shall contain Ten short answer questions (2 marks each) for a total of 20 marks, with Two short answer questions from each unit. Remaining Five Questions (each question covering one unit of syllabus) carrying 10 marks each shall be EITHER/OR type descriptive questions and may contain sub-questions.

CONSTRUCTION TECHNOLOGY AND MANAGEMENT (CTM)

V Semester : All Branches except CE					Scheme : 2023			
Course Code	Category	Hours/Week			Credits	Maximum Marks		
OE502	OE-I	L/D	T	P	C	Continuous Internal Assessment	End Exam	Total
		3	-	-	3	30	70	100
Sessional Exam Duration : 2 Hrs					End Exam Duration: 3 Hrs			

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

CO1: Understand (Cos) project management fundamentals, organizational structures, and leadership principles in construction.

CO2: Solve and formulate network analysis in CPM and PERT networks.

CO3: Understand the structure of organization and resource allocation.

CO4: Evaluate various contract types, contract formation, and legal aspects in construction management.

CO5: Assess safety management practices, accident prevention strategies, and quality management systems in construction.

UNIT – I

Introduction: Management objectives and functions – Stages of project management – Types of organization – Organizational chart of a construction company – Team of construction unit – Manager's duties and responsibilities.

Construction Planning and Scheduling: Objectives and importance of planning and scheduling – Methods of planning and scheduling.

UNIT – II

Network Techniques in Construction Management: Elements of network – Network techniques – Breakdown structures – Representation and specifying of activities and events – Rules for network.

Critical Path Method (CPM): Introduction – Difference between CPM and PERT – Time estimates – Float – Critical path – Network analysis and computation problems.

UNIT – III

Program Evaluation and Review Technique (PERT): Introduction – Time estimates – Slack – Critical path – Network analysis and computation problems.

Cost–Time Analysis in Net Work Planning: Importance of time – Project cost analysis in network planning – Updating – Resources allocation.

UNIT – IV

Tenders and Contracts: Type of tenders – Principles of tendering – Notice inviting tender – Contracts definition – Essentials – Types – Documents – Conditions of contracts.

Arbitration: Definition – Arbitrator – Arbitration agreement – Qualification of arbitrator – Advantages of arbitration.

UNIT – V

Safety Management: Implementation and Application of QMS – ISO 9000 Series – Accident theories – Cost of accidents – Problem areas in construction safety – Fall protection – Incentives – Zero accident concepts – Planning for safety.

Text Books

1. SK. Sears, GA. Sears, RH. Clough, *Construction Project Management*, John Wiley and

Sons, 6th Edition, 2016.
2. Saleh Mubarak, *Construction Project Scheduling and Control*, 4th Edition, 2019.
3. Pandey, I.M, *Financial Management*, Pearson India Education Services Pvt. Ltd., 12th edition, 2021.

Reference Books

1. Brien, J.O. and Plotnick, F.L., *CPM in Construction Management,* McGraw Hill, 2010.
2. Punmia, B.C., and Khandelwal, K.K., *Project Planning and control with PERT and CPM*, Laxmi Publications, 2002.
3. Stephens Nunnally, *Construction Methods and Management*, Pearson New International Edition 8th Edition.
4. Rhoden, M and Cato B, *Construction Management and Organisational Behaviour*, Wiley-Blackwell, 2016.

Online Learning Resources

1. https://archive.nptel.ac.in/courses/105/104/105104161/
2. https://archive.nptel.ac.in/courses/105/103/105103093/

Question Paper Pattern:

Sessional Exam: The question paper for Sessional Examination shall be for 40 marks. The question paper shall consist of Four Questions and all questions are compulsory. Question No.1 contains Five short answer questions (2marks each) for a total of 10 marks. Remaining Three Questions shall be EITHER/OR type descriptive questions for 10 marks each. Each of these descriptive questions may contain sub-questions.

End Exam: The question paper for End Examination shall be for 70 marks. The question paper shall contain Six Questions and all questions are compulsory. Question No.1 shall contain Ten short answer questions (2 marks each) for a total of 20 marks, with Two short answer questions from each unit. Remaining Five Questions (each question covering one unit of syllabus) carrying 10 marks each shall be EITHER/OR type descriptive questions and may contain sub-questions.

ELECTRICAL SAFETY PRACTICES AND STANDARDS (ESPS)

V Semester : All Branches except EEE					Scheme : 2023			
Course Code	Category	Hours/Week			Credits	Maximum Marks		
OE503	OE-I	L/D	T	P	C	Continuous Internal Assessment	End Exam	Total
		3	-	-	3	30	70	100
Sessional Exam Duration : 2 Hrs					End Exam Duration: 3 Hrs			

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

CO1: Understanding the fundamentals of electrical safety.

CO2: Identifying and applying safety components.

CO3: Analyzing grounding practices and electrical bonding.

CO4: Applying safety practices in electrical installations and environments.

CO5: Evaluating electrical safety standards and regulatory compliance.

UNIT – I

Introduction to Electrical Safety

Fundamentals of electrical safety – Electric shock – Physiological effects of electric current – Safety requirements – Hazards of electricity – ARC – Blast – Causes for electrical failure.

UNIT – II

Safety Components

Introduction to conductors and insulators – Voltage classification – Safety against over voltages – Safety against static electricity – Electrical safety equipment‘s – Fire extinguishers for electrical safety.

UNIT – III

Grounding

General requirements for grounding and bonding – Definitions – System grounding – Equipment grounding – The earth – Earthing practices – Determining safe approach distance – Determining arc hazard category.

UNIT – IV

Safety Practices

General first aid – Safety in handling hand held electrical appliances tools – Electrical safety in train stations – Swimming pools – External lighting installations – Medical locations – Case studies.

UNIT – V

Standards for Electrical Safety

Electricity Acts – Rules & regulations – Electrical standards – NFPA 70 E-OSHA standards – IEEE standards – National Electrical Code 2005 – National Electric Safety Code NESC – Statutory requirements from electrical inspectorate.

Text Books

1. Massimo A.G. Mitolo, *Electrical Safety of Low-Voltage Systems*, McGraw Hill, USA, 2009.

2. Mohamed El-Sharkawi, *Electric Safety - Practice and Standards*, CRC Press, USA, 2014.

Reference Books

1. Kenneth G. Mastrullo, Ray A. Jones, *The Electrical Safety Program Book*, Jones and Bartlett Publishers, London, 2nd Edition, 2011.

2. Palmer Hickman, *Electrical Safety-Related Work Practices*, Jones & Bartlett Publishers, London, 2009.

3. Fordham Cooper, W., *Electrical Safety Engineering*, Butterworth and Company, London, 1986.

4. John Cadick, Mary Capelli-Schellpfeffer, Dennis K. Neitzel, *Electrical Safety Hand Book*, McGraw-Hill, New York, USA, 4th edition, 2012.

Online Learning Resources

1. https://onlinecourses.swayam2.ac.in/nou25_ec08/preview

Question Paper Pattern:

Sessional Exam: The question paper for Sessional Examination shall be for 40 marks. The question paper shall consist of Four Questions and all questions are compulsory. Question No.1 contains Five short answer questions (2marks each) for a total of 10 marks. Remaining Three Questions shall be EITHER/OR type descriptive questions for 10 marks each. Each of these descriptive questions may contain sub-questions.

End Exam: The question paper for End Examination shall be for 70 marks. The question paper shall contain Six Questions and all questions are compulsory. Question No.1 shall contain Ten short answer questions (2 marks each) for a total of 20 marks, with Two short answer questions from each unit. Remaining Five Questions (each question covering one unit of syllabus) carrying 10 marks each shall be EITHER/OR type descriptive questions and may contain sub-questions.

SUSTAINABLE ENERGY TECHNOLOGIES (SET)

V Semester : All Branches except ME					Scheme : 2023			
Course Code	Category	Hours/Week			Credits	Maximum Marks		
		L/D	T	P	C	Continuous Internal Assessment	End Exam	Total
OE504	OE-I	3	-	-	3	30	70	100
Sessional Exam Duration : 2 Hrs					End Exam Duration: 3 Hrs			

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

CO1: Illustrate the importance of solar radiation and solar PV modules.

CO2: Discuss the storage methods in PV systems.

CO3: Explain the solar energy storage for different applications.

CO4: Understand the principles of wind energy, and bio-mass energy.

CO5: Attain knowledge in geothermal energy, ocean energy and fuel cells.

UNIT – I

***Solar Radiation*:**

Role and potential of new and renewable sources – The solar energy option – Environmental impact of solar power – Structure of the sun – The solar constant – Sun-earth relationships – Coordinate systems and coordinates of the sun – Extraterrestrial and terrestrial solar radiation – Solar radiation on titled surface – Instruments for measuring solar radiation and sun shine – Solar radiation data – Numerical problems.

***Solar PV Modules and PV Systems*:**

PV module circuit design – Module structure – Packing density – Interconnections – Mismatch and temperature effects – Electrical and mechanical insulation – Lifetime of PV modules – Degradation and failure – PV module parameters – Efficiency of PV module – Solar PV systems – Design of off grid solar power plant – Installation and maintenance.

UNIT – II

Storage in PV Systems

Battery operation – Types of batteries – Battery parameters – Application and selection of batteries for solar PV system – Battery maintenance and measurements – Battery installation for PV system.

UNIT – III

Solar Energy Collection:

Flat plate and concentrating collectors – Classification of concentrating collectors – Orientation.

Solar Energy Storage and Applications:

Different methods – Sensible, latent heat and stratified storage – Solar ponds – Solar applications – Solar heating/cooling technique – Solar distillation and drying – Solar cookers – Central power tower concept and solar chimney.

UNIT – IV

Wind Energy:

Sources and potentials – Horizontal and vertical axis windmills – Performance characteristics – Betz criteria – Types of winds – Wind data measurement.

Bio-Mass:

Principles of bio-conversion – Anaerobic/aerobic digestion – Types of bio-gas digesters –

Gas yield – Utilization for cooking – Bio fuels – I.C. engine operation and economic aspects.

UNIT – V

Geothermal Energy:
Origin – Applications – Types of geothermal resources – Relative merits. Ocean energy: Ocean thermal energy – Open cycle & closed cycle – OTEC plants – Environmental impacts – Challenges.

Fuel Cells: Introduction – Applications – Classification – Different types of fuel cells such as phosphoric acid fuel cell – Alkaline fuel cell – PEM fuel cell – MC fuel cell.

Text Books

1. Sukhatme S.P. and J.K.Nayak , *Solar Energy – Principles of Thermal Collection and Storage*, TMH, 2009.
2. Khan B.H, *Non-Conventional Energy Resources*, Tata McGraw Hill, New Delhi, 2006.
3. Twidell & Weir, *Renewable Energy Sources*, Taylor and Francis / 2nd Special Indian Edition, 2006.
4. G.N. Tiwari and M.K. Ghosal, *Fundamentals of Renewable Energy Sources*, Alpha Science International Limited, 2007.

Reference Books

1. D. Yogi Goswami, Frank Krieth& John F Kreider , *Principles of Solar Engineering*, Taylor & Francis, 2015.
2. Ashok V Desai, *Non-Conventional Energy*, New Age International (P) Ltd., 1990.
3. R. Ramesh & K. Uday Kumar, *Renewable Energy Technologies*, Narosa Publishing, 1997.

G.D Roy , *Non-conventional Energy Source*, Standard Publishers, 2004

4. Anjaneyulu & Francis, *Energy Resources Utilization and Technologies*, BS Publications, 2012.
5. Frank Krieth & John F Kreider, *Principles of Solar Energy*, Hemisphere Publications, 2000.

Online Learning Resources

1. https://nptel.ac.in/courses/112106318

Question Paper Pattern:

Sessional Exam: The question paper for Sessional Examination shall be for 40 marks. The question paper shall consist of Four Questions and all questions are compulsory. Question No.1 contains Five short answer questions (2marks each) for a total of 10 marks. Remaining Three Questions shall be EITHER/OR type descriptive questions for 10 marks each. Each of these descriptive questions may contain sub-questions.

End Exam: The question paper for End Examination shall be for 70 marks. The question paper shall contain Six Questions and all questions are compulsory. Question No.1 shall contain Ten short answer questions (2 marks each) for a total of 20 marks, with Two short answer questions from each unit. Remaining Five Questions (each question covering one unit of syllabus) carrying 10 marks each shall be EITHER/OR type descriptive questions and may contain sub-questions.

ELECTRONIC CIRCUITS (EC)

<table>
<tr><td colspan="5">V Semester : All Branches except ECE</td><td colspan="4">Scheme : 2023</td></tr>
<tr><td>Course Code</td><td>Category</td><td colspan="3">Hours/Week</td><td>Credits</td><td colspan="3">Maximum Marks</td></tr>
<tr><td rowspan="2">OE505</td><td rowspan="2">OE-I</td><td>L/D</td><td>T</td><td>P</td><td>C</td><td>Continuous Internal Assessment</td><td>End Exam</td><td>Total</td></tr>
<tr><td>3</td><td>-</td><td>-</td><td>3</td><td>30</td><td>70</td><td>100</td></tr>
<tr><td colspan="5">Sessional Exam Duration : 2 Hrs</td><td colspan="4">End Exam Duration: 3 Hrs</td></tr>
<tr><td colspan="9"></td></tr>
<tr><td colspan="9">Course Outcomes : At the end of the course the student will be able to</td></tr>
<tr><td colspan="9">CO1: Illustrate the VI Characteristics of diode and special purpose diodes, design rectifiers, wave shaping circuits and describe the behavior of special purpose diodes.</td></tr>
<tr><td colspan="9">CO2: Explore the operation, configurations, and biasing of BJTs.</td></tr>
<tr><td colspan="9">CO3: Gain knowledge about the operation, analysis, and coupling techniques of BJT amplifiers.</td></tr>
<tr><td colspan="9">CO4: Understand the operation, applications and uses of feedback amplifiers and oscillators.</td></tr>
<tr><td colspan="9">CO5: Analyze the characteristics, configurations, and applications of operational amplifiers.</td></tr>
<tr><td colspan="9">UNIT – I</td></tr>
<tr><td colspan="9">Semiconductor Diode and Applications:
Introduction – PN junction diode – Structure, operation and VI characteristics – Half-wave, full-wave and bridge rectifiers with and without filters – Positive and negative clipping and clamping circuits (Qualitative treatment only).

Special Diodes:
Zener and Avalanche breakdowns – VI Characteristics of Zener diode, Zener diode as voltage regulator – Construction, operation and VI characteristics of tunnel diode – LED, Varactor diode, Photo diode.</td></tr>
<tr><td colspan="9">UNIT – II</td></tr>
<tr><td colspan="9">Bipolar Junction Transistor (BJT):
Principle of operation – Common emitter – Common base and common collector configurations – Transistor as a switch and amplifier – Transistor biasing and stabilization – Operating point – DC & AC load lines – Biasing – Fixed bias, self bias – Bias stability – Bias compensation using diodes.</td></tr>
<tr><td colspan="9">UNIT – III</td></tr>
<tr><td colspan="9">Single Stage Amplifiers:
Classification of amplifiers – Distortion in amplifiers – Analysis of CE, CC and CB configurations with simplified hybrid model.
Multistage Amplifiers:
Different coupling schemes used in amplifiers – RC coupled amplifiers – Transformer coupled amplifier – Direct coupled amplifier – Multistage RC coupled BJT amplifier (Qualitative treatment only).</td></tr>
<tr><td colspan="9">UNIT – IV</td></tr>
<tr><td colspan="9">Feedback Amplifiers:
Concepts of feedback – Classification of feedback amplifiers – Effect of feedback on amplifier characteristics – Voltage Series, Voltage Shunt, Current Series and Current Shunt Feedback Configurations (Qualitative treatment only).
Oscillators:</td></tr>
</table>

Classification of oscillators – Condition for oscillations – RC phase shift oscillators – Generalized analysis of LC oscillators – Hartley and Colpitts oscillators – Wien Bridge oscillator.

UNIT – V

Op-amp:

Classification of IC's – Basic information of Op-amp – Ideal and practical Op-amp – 741 op-amp and its features – Modes of operation-inverting, non-inverting, differential. Applications of op-amp: Summing, scaling and averaging amplifiers, integrator, differentiator, phase shift oscillator and comparator.

Text Books

1. J. Millman and Christos. C. Halkias, *Electronics Devices and Circuits*, 3rd edition, Tata McGraw Hill, 2006.
2. David A. Bell, *Electronics Devices and Circuits Theory*, 5th Edition, Oxford University press. 2008.

Reference Books

1. R.L. Boylestad, Lousis Nashelsky and K. Lal Kishore, *Electronics Devices and Circuits Theory,* 12th edition, Pearson, 2006.
2. N. Salivahanan, and N. Suresh Kumar, *Electronic Devices and Circuits*, 3rd Edition, TMH, 2012.
3. S. Sedra and K.C. Smith, *Microelectronic Circuits*, 5th Edition, Oxford University Press.

Online Learning Resources

Question Paper Pattern:

Sessional Exam: The question paper for Sessional Examination shall be for 40 marks. The question paper shall consist of Four Questions and all questions are compulsory. Question No.1 contains Five short answer questions (2marks each) for a total of 10 marks. Remaining Three Questions shall be EITHER/OR type descriptive questions for 10 marks each. Each of these descriptive questions may contain sub-questions.

End Exam: The question paper for End Examination shall be for 70 marks. The question paper shall contain Six Questions and all questions are compulsory. Question No.1 shall contain Ten short answer questions (2 marks each) for a total of 20 marks, with Two short answer questions from each unit. Remaining Five Questions (each question covering one unit of syllabus) carrying 10 marks each shall be EITHER/OR type descriptive questions and may contain sub-questions.

JAVA PROGRAMMING (JP)

V Semester : CE, EEE, ME, and ECE					Scheme : 2023			
Course Code	Category	Hours/Week			Credits	Maximum Marks		
OE506	OE-I	L/D	T	P	C	Continuous Internal Assessment	End Exam	Total
		3	-	-	3	30	70	100
Sessional Exam Duration : 2 Hrs					End Exam Duration: 3 Hrs			

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

CO1: Analyze problems, design solutions using OOP principles, and implement them efficiently in Java.

CO2: Design and implement classes to model real-world entities, with a focus on attributes, behaviors, and relationships between objects.

CO3: Demonstrate an understanding of inheritance hierarchies and polymorphic behaviour, including method overriding and dynamic method dispatch.

CO4: Apply Competence in handling exceptions and errors to write robust and fault-tolerant code.

CO5: Perform file input/output operations, including reading from and writing to files using Java I/O classes, graphical user interface programming using Java FX.

CO6: Choose appropriate data structure of Java to solve a problem.

UNIT – I

Object Oriented Programming: Basic concepts – Features of Java – Principles – Program structure in Java: Introduction – Writing simple Java programs – Java statements.

***Data Types, Variables, and Operators*:** Introduction – Data types in Java – Declaration of variables – Type casting – Scope of variable identifier – Variables, constants – Scope and lifetime of variables – Operators – Type conversion and casting.

***Introduction to Operators*:** Precedence and associativity of operators – Assignment operator (=), Basic arithmetic operators – Increment (++) and Decrement (--) operators – Ternary operator – Relational operators – Boolean logical operators – Bit-wise logical operators.
***Control Statements*:** Introduction – Control statements – If Nested loops – Switch statement – Iteration statements, while Expression, do–while loop, for loop, Nested for Loop

UNIT – II

Classes and Objects: Introduction to classes – Introduction – Class declaration and modifiers – Class members – Declaration of class objects – Assigning one object to another – Constructor methods for class – Nested classes, Final class and methods, Passing arguments by value and by reference – Keyword this finalize and wrapper classes.

Methods: Introduction – Defining methods – Overloaded methods – Overloaded constructor methods – Class objects as parameters in methods – Access control, Recursive methods – Attributes final and static.

UNIT – III

Arrays: Introduction – Declaration and initialization of arrays – Memory storage & access – array operations – Arrays as vectors – Two dimensional arrays – Arrays of varying lengths – Three dimensional arrays.
Inheritance: Introduction – Access control and types of inheritance – Multilevel and hierarchical inheritance – Final and super keywords – Method overriding – Dynamic method

dispatch – Abstract classes – Interfaces and inheritance.

Interfaces: Introduction – Declaration of interface – Implementation of interface – Default methods in interfaces – Static methods in interface – Functional interfaces – Annotations.

UNIT – IV

Packages and Java Librar *:*

Packages: Introduction – Defining package – Importing packages and classes into programs – Access control – Packages in Java SE – Class object, enumeration, class math, wrapper classes, Java Util classes and interfaces – Formatter class – Random class – Formatting for date/time in Java

Exception Handling: Introduction – Hierarchy of standard exception classes – Keywords throws and throw, try, catch, and finally blocks – Multiple catch clauses – Class throw able, unchecked exceptions – Checked exceptions.

Java I/O and File: Java I/O API – Standard I/O streams, types, byte streams.

UNIT – V

String Handling in Java: Introduction – Interface char sequence – Class string – Methods for extracting characters from strings – Comparison – Modifying – Searching – Class string buffer.

Multithreaded Programming: Introduction – Java thread model – Creating a thread-extending Thread class and implementing runnable interface – Thread life cycle – Thread class methods – Thread priorities – Deadlocks in threads – Thread synchronization and inter thread communication.

Java Database Connectivity*:* Introduction – JDBC architecture – Installing My SQL and My SQL connector/J – JDBC environment setup – Establishing JDBC database connections – Result set interface.

Text Books

1. Anitha Seth, B.L. Juneja, *JAVA One Step Ahead*, Oxford.
2. DebasisSamanta, Monalisa Sarma, *Joy with JAVA, Fundamentals of Object Oriented Programming*, Cambridge, 2023.
3. Paul Deitel, Harvey Deitel, *JAVA 9 for Programmers,* 4th Edition, Pearson.

Reference Books

1. Herbert Schildt, *The Complete Reference Java*, 11th edition, TMH.
2. Y Daniel Liang, *Introduction to Java Programming*, 7th Edition, Pearson.

Online Learning Resources

1. https://nptel.ac.in/courses/106/105/106105191/

https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_01288046454761881634 7 _shared/overview

Question Paper Pattern:

Sessional Exam: The question paper for Sessional Examination shall be for 40 marks. The question paper shall consist of Four Questions and all questions are compulsory. Question No.1 contains Five short answer questions (2marks each) for a total of 10 marks. Remaining Three Questions shall be EITHER/OR type descriptive questions for 10 marks each. Each of these descriptive questions may contain sub-questions.

End Exam: The question paper for End Examination shall be for 70 marks. The question paper shall contain Six Questions and all questions are compulsory. Question No.1 shall contain Ten short answer questions (2 marks each) for a total of 20 marks, with Two short answer questions from each unit. Remaining Five Questions (each question covering one unit of syllabus) carrying 10 marks each shall be EITHER/OR type descriptive questions and may contain sub-questions.

FOUNDATIONS OF ARTIFICIAL INTELLIGENCE (FAI)

V Semester : CE, EEE, and ECE					Scheme : 2023			
Course Code	Category	Hours/Week			Credits	Maximum Marks		
OE507	OE-I	L/D	T	P	C	Continuous Internal Assessment	End Exam	Total
		3	-	-	3	30	70	100
Sessional Exam Duration : 2 Hrs					End Exam Duration: 3 Hrs			

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

CO1: Learn the distinction between optimal reasoning vs. human like reasoning and formulate an efficient problem space for a problem expressed in natural language. Also select a search algorithm for a problem and estimate its time and space complexities.

CO2: Apply AI techniques to solve problems of game playing, theorem proving, and machine learning.

CO3: Learn different knowledge representation techniques.

CO4: Understand the concepts of state space representation, exhaustive search, and heuristic search together with the time and space complexities.

CO5: Comprehend the applications of probabilistic reasoning and Bayesian networks.

CO6: Analyze supervised learning vs. learning decision trees.

UNIT – I

***Introduction to AI*:** Intelligent agents – Problem-Solving agents.
***Searching for Solutions*:** Breadth-first search – Depth-first search – Hill-climbing search – Simulated annealing search – Local search in continuous spaces.

UNIT – II

Games: Optimal decisions in games – Alpha–Beta pruning – Defining constraint satisfaction problems – Constraint propagation – Backtracking search for CSPs – Knowledge-Based agents – Logic – Propositional logic, Propositional theorem proving: Inference and proofs – Proof by resolution – Horn clauses and definite clauses.

UNIT – III

First-Order Logic: Syntax and semantics of first-order logic – Using first order logic – knowledge engineering in first-order logic. Inference in first-order logic: Propositional vs. First order inference – Unification – Forward chaining – Backward chaining – Resolution.
***Knowledge Representation*:** Ontological engineering – Categories and objects – Events.

UNIT – IV

Planning: Definition of classical planning – Algorithms for planning with state space search – Planning graphs, other classical planning approaches – Analysis of planning approaches – Hierarchical planning.

UNIT – V

Probabilistic Reasoning: Acting under uncertainty – Basic probability notation Bayes' rule and its use – Probabilistic reasoning – Representing knowledge in an uncertain domain – The semantics of Bayesian networks – Efficient representation of conditional distributions – Approximate inference in Bayesian networks – Relational and first- order probability.

Text Books

1. Stuart Russell and Peter Norvig, *Artificial Intelligence: A Modern Approach*, Third Edition, Pearson Education.

Reference Books
1. E. Rich and K. Knight, *Artificial Intelligence*, 3rd Edition, TMH.
2. Patrick Henny Winston, *Artificial Intelligence*, 3rd Edition, Pearson Education.
3. Shivani Goel, *Artificial Intelligence*, Pearson Education.
4. Patterson, *Artificial Intelligence and Expert Systems*, Pearson Education.
Online Learning Resources
1. https://swayam.gov.in/nd1_noc19_me71/preview
2. https://ai.google/
Question Paper Pattern:
Sessional Exam: The question paper for Sessional Examination shall be for 40 marks. The question paper shall consist of Four Questions and all questions are compulsory. Question No.1 contains Five short answer questions (2marks each) for a total of 10 marks. Remaining Three Questions shall be EITHER/OR type descriptive questions for 10 marks each. Each of these descriptive questions may contain sub-questions. **End Exam:** The question paper for End Examination shall be for 70 marks. The question paper shall contain Six Questions and all questions are compulsory. Question No.1 shall contain Ten short answer questions (2 marks each) for a total of 20 marks, with Two short answer questions from each unit. Remaining Five Questions (each question covering one unit of syllabus) carrying 10 marks each shall be EITHER/OR type descriptive questions and may contain sub-questions.

ETHICAL HACKING (EH)

<table>
<tr><td colspan="5">V Semester : All Branches</td><td colspan="4">Scheme : 2023</td></tr>
<tr><td>Course Code</td><td>Category</td><td colspan="3">Hours/Week</td><td>Credits</td><td colspan="3">Maximum Marks</td></tr>
<tr><td rowspan="2">OE508</td><td rowspan="2">OE-I</td><td>L/D</td><td>T</td><td>P</td><td>C</td><td>Continuous Internal Assessment</td><td>End Exam</td><td>Total</td></tr>
<tr><td>3</td><td>-</td><td>-</td><td>3</td><td>30</td><td>70</td><td>100</td></tr>
<tr><td colspan="5">Sessional Exam Duration : 2 Hrs</td><td colspan="4">End Exam Duration: 3 Hrs</td></tr>
<tr><td colspan="9"></td></tr>
<tr><td colspan="9">Course Outcomes :At the end of the course the student will be able to</td></tr>
<tr><td colspan="9">CO1: Understand the basics of security and ethical hacking.</td></tr>
<tr><td colspan="9">CO2: Understand about foot printing and types of attacks in social engineering.</td></tr>
<tr><td colspan="9">CO3: Understand about sniffers, hijacking and DoS attacks.</td></tr>
<tr><td colspan="9">CO4: Understand the importance of web server hacking, database hacking and SQL Injection.</td></tr>
<tr><td colspan="9">CO5: Understand about wireless technologies, intrusion detection and firewalls.</td></tr>
<tr><td colspan="9">UNIT – I</td></tr>
<tr><td colspan="9">Introduction to Ethical Hacking: Introduction – Security fundamentals – Security testing – Hackers and crackers description – Ethical hackers.
Technical Foundations of Hacking: The hacking process – Information security systems and the stack.</td></tr>
<tr><td colspan="9">UNIT – II</td></tr>
<tr><td colspan="9">Foot printing: Information gathering methodology – OS fingerprinting – Fingerprinting services – Enumeration – System hacking.
Social Engineering: Social engineering – Malware threats – Vulnerability analysis.</td></tr>
<tr><td colspan="9">UNIT – III</td></tr>
<tr><td colspan="9">Sniffers: Passive sniffing – Active sniffing – ARP –ARP poisoning and MAC flooding – Tools for sniffing – wire shark – Sniffing and spoofing countermeasures.
Session Hijacking: Transport layer hijacking – Application layer hijacking – Session hijacking Tools.
Denial of Service: DoS attack techniques – Distributed DoS – DDoS tools.</td></tr>
<tr><td colspan="9">UNIT – IV</td></tr>
<tr><td colspan="9">Web Server Hacking: HTTP protocol – Scanning web servers – Banner grabbing and Enumeration – Web server, DoS/ DDoS and DNS attacks.
Database Hacking: Introduction to SQL and SQL injection and categories – Finger printing – UNION Exploitation technique – Boolean in SQL injection attacks – Out-of band exploitation – Exploring the time-delay SQL injection technique – Stored procedure SQL injection and mitigations – SQL injection hacking tools.</td></tr>
<tr><td colspan="9">UNIT – V</td></tr>
<tr><td colspan="9">Wireless Technologies, Mobile Security: Mobile device operation and security – Wireless LAN's- Basics – Wireless LAN frequencies and signalling – Wireless LAN security.
IDS: Intrusion Detection and prevention systems – Firewalls and honey pots.</td></tr>
<tr><td colspan="9">Text Books</td></tr>
<tr><td colspan="9">1. Micheal Gregg, Certified Ethical Hacker (CEH) Cert Guide, Pearson education, 2020.</td></tr>
<tr><td colspan="9"></td></tr>
<tr><td colspan="9">Reference Books</td></tr>
<tr><td colspan="9">1. EC-Council, Ethical Hacking and Counter Measures (CEH), CENGAGE Learning,</td></tr>
</table>

2020.
2. Sai Satish, *Hacking Secrets Part-1*, Indian Servers, 2018.
3. David Litchfield, Chris Anley, *The Database Hackers Handbook: Defending Database Servers*, Wiley.

Online Learning Resources

1. https://www.coursera.org/courses?query=ethical%20hacking
2. https://onlinecourses.nptel.ac.in/noc22_cs13/preview
3. https://www.geeksforgeeks.org/ethical-hacking-tutorial/

Question Paper Pattern:

Sessional Exam: The question paper for Sessional Examination shall be for 40 marks. The question paper shall consist of Four Questions and all questions are compulsory. Question No.1 contains Five short answer questions (2marks each) for a total of 10 marks. Remaining Three Questions shall be EITHER/OR type descriptive questions for 10 marks each. Each of these descriptive questions may contain sub-questions.

End Exam: The question paper for End Examination shall be for 70 marks. The question paper shall contain Six Questions and all questions are compulsory. Question No.1 shall contain Ten short answer questions (2 marks each) for a total of 20 marks, with Two short answer questions from each unit. Remaining Five Questions (each question covering one unit of syllabus) carrying 10 marks each shall be EITHER/OR type descriptive questions and may contain sub-questions.

MATHEMATICS FOR MACHINE LEARNING AND AI (MMLA)

V Semester : All Branches					Scheme : 2023			
Course Code	Category	Hours/Week			Credits	Maximum Marks		
OE509	OE-I	L/D	T	P	C	Continuous Internal Assessment	End Exam	Total
		3	-	-	3	30	70	100
Sessional Exam Duration : 2 Hrs					End Exam Duration: 3 Hrs			

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

CO1: Apply linear algebra concepts to ML techniques like PCA and regression.

CO2: Analyze probabilistic models and statistical methods for AI applications.

CO3: Implement optimization techniques for machine learning algorithms.

CO4: Utilize vector calculus and transformations in AI-based models.

CO5: Develop graph-based AI models using mathematical representations.

UNIT – I

Linear Algebra for Machine Learning: Review of vector spaces, basis, linear independence – Vector and matrix norms – Matrix factorization techniques – Eigen values, eigenvectors, diagonalization – Singular Value Decomposition (SVD) and Principal Component Analysis (PCA).

UNIT – II

***Probability and Statistics for AI*:** Probability distributions – Gaussian, Binomial, Poisson, Bayes' Theorem – Maximum Likelihood Estimation (MLE), and Maximum a Posteriori (MAP) – Entropy and Kullback-Leibler (KL) divergence in AI – Cross entropy loss – Markov chains.

UNIT – III

***Optimization Techniques for ML*:** Multivariable calculus – Gradients, Hessians, Jacobians. Constrained optimization: Lagrange multipliers and KKT conditions. Gradient descent and its variants (Momentum, Adam) Newton's method – BFGS method.

UNIT – IV

Vector Calculus & Transformations: Vector calculus – Gradient, divergence, curl. Fourier transform & Laplace transform in ML applications.

UNIT – V

Graph Theory for AI: Graph representations – Adjacency matrices – Laplacian matrices. Bayesian networks & Probabilistic graphical models. Introduction to Graph Neural Networks (GNNs).

Text Books

1. Marc Peter Deisenroth, A. Aldo Faisal, Cheng Soon Ong, *Mathematics for Machine Learning*, Cambridge University Press, 2020.
2. Christopher Bishop, *Pattern Recognition and Machine Learning*, Springer.

Reference Books

1. Gilbert Strang, *Linear Algebra and Its Applications*, Cengage Learning, 2016.
2. Jonathan Gross, Jay Yellen, *Graph Theory and Its Applications*, CRC Press, 2018.

Online Learning Resources

1. https://ocw.mit.eduhttps://

2. https://cs229.stanford.edu/
3. https://deepai.org

Question Paper Pattern:

Sessional Exam: The question paper for Sessional Examination shall be for 40 marks. The question paper shall consist of Four Questions and all questions are compulsory. Question No.1 contains Five short answer questions (2marks each) for a total of 10 marks. Remaining Three Questions shall be EITHER/OR type descriptive questions for 10 marks each. Each of these descriptive questions may contain sub-questions.

End Exam: The question paper for End Examination shall be for 70 marks. The question paper shall contain Six Questions and all questions are compulsory. Question No.1 shall contain Ten short answer questions (2 marks each) for a total of 20 marks, with Two short answer questions from each unit. Remaining Five Questions (each question covering one unit of syllabus) carrying 10 marks each shall be EITHER/OR type descriptive questions and may contain sub-questions.

MATERIALS CHARACTERIZATION TECHNIQUES (MCT)

V Semester : All Branches					Scheme : 2023			
Course Code	Category	Hours/Week			Credits	Maximum Marks		
OE510	OE-I	L/D	T	P	C	Continuous Internal Assessment	End Exam	Total
		3	-	-	3	30	70	100
Sessional Exam Duration : 2 Hrs					End Exam Duration: 3 Hrs			

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

CO1: Analyze the crystal structure and crystallite size by various methods.

CO2: Analyze the morphology of the sample by using a scanning electron microscope.

CO3: Analyze the morphology and crystal structure of the sample by using transmission electron microscope.

CO4: Explain the principle and experimental arrangement of various spectroscopic techniques.

CO5: Identify the construction and working principle of various electrical & magnetic characterization techniques.

UNIT – I

Structure Analysis by Powder X-Ray Diffraction: Introduction – Bragg's law of diffraction – Intensity of diffracted beams – Factors affecting diffraction – Intensities, structure of polycrystalline aggregates – Determination of crystal structure – Crystallite size by Scherer and Williamson-Hall (W-H) methods – Small angle X-ray scattering (SAXS) (in brief).

UNIT – II

Microscopy Technique-1- Scanning Electron Microscopy (SEM): Introduction – Principle – Construction and working principle of Scanning Electron Microscopy – Specimen preparation – Different types of modes used (Secondary Electron and Backscatter Electron) – Advantages, limitations and applications of SEM.

UNIT – III

Microscopy Technique-2 - Transmission Electron Microscopy (TEM): Construction and working principle – Resolving power and magnification – Bright and dark fields, Diffraction and image formation – Specimen preparation – Selected area diffraction – Applications of Transmission Electron Microscopy – Difference between SEM and TEM, Advantage and limitations of Transmission Electron Microscopy.

UNIT – IV

Spectroscopy Techniques: Principle – Experimental arrangement – Analysis and advantages of the spectroscopic techniques – (i) UV-Visible spectroscopy (ii) Raman Spectroscopy, (iii) Fourier Transform Infrared (FTIR) spectroscopy, (iv) X-ray Photoelectron Spectroscopy (XPS).

UNIT – V

***Electrical & Magnetic Characterization Techniques*:** Electrical properties analysis techniques (DC conductivity, AC conductivity) – Activation energy – Effect of magnetic field on the electrical properties (Hall Effect) – Magnetization measurement by induction method – Vibrating Sample Magnetometer (VSM) and SQUID.

Text Books

1. Yang Leng, *Material Characterization: Introduction to Microscopic and Spectroscopic Methods*, John Wiley & Sons (Asia) Pvt. Ltd. 2013.

2. David Brandon, Wayne D Kalpan, *Microstructural Characterization of Materials*, John Wiley & Sons Ltd., 2008

Reference Books

1. Colin Neville Banwelland Elaine M. McCash, *Fundamentals of Molecular Spectroscopy*, 4th edition, Tata McGraw-Hill, 2008.

2. Bernard Dennis Cullity & Stuart R Stocks, *Elements of X-ray diffraction*, Prentice Hall, 2001, Science.

3. Khalid Sultan, *Practical Guide to Materials Characterization: Techniques and Applications*, Wiley, 2021.

4. Sam Zhang, Lin Li, Ashok Kumar, *Materials Characterization Techniques*, CRC Press, 2008.

Online Learning Resources

1. https://nptel.ac.in/courses/115/103/115103030/
2. https://nptel.ac.in/content/syllabus_pdf/113106034.pdf
3. https://nptel.ac.in/noc/courses/noc19/SEM1/noc19-mm08/

Question Paper Pattern:

Sessional Exam: The question paper for Sessional Examination shall be for 40 marks. The question paper shall consist of Four Questions and all questions are compulsory. Question No.1 contains Five short answer questions (2marks each) for a total of 10 marks. Remaining Three Questions shall be EITHER/OR type descriptive questions for 10 marks each. Each of these descriptive questions may contain sub-questions.

End Exam: The question paper for End Examination shall be for 70 marks. The question paper shall contain Six Questions and all questions are compulsory. Question No.1 shall contain Ten short answer questions (2 marks each) for a total of 20 marks, with Two short answer questions from each unit. Remaining Five Questions (each question covering one unit of syllabus) carrying 10 marks each shall be EITHER/OR type descriptive questions and may contain sub-questions.

CHEMISTRY OF ENERGY SYSTEMS (CES)

V Semester : All Branches					Scheme : 2023			
Course Code	Category	Hours/Week			Credits	Maximum Marks		
OE511	OE-I	L/D	T	P	C	Continuous Internal Assessment	End Exam	Total
		3	-	-	3	30	70	100
Sessional Exam Duration : 2 Hrs					End Exam Duration: 3 Hrs			

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

CO1: Solve the problems based on electrode potential, describe the Galvanic cell, Differentiate between lead acid and lithium ion batteries, Illustrate the electrical double layer.

CO2: Describe the working principle of fuel cell, Explain the efficiency of the fuel cell, Discuss about the basic design of fuel cells, Classify the fuel cell.

CO3: Differentiate between photo and photo electro chemical conversions, Illustrate the photochemical cells, Identify the applications of photochemical reactions, Interpret advantages of photo electron catalytic conversion.

CO4: Apply the photovoltaic technology, Demonstrate about solar energy and prospects Illustrate the solar cells, Discuss about concentrated solar power.

CO5: Differentiate chemical and physical methods of hydrogen storage, Discuss the metal organic framework, Illustrate the carbon and metal oxide porous structures, Describe the liquification methods.

UNIT – I

Electrochemical Systems: Galvanic cell – Nernst equation – standard electrode potential – Application of EMF – Electrical double layer – Polarization: Batteries – Introduction – Lead-acid, Nickel- cadmium, Lithium ion batteries and their applications.

UNIT – II

Fuel Cells: Fuel cell – Introduction – Basic design of fuel cell – Working principle – Classification of fuel cells – Polymer electrolyte membrane (PEM) fuel cells – Solid-oxide fuel cells (SOFC) – Fuel cell efficiency and applications.

UNIT – III

Photo and Photo electrochemical Conversions: Photochemical cells – Introduction and applications of photochemical reactions – Specificity of photo electrochemical cell – Advantage of photoelectron catalytic conversions and their applications.

UNIT – IV

Solar Energy: Introduction and prospects – Photovoltaic (PV) technology – Concentrated Solar Power (CSP) – Solar cells and applications

UNIT – V

Hydrogen Storage: Hydrogen storage and delivery: State-of-the art – Established technologies – Chemical and physical methods of hydrogen storage – Compressed gas storage, liquid hydrogen storage, other storage methods – Hydrogen storage in metal hydrides – Metal Organic Frameworks (MOF) – Metal oxide porous structures – Hydrogel, and organic hydrogen carriers.

Text Books

1. Ira N. Levine , *Physical chemistry*
2. Bahl and Bahl and Tuli, *Essentials of Physical Chemistry*.

3. Silver and Atkins, *Inorganic Chemistry*.

Reference Books

1. US Department of Energy (EG&G Technical Services and corporation), *Fuel Cell Hand Book,* 7th Edition.
2. Arvind Tiwari and Shyam, *Hand Book of Solar Energy and Applications*.
3. Klaus Jagar et. al., *Solar Energy Fundamental, Technology and Systems*.
4. Levine Klebonoff, Hydrogen storage.

Online Learning Resources

Question Paper Pattern:

Sessional Exam: The question paper for Sessional Examination shall be for 40 marks. The question paper shall consist of Four Questions and all questions are compulsory. Question No.1 contains Five short answer questions (2marks each) for a total of 10 marks. Remaining Three Questions shall be EITHER/OR type descriptive questions for 10 marks each. Each of these descriptive questions may contain sub-questions.

End Exam: The question paper for End Examination shall be for 70 marks. The question paper shall contain Six Questions and all questions are compulsory. Question No.1 shall contain Ten short answer questions (2 marks each) for a total of 20 marks, with Two short answer questions from each unit. Remaining Five Questions (each question covering one unit of syllabus) carrying 10 marks each shall be EITHER/OR type descriptive questions and may contain sub-questions.

ENGLISH FOR COMPETITIVE EXAMINATIONS (ECE)

V Semester : All Branches					Scheme : 2023			
Course Code	Category	Hours/Week			Credits	Maximum Marks		
		L/D	T	P	C	Continuous Internal Assessment	End Exam	Total
OE512	OE-I	3	-	-	3	30	70	100
Sessional Exam Duration : 2 Hrs					End Exam Duration: 3 Hrs			

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

CO1: Identify the basics of English grammar and its importance.

CO2: Explain the use of grammatical structures in sentences.

CO3: Demonstrate the ability to use various concepts in grammar and vocabulary and their applications in everyday use and in competitive exams.

CO4: Analyze an unknown passage and reach conclusions about it.

CO5: Choose the appropriate form of verbs in framing sentences.

CO6: Develop speed reading and comprehending ability thereby performs better in competitive exams.

UNIT – I

Grammar-I: Nouns-classification-errors – Pronouns-types-errors – Adjectives-types-errors – Articles-definite indefinite – Degrees of Comparison – Adverbs-types-errors – Conjunctions-usage – Prepositions-usage – Tag Questions-types-identifying errors – Practice.

UNIT – II

Grammar-II: Verbs-tenses- structure-usages- negatives- positives- time adverbs – Sequence of tenses-If Clause – Voice-active voice and passive voice – Reported Speech – Agreement-subject and verb modals-spotting errors-practices.

UNIT – III

Verbal Ability: Sentence completion –Verbal analogies –Word groups – Instructions – Critical reasoning – Verbal deduction – Select appropriate pair – Reading comprehension-Paragraph-Jumbles-Selecting the proper statement by reading a given paragraph.

UNIT – IV

Reading Comprehension and Vocabulary: Competitive Vocabulary :Word Building – Memory techniques – Synonyms, Antonyms, Affixes-Prefix &Suffix, One word substitutes, Compound words, Phrasal verbs, Idioms and Phrases, Homophones, Linking words, Modifiers, Intensifiers - Mastering competitive vocabulary, Cracking the unknowing passage – Speed reading techniques – Skimming & Scanning – Types of answering – Elimination methods.

UNIT – V

Writing for Competitive Examinations: Punctuation-Spelling rules-Word order-Sub Skills of Writing- Paragraph meaning – Salient features-types – Note-making – Note-taking – Summarizing – Precise writing – Paraphrasing Expansion of proverbs – Essay writing-types.

Text Books

1. Wren & Martin, *English for Competitive Examinations*, S. Chand & Co, 2021.
2. *Objective English for Competitive Examination*, Tata McGraw Hill, New Delhi, 2014.

Reference Books

1. Hari Mohan Prasad, *Objective English for Competitive Examination*, Tata McGraw Hill, New Delhi, 2014.
2. Philip Sunil Solomon, *English for Success in Competitive Exams*, Oxford, 2016.
3. Shalini Verma, *Word Power Made Handy*, S Chand Publications.
4. Neira, Anjana Dev & Co., *Creative Writing: A Beginner's Manual*. Pearson Education India, 2008.
5. Abhishek Jain, *Vocabulary Learning Techniques*, Vol. I&II, RR Global Publishers 2013.
6. Michel Swan, *Practical English Usage*, Oxford, 2006.

Online Learning Resources

1. https://www.grammar.cl/english/parts-of-speech.htm
2. https://academicguides.waldenu.edu/writingcenter/grammar/partsofspeech
3. https://learnenglish.britishcouncil.org/grammar/english-grammar-reference/active-passive-voice
4. https://languagetool.org/insights/post/verb-tenses/
5. https://www.britishcouncil.in/blog/best-free-english-learning-resources-british-council
6. https://www.careerride.com/post/social-essays-for-competitive-exams-586.aspx

Question Paper Pattern:

Sessional Exam: The question paper for Sessional Examination shall be for 40 marks. The question paper shall consist of Four Questions and all questions are compulsory. Question No.1 contains Five short answer questions (2marks each) for a total of 10 marks. Remaining Three Questions shall be EITHER/OR type descriptive questions for 10 marks each. Each of these descriptive questions may contain sub-questions.

End Exam: The question paper for End Examination shall be for 70 marks. The question paper shall contain Six Questions and all questions are compulsory. Question No.1 shall contain Ten short answer questions (2 marks each) for a total of 20 marks, with Two short answer questions from each unit. Remaining Five Questions (each question covering one unit of syllabus) carrying 10 marks each shall be EITHER/OR type descriptive questions and may contain sub-questions.

ENTREPRENEURSHIP AND NEW VENTURE CREATION (ENVC)

V Semester : All Branches					Scheme : 2023			
Course Code	Category	Hours/Week			Credits	Maximum Marks		
OE513	OE-I	L/D	T	P	C	Continuous Internal Assessment	End Exam	Total
		3	-	-	3	30	70	100
Sessional Exam Duration : 2 Hrs					End Exam Duration: 3 Hrs			

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

CO1: Understand the concept of entrepreneurship, analyze its role in economic development, and develop a creative mindset for starting a business.

CO2: Understand customer problems, validate them with potential customers, and evaluate customer segments and personas.

CO3: Evaluate customer needs through jobs-to-be-done analysis and develop value propositions using prototypes and MVPs.

CO4: Apply lean business models, financial and sales plans to design a venture with suitable funding and marketing channels.

CO5: Analyze scaling aspirations and venture components to develop an investor-ready pitch.

UNIT – I

Entrepreneurship Fundamentals and Context: Meaning and concept, attributes and mindset of entrepreneurial and entrepreneurial leadership, role models in each and their role in economic development. An understanding of how to build entrepreneurial mindset, skill sets, attributes and networks while on campus.

UNIT – II

Problem & Customer Identification: Understanding and analyzing the macro-problem and industry perspective - technological, socioeconomic and urbanization trends and their implication on new opportunities – Identifying passion – Identifying and defining problem using design thinking principles – Analyzing problem and validating with the potential customer – Understanding customer segmentation, creating and validating customer personas.

UNIT – III

Solution Design, Prototyping & Opportunity Assessment and Sizing: Understanding customer Jobs-to-be-done and crafting innovative solution design to map to customer's needs and create a strong value proposition – Understanding prototyping and Minimum Viable Product (MVP) – Developing a feasibility prototype with differentiating value, features and benefits – Assess relative market position via competition analysis – Sizing the market and assess scope and potential scale of the opportunity.

UNIT – IV

Business & Financial Model, Go-To-Market Plan: Introduction to business model and types, Lean approach, 9 block lean canvas model, riskiest assumptions to business models. Importance of Build - Measure – Lean approach. Business planning: Components of business plan - sales plan, people plan and financial plan. Financial Planning: Types of costs, preparing a financial plan for profitability using financial template, understanding basics of Unit economics and analyzing financial performance. Introduction to Marketing and Sales, Selecting the right channel, creating digital presence, building customer acquisition strategy. Choosing a form of business organization specific to your venture,

identifying sources of funds: Debt & Equity Map the Start-up Life-cycle to Funding Options.

UNIT – V

Scale Outlook and Venture Pitch Readiness: Understand and identify potential and aspiration for scale vis-a-vis your venture idea. Persuasive storytelling and its key components – Build an investor ready pitch deck.

Text Books

1. Robert D. Hisrich, Michael P. Peters, Dean A. Shepherd, Sabyasachi Sinha, *Entrepreneurship*, McGraw Hill, 11th Edition, 2020.
2. Ries, E., *The Lean Startup: How Today's Entrepreneurs Use Continuous Innovation to Create Radically Successful Businesses*, Crown Business, 2011.

Reference Books

1. Simon Sinek, *Start with Why*, Penguin Books limited, 2011.
2. Brown Tim, *Change by Design Revised & Updated: How Design Thinking*
3. *Transforms Organizations and Inspires Innovation*, Harper Business, 2019.
4. Namita Thapar, *The Dolphin and the Shark: Stories on Entrepreneurship*, Penguin Books Limited, 2022.

Online Learning Resources

1. https://wadhwanifoundation.org/initiatives/entrepreneurship/

Question Paper Pattern:

Sessional Exam: The question paper for Sessional Examination shall be for 40 marks. The question paper shall consist of Four Questions and all questions are compulsory. Question No.1 contains Five short answer questions (2marks each) for a total of 10 marks. Remaining Three Questions shall be EITHER/OR type descriptive questions for 10 marks each. Each of these descriptive questions may contain sub-questions.

End Exam: The question paper for End Examination shall be for 70 marks. The question paper shall contain Six Questions and all questions are compulsory. Question No.1 shall contain Ten short answer questions (2 marks each) for a total of 20 marks, with Two short answer questions from each unit. Remaining Five Questions (each question covering one unit of syllabus) carrying 10 marks each shall be EITHER/OR type descriptive questions and may contain sub-questions.

Open Elective – II

S. No.	Subject Code	Course Name	Offering Department	Eligible Branches
1	OE601	Disaster Management	CE	All Branches
2	OE602	Sustainability in Engineering Practices	CE	All Branches
3	OE603	Renewable Energy Sources	EEE	All Branches Except EEE
4	OE604	Automation and Robotics	ME	All Branches Except ME
5	OE605	Product Lifecycle Management	ME	All Branches Except CE
6	OE606	Digital Electronics	ECE	All Branches Except ECE
7	OE607	Foundations of Operating Systems	CSE	CE,EEE,ME, and ECE
8	OE608	Foundations of Machine Learning	CSE	CE,EEE, and ECE
9	OE609	Web Technologies	CSE	CE,EEE,ME, and ECE
10	OE610	Introduction to Information Systems	CSE	CE,EEE,ME, and ECE
11	OE611	Optimization Techniques	HBS	All Branches Except ME
12	OE612	Physics of Electronic Materials and Devices	HBS	All Branches
13	OE613	Chemistry of Polymers and Applications		
14	OE614	Academic Writing and Public Speaking		
15	OE615	Mathematical Foundation of Quantum Technologies		

DISASTER MANAGEMENT (DM)

VI Semester : All Branches						Scheme : 2023		
Course Code	Category	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	Continuous Internal Assessment	End Exam	Total
OE601	OE-II	3	-	-	3	30	70	100
Sessional Exam Duration: 2 Hrs						End Exam Duration: 3 Hrs		

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

CO1: Understand the definitions and terminologies used in disaster management.

CO2: Understand the types and categories of disasters.

CO3: Understand the impact of disasters on socio-economic and environment.

CO4: Plan for disaster risk reduction, mitigation and management strategies.

CO5: Understand the relationship between development and disasters.

UNIT – I

Introduction

Concepts and definitions: disaster, hazard, vulnerability, risks, severity, frequency and details, capacity, impact, prevention, mitigation.

UNIT – II

Disasters: Disasters classification

Natural Disasters: Floods, draught, cyclones, volcanoes, earthquakes, tsunami, landslides, coastal erosion, soil erosion, forest fires etc.

Manmade Disasters: Industrial pollution – Artificial flooding in urban areas –Nuclear radiation – Chemical spills – Transportation accidents – Terrorist strikes, etc. – Mountain and coastal areas.

UNIT – III

Disaster Impacts

Disaster impacts –Environmental, physical, social, ecological, economic, political, etc., Health - psycho-social issues – Demographic aspects – Hazard locations – Global and national disaster trends – Climate change and urban disasters.

UNIT – IV

Disaster Risk Reduction:

Disaster Management Cycle - its phases: Prevention, mitigation, preparedness, relief and recovery – Risk analysis, vulnerability and capacity assessment – Early warning systems.

Post-Disaster Environmental Response (i.e. water, sanitation, food safety, waste management, disease control, security, and communications)**:** Role and responsibilities of government, community, local institutions, NGOs and other stakeholders – Policies and legislation for disaster risk reduction – Activities of National Disaster Management Authority.

UNIT – V

Disasters, Environment and Development

Factors affecting vulnerability such as impact of developmental projects and environmental modifications – Sustainable and environmental friendly recovery – Reconstruction and development methods.

Text Books:

1. Pradeep Sahni, *Disaster Risk Reduction in South Asia*, PHI, New Delhi.

2. Ghosh G.K., *Disaster Management*, APH Publishing Corporation.

3. Singh B.K., *Handbook of Disaster Management Techniques &Guidelines*, Rajat Publication.

4. V. K. Sharma, *Disaster Management*, National Centre for Disaster Management, IIPE, Delhi.

Reference Books:

1. A Status Report Publication of the Govt. of India, Ministry of Home Affairs, National Disaster Management Division, *Disaster Management in India*.

2. A.S. Arya, Anup Karanth, and Ankush Agarwal, *Hazards, Disasters and Your Community; A Primer for Parliamentarians*, GOI–UNDP Disaster Risk Management Programme.

3. Interagency Standing Committee (IASC) (Feb. 2007). IASC Guidelines on Mental Health and Psychosocial Support in Emergency Settings. Geneva: IASC.

Online Learning Resources:

1. http://ndma.gov.in/ (Home page of National Disaster Management Authority)

2. http://www.ndmindia.nic.in/ (National Disaster management in India, Ministry of Home Affairs).

3. www.odihpn.org, *Disaster Preparedness Programme in India. A Cost Benefit Analysis*, Commissioned and Published by the Humanitarian Practice Network 'at ODI HPN.

4. www.empowerpoor.org, *Drought in India: Challenges and Initiatives; Poorest Areas in Civil Society (PACS) Programme*. [2001–2008]

Question Paper Pattern:

Sessional Exam: The question paper for Sessional Examination shall be for 40 marks. The question paper shall consist of Four Questions and all questions are compulsory. Question No.1 contains Five short answer questions (2marks each) for a total of 10 marks. Remaining Three Questions shall be EITHER/OR type descriptive questions for 10 marks each. Each of these descriptive questions may contain sub-questions.

End Exam: The question paper for End Examination shall be for 70 marks. The question paper shall contain Six Questions and all questions are compulsory. Question No.1 shall contain Ten short answer questions (2 marks each) for a total of 20 marks, with Two short answer questions from each unit. Remaining Five Questions (each question covering one unit of syllabus) carrying 10 marks each shall be EITHER/OR type descriptive questions and may contain sub-questions.

SUSTAINABILITY IN ENGINEERING PRACTICES (SEP)

VI Semester : All Branches					Scheme : 2023			
Course Code	Category	Hours/Week			Credits	Maximum Marks		
OE602	OE-II	L/D	T	P	C	Continuous Internal Assessment	End Exam	Total
		3	-	-	3	30	70	100
Sessional Exam Duration : 2 Hrs					End Exam Duration: 3 Hrs			

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

CO1: Understand the fundamentals of sustainability, the carbon cycle, and the environmental impact of construction materials.

CO2: Analyze sustainable construction materials, their durability, and life cycle assessment.

CO3: Apply energy calculations in construction materials and assess their embodied energy.

CO4: Evaluate green building standards, energy codes, and performance ratings.

CO5: Assess the environmental effects of energy use, climate change, and global warming.

UNIT – I

Introduction

Introduction and definition of sustainability – Carbon cycle – Role of construction material: concrete and steel, etc. – CO_2 contribution from cement and other construction materials.

UNIT – II

Materials Used in Sustainable Construction

Construction materials and indoor air quality – No/low cement concrete – Recycled and manufactured aggregate – Role of QC and durability – Life cycle and sustainability.

UNIT – III

Energy Calculations

Components of embodied energy – Calculation of embodied energy for construction materials – Energy concept and primary energy – Embodied energy vis-a-vis operational energy in conditioned building – Life cycle energy use.

UNIT – IV

Green Buildings

Control of energy use in building – ECBC code, codes in neighboring tropical countries – OTTV concepts and calculations – Features of LEED and TERI – GRIHA ratings – Role of insulation and thermal properties of construction materials – Influence of moisture content and modeling – Performance ratings of green buildings – Zero energy building.

UNIT – V

Environmental Effects

Non-renewable sources of energy and environmental impact – Energy norm, coal, oil, natural gas – Nuclear energy – Global temperature, green house effects, global warming – Acid rain: causes, effects and control methods – Regional impacts of temperature change.

Text Books

1. Charles J Kibert, *Sustainable Construction: Green Building Design & Delivery*, 4th Edition, Wiley Publishers 2016.

2. Steve Goodhew, *Sustainable Construction Process*, Wiley Blackwell, UK, 2016.

Reference Books

1. Craig A. Langston & Grace K.C. Ding, *Sustainable Practices in the Built Environment*,

Butterworth Heinemann Publishers, 2011.

2. William P Spence, *Construction Materials, Methods & Techniques* (3e), Yesdee Publication Pvt. Ltd., 2012.

Online Learning Resources:

1. https://archive.nptel.ac.in/courses/105/105/105105157/

Question Paper Pattern:

Sessional Exam: The question paper for Sessional Examination shall be for 40 marks. The question paper shall consist of Four Questions and all questions are compulsory. Question No.1 contains Five short answer questions (2marks each) for a total of 10 marks. Remaining Three Questions shall be EITHER/OR type descriptive questions for 10 marks each. Each of these descriptive questions may contain sub-questions.

End Exam: The question paper for End Examination shall be for 70 marks. The question paper shall contain Six Questions and all questions are compulsory. Question No.1 shall contain Ten short answer questions (2 marks each) for a total of 20 marks, with Two short answer questions from each unit. Remaining Five Questions (each question covering one unit of syllabus) carrying 10 marks each shall be EITHER/OR type descriptive questions and may contain sub-questions.

RENEWABLE ENERGY SOURCES (RES)

VI Semester : All Branches except EEE					Scheme : 2023			
Course Code	Category	Hours/Week			Credits	Maximum Marks		
		L/D	T	P	C	Continuous Internal Assessment	End Exam	Total
OE603	OE-II	3	-	-	3	30	70	100
Sessional Exam Duration : 2 Hrs					End Exam Duration: 3 Hrs			

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

CO1: Understand principle operation of various renewable energy sources.

CO2: Identify site selection of various renewable energy sources.

CO3: Analyze various factors affecting on solar energy measurements, wind energy conversion techniques, Geothermal, Biomass, Tidal Wave and Fuel cell energies.

CO4: Design of Solar PV modules and considerations of horizontal and vertical axis Wind energy systems.

CO5: Apply the concepts of Geothermal Energy, Ocean Energy, Bio mass and Fuel Cells for generation of power.

UNIT – I

Solar Energy: Solar radiation – Beam and diffuse radiation – Solar constant – Sun at Zenith – Attenuation and measurement of solar radiation – Local solar time – Derived solar angles – Sunrise, sunset and day length – Flat plate collectors – Concentrating collectors – Storage of solar energy – Thermal storage.

UNIT – II

PV Energy Systems: Introduction – The PV effect in crystalline silicon basic principles – The film PV – Other PV technologies – Solar PV modules from solar cells – Mismatch in series and parallel connections design and structure of PV modules – Electrical characteristics of silicon PV cells and modules – Stand-alone PV system configuration – Grid connected PV systems.

UNIT – III

Wind Energy: Principle of wind energy conversion – Basic components of wind energy conversion systems – Wind mill components – Various types and their constructional features – Design considerations of horizontal and vertical axis wind machines –Analysis of aerodynamic forces acting on wind mill blades – Wind data and energy estimation and site selection considerations.

UNIT – IV

Geothermal Energy: Estimation and nature of geothermal energy – Geothermal sources and resources like hydrothermal – Geo-pressured hot dry rock – Magma – Advantages, disadvantages and application of geothermal energy – Prospects of geothermal energy in India.

UNIT – V

Miscellaneous Energy Technologies:

Ocean Energy: Tidal Energy – Principle of working – Operation methods – Advantages and limitations. Wave Energy – Principle of working – Energy and power from waves – Wave energy conversion devices – Advantages and limitations.

Bio mass Energy: Biomass conversion technologies – Biogas generation plants – Classification, advantages and disadvantages – Constructional details, site selection, digester design consideration.

Fuel Cell: Principle of working of various types of fuel cells and their working, performance and limitations.

Text Books

1. G. D. Rai, *Non-Conventional Energy Sources*, 4th Edition, Khanna Publishers, 2000.

2. Chetan Singh Solanki, *Solar Photo Voltaics Fundamentals, Technologies and Applications,* 2nd Edition, PHI Learning Private Limited. 2012.

Reference Books

1. Stephen Peake, *Renewable Energy Power for a Sustainable Future*, Oxford International Edition, 2018.

2. S. P. Sukhatme, *Solar Energy*, 3rd Edition, Tata McGraw Hill Education Pvt. Ltd., 2008.

3. B H Khan, *Non-Conventional Energy Resources*, 2nd Edition, Tata McGraw Hill Education Pvt. Ltd., 2011.

4. S. Hasan Saeed and D.K. Sharma, *Non-Conventional Energy Resources*, 3rd Edition, S.K. Kataria & Sons, 2012.

5. G. N. Tiwari and M.K. Ghosal, *Renewable Energy Resource: Basic Principles and Applications*, Narosa Publishing House, 2004.

Online Learning Resources

1. https://nptel.ac.in/courses/103103206
2. https://nptel.ac.in/courses/108108078

Question Paper Pattern:

Sessional Exam: The question paper for Sessional Examination shall be for 40 marks. The question paper shall consist of Four Questions and all questions are compulsory. Question No.1 contains Five short answer questions (2marks each) for a total of 10 marks. Remaining Three Questions shall be EITHER/OR type descriptive questions for 10 marks each. Each of these descriptive questions may contain sub-questions.

End Exam: The question paper for End Examination shall be for 70 marks. The question paper shall contain Six Questions and all questions are compulsory. Question No.1 shall contain Ten short answer questions (2 marks each) for a total of 20 marks, with Two short answer questions from each unit. Remaining Five Questions (each question covering one unit of syllabus) carrying 10 marks each shall be EITHER/OR type descriptive questions and may contain sub-questions.

AUTOMATION AND ROBOTICS (ART)

<table>
<tr><td colspan="5">VI Semester : All Branches except ME</td><td colspan="4">Scheme : 2023</td></tr>
<tr><td>Course Code</td><td>Category</td><td colspan="3">Hours/Week</td><td>Credits</td><td colspan="3">Maximum Marks</td></tr>
<tr><td rowspan="2">OE604</td><td rowspan="2">OE-II</td><td>L/D</td><td>T</td><td>P</td><td>C</td><td>Continuous Internal Assessment</td><td>End Exam</td><td>Total</td></tr>
<tr><td>3</td><td>-</td><td>-</td><td>3</td><td>30</td><td>70</td><td>100</td></tr>
<tr><td colspan="5">Sessional Exam Duration : 2 Hrs</td><td colspan="4">End Exam Duration: 3 Hrs</td></tr>
</table>

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

CO1: Understand the fundamentals of automation, manufacturing systems and automation hardware.

CO2: Understand and Analyze automated flow lines and apply assembly line balancing methods.

CO3: Classify robots, joints, actuators, and sensors used in robotic systems.

CO4: Solve basic manipulator kinematics using transformation matrices.

CO5: Apply robot programming concepts and language structures for industrial tasks. Explain robot applications in manufacturing such as welding, material handling, and inspection.

UNIT – I

Introduction to Automation: Notion of Automation – Types – Basic elements of an automated system – Manufacturing Industries – Types of production – Functions in manufacturing – Organization and information processing in manufacturing – Automation strategies and levels of automation – Hardware components for automation and process control – Mechanical feeders, hoppers, orienters, high speed automatic insertion devices.

UNIT – II

Automated Flow Lines: Automated flow lines – Part transfer methods and mechanisms – Types of Flow lines – Flow line with/without buffer storage – Quantitative analysis of flow lines – Assembly line balancing – Assembly process and systems assembly line – Line balancing methods – Ways of improving line balance – Flexible assembly lines.

UNIT – III

Introduction to Robotics: Definition of Robot – Classification of Robot configurations – Types of Joints – Degrees of freedom – End effectors – Types of end effectors – Grippers- Mechanical grippers – Vacuum cups – Magnetic grippers – Tools.

Robot Actuators and Feedback Components: Electrical Actuators (Variable reluctance stepper motor, Permanent magnet stepper motor) – Hydraulic and pneumatic actuators. Position sensors – Potentiometer – Resolvers – Encoders. Velocity sensors – Tactile sensors – Proximity sensors.

UNIT – IV

Manipulator Kinematics: Introduction to manipulator kinematics – Position representation – Forward transformation and reverse transformation of two degree freedom robot arm, three degree of freedom arm in two dimensions, four degree freedom manipulators in three dimension, 3×3 Rotation matrix – Homogeneous transformation matrix and D – H notation matrix.

UNIT – V

Robot Programming: Methods of robot programming – Lead through- WAIT, SIGNAL and delay commands – The textual robot programming languages – Robot language structures, constants, variables and other data objects, motion commands, end effectors, sensors

commands and monitor mode commands.

Robot Applications in Manufacturing: Material transfer and machine loading and unloading general considerations in material handling.

Processing Operations: Spot welding, continuous arc welding, spray coating, and other processing operations – Assembly and Inspection.

Text Books

1. M.P. Groover, Automation, *Production systems and Computer Integrated Manufacturing*, Pearson Education.

2. Mickel. P. Groover et.al, *Industrial Robotics-Technology, Programming and Applications*, McGraw Hill Publishers, New Delhi.

3. Deb S.R., *Robotics Technology and Flexible Automation*, TMH Publishers, New Delhi.

Reference Books

1. Richard D. Klafter, *Robotic Engineering: An Integrated Approach*, Pearson Publications.

2. K.S. Fu, Ralph C. Gonzalez and C.S.G. Lee, *Robotics, Control, Sensing, Vision*, McGraw Hill.

3. Ashitava Ghosal, *Robotics Fundamental Concepts and Analysis*, Oxford.

Online Learning Resources

Question Paper Pattern:

Sessional Exam: The question paper for Sessional Examination shall be for 40 marks. The question paper shall consist of Four Questions and all questions are compulsory. Question No.1 contains Five short answer questions (2marks each) for a total of 10 marks. Remaining Three Questions shall be EITHER/OR type descriptive questions for 10 marks each. Each of these descriptive questions may contain sub-questions.

End Exam: The question paper for End Examination shall be for 70 marks. The question paper shall contain Six Questions and all questions are compulsory. Question No.1 shall contain Ten short answer questions (2 marks each) for a total of 20 marks, with Two short answer questions from each unit. Remaining Five Questions (each question covering one unit of syllabus) carrying 10 marks each shall be EITHER/OR type descriptive questions and may contain sub-questions.

PRODUCT LIFECYCLE MANAGEMENT (PLM)

VI Semester : All Branches except CE					Scheme : 2023			
Course Code	Category	Hours/Week			Credits	Maximum Marks		
OE605	OE-II	L/D	T	P	C	Continuous Internal Assessment	End Exam	Total
		3	-	-	3	30	70	100
Sessional Exam Duration : 2 Hrs					End Exam Duration: 3 Hrs			

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

CO1: Understand Product life cycle management process.

CO2: Understand different steps in product development process.

CO3: Get knowledge on product data management.

CO4: Understand the implementation of PLM and its impact on the organization.

CO5: Understand core functions of PLM and supply chain and ERP systems.

UNIT – I

Organization business models (MTS, MTO, CTO, ETO etc.) – Basics of enterprise systems (PLM, ERP, MES), Background, Overview, Need, Benefits, and Concept of Product Life Cycle – Components / Elements of PLM – Emergence of PLM – Significance of PLM, Differences between PLM and PDM.

UNIT – II

Integrated Product development process – Conceive – Specification, Concept design, Design – Detailed design – Validation and analysis (Simulation) – Tool design, Realize-Plan manufacturing, Manufacture, Build/Assemble, Test (quality check).

UNIT – III

Workflow processes – Design collaboration – Processes management – Document management – Visualization – Bill of Materials (BOM) management – Lab exercises.

UNIT – IV

Engineering change control – Configuration management – Manufacturing process management – Variant management – Classification PLM architecture – Various PLM tools, Data modeling – Security management.

UNIT – V

CAD Integrations – Information authoring tools (e.g., MCAD, ECAD, Technical publishing) – Core functions (e.g., data vaults) – Data flow to other systems such as supply chain and ERP systems. (4 hours for lab exercises).

Text Books

1. Grieves, Michael, *Product Lifecycle Management*, McGraw Hill Publishers.
2. Antti Saaksvuori, Anselmi Immonen, *Product Life Cycle Management*, Springer Publications.

Reference Books

1. Kari Ulrich and Steven D. Eppinger, *Product Design & Development*, McGraw Hill International
2. Burden, Rodger, *PDM: Product Data Management*, Resource Publications.

Online Learning Resources

Question Paper Pattern:

Sessional Exam: The question paper for Sessional Examination shall be for 40 marks. The question paper shall consist of Four Questions and all questions are compulsory. Question No.1 contains Five short answer questions (2marks each) for a total of 10 marks. Remaining Three Questions shall be EITHER/OR type descriptive questions for 10 marks each. Each of these descriptive questions may contain sub-questions.

End Exam: The question paper for End Examination shall be for 70 marks. The question paper shall contain Six Questions and all questions are compulsory. Question No.1 shall contain Ten short answer questions (2 marks each) for a total of 20 marks, with Two short answer questions from each unit. Remaining Five Questions (each question covering one unit of syllabus) carrying 10 marks each shall be EITHER/OR type descriptive questions and may contain sub-questions.

DIGITAL ELECTRONICS (DE)

VI Semester : All Branches except ECE					Scheme : 2023			
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
		L/D	**T**	**P**	**C**	**Continuous Internal Assessment**	**End Exam**	**Total**
OE606	**OE-II**	**3**	**-**	**-**	**3**	**30**	**70**	**100**
Sessional Exam Duration : 2 Hrs					**End Exam Duration: 3 Hrs**			

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

CO1: Learn Boolean algebra, logic simplification techniques, and combinational circuit design.

CO2: Analyze combinational circuits like adders, sub tractors, and code converters.

CO3: Explore combinational logic circuits and their applications in digital design.

CO4: Understand sequential logic circuits, including latches, flip-flops, counters, and shift registers.

CO5: Gain knowledge about programmable logic devices and digital IC's.

UNIT – I

Logic Simplification and Combinational Logic Design: Review of Boolean algebra and De Morgan's theorem – SOP & POS forms – Canonical forms – Introduction to logic gates, Ex-OR, Ex-NOR operations – Minimization of switching functions: Karnaugh map method – Logic function realization – AND-OR, OR-AND, and NAND/NOR realizations.

UNIT – II

Introduction to Combinational Design-1: Binary adders – Subtractors and BCD adder – Code converters – Binary to Gray, Gray to Binary, BCD to excess3, BCD to Seven segment display.

UNIT – III

Combinational Logic Design-2: Decoders, Encoders, Priority Encoder, Multiplexers, Demultiplexers, Comparators – Implementations of Logic Functions using Decoders and Multiplexers.

UNIT – IV

Sequential Logic Design: Latches, Flip-flops, S-R, D, T, JK and Master-Slave JK FF, Edge triggered FF, set up and hold times, Ripple counters, Shift registers.

UNIT – V

Programmable Logic Devices: ROM – Programmable Logic Devices (PLA and PAL) – Digital IC's: Decoder (74x138), Priority Encoder (74x148), multiplexer (74x151) and de-multiplexer (74x155), comparator (74x85).

Text Books

1. M.Morris Mano & Michel D. Ciletti, *Digital Design*, 5th Edition, Pearson Education, 1999.

2. ZviKohavi and Nirah K. Jha, *Switching Theory and Finite Automata Theory*, 2nd Edition, Tata McGraw Hill, 2005.

Reference Books

1. Charles H Roth, Jr., *Fundamentals of Logic Design*, 5th Edition, Brooks/cole, Cengage Learning, 2004.

Online Learning Resources
1. http://ndma.gov.in/ (Home page of National Disaster Management Authority)
2. http://www.ndmindia.nic.in/ (National Disaster management in India, Ministry of Home Affairs).
3. www.odihpn.org, Disaster Preparedness Programme in India. A Cost Benefit Analysis, Commissioned and Published by the Humanitarian Practice Network 'at ODI HPN.
4. www.empowerpoor.org, Drought in India: Challenges and Initiatives; Poorest Areas in Civil Society (PACS) Programme. [2001–2008]
Question Paper Pattern:
Sessional Exam: The question paper for Sessional Examination shall be for 40 marks. The question paper shall consist of Four Questions and all questions are compulsory. Question No.1 contains Five short answer questions (2marks each) for a total of 10 marks. Remaining Three Questions shall be EITHER/OR type descriptive questions for 10 marks each. Each of these descriptive questions may contain sub-questions. **End Exam:** The question paper for End Examination shall be for 70 marks. The question paper shall contain Six Questions and all questions are compulsory. Question No.1 shall contain Ten short answer questions (2 marks each) for a total of 20 marks, with Two short answer questions from each unit. Remaining Five Questions (each question covering one unit of syllabus) carrying 10 marks each shall be EITHER/OR type descriptive questions and may contain sub-questions.

FOUNDATIONS OF OPERATING SYSTEMS (FOS)

VI Semester : CE, EEE, ME, and ECE						Scheme : 2023		
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
		L/D	**T**	**P**	**C**	**Continuous Internal Assessment**	**End Exam**	**Total**
OE607	**OE-II**	**3**	**-**	**-**	**3**	**30**	**70**	**100**
Sessional Exam Duration : 2 Hrs						**End Exam Duration: 3 Hrs**		

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

CO1: Describe the basics of the operating systems, mechanisms of OS to handle processes, threads, and their communication.

CO2: Understand the basic concepts and principles of operating systems, including process management, memory management, file systems, and Protection.

CO3: Make use of process scheduling algorithms and synchronization techniques to achieve better performance of a computer system.

CO4: Illustrate different conditions for deadlock and their possible solutions, memory management and its allocation policies.

CO5: Design and implement file systems, focusing on file access methods, directory structure, free space management, and also explore various protection mechanisms.

UNIT – I

Operating Systems Overview: Introduction – Operating system functions – Operating systems operations – Computing environments – Free and open-source operating systems System structures: Operating system services – User and operating-system interface – System calls – Types of system calls, system programs – Operating system design and implementation – Operating system structure – Building and booting an operating system – Operating system debugging.

UNIT – II

Processes: Process concept – Process scheduling – Operations on processes – Inter-process communication. Threads and Concurrency: Multithreading models – Thread libraries – Threading issues. CPU Scheduling: Basic concepts – Scheduling criteria – Scheduling algorithms – Multiple processor scheduling.

UNIT – III

Synchronization Tools: The critical section problem – Peterson‘s solution – Mutex locks, semaphores, monitors – Classic problems of synchronization. Deadlocks: system model – Deadlock characterization – Methods for handling deadlocks – Deadlock prevention, Deadlock avoidance, Deadlock detection, Recovery from deadlock.

UNIT – IV

***Memory- Management Strategies*:** Introduction – Contiguous memory allocation – Paging – Structure of the page table – Swapping. Virtual memory management: Introduction – Demand paging – Copy on-write – Page replacement – Allocation of frames, Thrashing. Storage management: Overview of mass storage structure, HDD scheduling.

UNIT – V

***File System: File System Interface*:** File concept – Access methods – Directory structure; File system implementation: File-system structure – File-system operations – Directory implementation – Allocation method v Free space management; File-System internals: File system mounting – Partitions and mounting – File sharing. Protection: Goals of protection, Principles of protection – Protection rings – Domain of protection – Access matrix.

Text Books
1. Silber Schatz A, Galvin P B, Gagne G, *Operating System Concepts*, 10th Edition, Wiley, 2018.
2. Tanenbaum A S, *Modern Operating Systems*, 4th Edition, Pearson, 2016.
Reference Books
1. Stallings W, *Operating Systems-Internals and Design Principles*, 9th edition, Pearson, 2018
2. D.M Dhamdhere, *Operating Systems: A Concept Based Approach*, 3rd Edition, McGraw Hill, 2013.
Online Learning Resources
1. https://nptel.ac.in/courses/106/106/106106144/
Question Paper Pattern:
Sessional Exam: The question paper for Sessional Examination shall be for 40 marks. The question paper shall consist of Four Questions and all questions are compulsory. Question No.1 contains Five short answer questions (2marks each) for a total of 10 marks. Remaining Three Questions shall be EITHER/OR type descriptive questions for 10 marks each. Each of these descriptive questions may contain sub-questions. **End Exam:** The question paper for End Examination shall be for 70 marks. The question paper shall contain Six Questions and all questions are compulsory. Question No.1 shall contain Ten short answer questions (2 marks each) for a total of 20 marks, with Two short answer questions from each unit. Remaining Five Questions (each question covering one unit of syllabus) carrying 10 marks each shall be EITHER/OR type descriptive questions and may contain sub-questions.

FOUNDATIONS OF MACHINE LEARNING (FML)

VI Semester : CE, EEE, and ECE					Scheme : 2023			
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
		L/D	**T**	**P**	**C**	**Continuous Internal Assessment**	**End Exam**	**Total**
OE608	**OE-II**	**3**	**-**	**-**	**3**	**30**	**70**	**100**
Sessional Exam Duration : 2 Hrs					**End Exam Duration: 3 Hrs**			

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

CO1: Identify machine learning techniques suitable for a given problem.

CO2: Solve the problems using various machine learning techniques.

CO3: Design application using machine learning techniques.

CO4: Understand and explore Supervised Learning techniques.

CO5: Understand and explore unsupervised learning techniques.

UNIT – I

Introduction to Machine Learning & Preparing to Model: Introduction: What is Human Learning? Types of Human Learning – What is Machine Learning? Types of Machine Learning – Problems Not to Be Solved Using Machine Learning – Applications of Machine Learning – State-of-The-Art Languages/Tools in Machine Learning – Issues in Machine Learning Preparing to Model: Introduction – Machine Learning Activities – Basic Types of Data in Machine Learning – Exploring Structure of Data – Data Quality and Remediation – Data Pre-Processing.

UNIT – II

Modelling and Evaluation &Basics of Feature Engineering: Introduction – Selecting a Model – Training a model (for Supervised Learning) – Model representation and interpretability – Evaluating performance of a model – Improving performance of a model Basics of Feature Engineering: Introduction – Feature transformation, and feature subset selection.

UNIT – III

Bayesian Concept Learning & Supervised Learning: Classification: Introduction – Why Bayesian Methods are Important? Bayes' Theorem, Bayes' Theorem and Concept Learning, Bayesian Belief Network. Supervised Learning: Classification: Introduction – Example of supervised learning – Classification model – Classification learning steps – Common classification algorithms-k-Nearest Neighbour (kNN) – Decision tree – Random forest model – Support vector machines.

UNIT – IV

Supervised Learning: Regression: Introduction – Example of regression – Common regression algorithms-Simple linear regression – Multiple linear regression – Assumptions in regression analysis – Main problems in regression analysis – Improving accuracy of the linear regression model – Polynomial regression model – Logistic regression – Maximum likelihood estimation.

UNIT – V

Unsupervised Learning: Introduction – Unsupervised vs Supervised learning, Application of unsupervised learning – Clustering – Clustering as a machine learning task – Different types of clustering techniques – Partitioning methods – K- Medoids: a representative object-based technique – Hierarchical clustering, Density-based methods-DBSCAN Finding Pattern using Association Rule- Definition of common terms – Association rule, The apriori

algorithm for association rule learning – Build the apriori principle rules.
Text Books
1. Saikat Dutt, Subramanian Chandra Mouli, Amit Kumar Das, *Machine Learning*, Pearson, 2019.
Reference Books
1. Ethern Alpaydin, *Introduction to Machine Learning*, MIT Press, 2004.
2. Stephen Marsland, *Machine Learning -An Algorithmic Perspective*, Second Edition,
3. Chapman and Hall/CRC, *Machine Learning and Pattern Recognition Series*, 2014.
4. Andreas C. Müller and Sarah Guido, *Introduction to Machine Learning with Python: A Guide for Data Scientists*, Oreilly.
Online Learning Resources
1. Andrew Ng, *Machine Learning B.Techning*,
2. https://www.deeplearning.ai/machine-learning- B.Techning/
3. Shai Shalev-Shwartz, Shai Ben-David, *Understanding Machine Learning: From Theory to Algorithms*, Cambridge University Press.
4. https://www.cse.huji.ac.il/~shais/UnderstandingMachineLearning/index.html
Question Paper Pattern:
Sessional Exam: The question paper for Sessional Examination shall be for 40 marks. The question paper shall consist of Four Questions and all questions are compulsory. Question No.1 contains Five short answer questions (2marks each) for a total of 10 marks. Remaining Three Questions shall be EITHER/OR type descriptive questions for 10 marks each. Each of these descriptive questions may contain sub-questions. **End Exam:** The question paper for End Examination shall be for 70 marks. The question paper shall contain Six Questions and all questions are compulsory. Question No.1 shall contain Ten short answer questions (2 marks each) for a total of 20 marks, with Two short answer questions from each unit. Remaining Five Questions (each question covering one unit of syllabus) carrying 10 marks each shall be EITHER/OR type descriptive questions and may contain sub-questions.

WEB TECHNOLOGIES (WT)

<table>
<tr><td colspan="5">VI Semester : CE, EEE, ME, and ECE</td><td colspan="4">Scheme : 2023</td></tr>
<tr><td>Course Code</td><td>Category</td><td colspan="3">Hours/Week</td><td>Credits</td><td colspan="3">Maximum Marks</td></tr>
<tr><td rowspan="2">OE609</td><td rowspan="2">OE-II</td><td>L/D</td><td>T</td><td>P</td><td>C</td><td>Continuous Internal Assessment</td><td>End Exam</td><td>Total</td></tr>
<tr><td>3</td><td>-</td><td>-</td><td>3</td><td>30</td><td>70</td><td>100</td></tr>
<tr><td colspan="5">Sessional Exam Duration : 2 Hrs</td><td colspan="4">End Exam Duration: 3 Hrs</td></tr>
<tr><td colspan="9"></td></tr>
<tr><td colspan="9">Course Outcomes :At the end of the course the student will be able to</td></tr>
<tr><td colspan="9">CO1: Design a web page using text formatting tags, hyperlinks.</td></tr>
<tr><td colspan="9">CO2: Develop a webpage with images, tables, hyperlinks, lists, and CSS.</td></tr>
<tr><td colspan="9">CO3: Design dynamic web pages using Java script.</td></tr>
<tr><td colspan="9">CO4: Design a form using HTML forms & controls.</td></tr>
<tr><td colspan="9">CO5: Understand the basic concepts of PHP and database connection using XAMPP server.</td></tr>
<tr><td colspan="9">UNIT – I</td></tr>
<tr><td colspan="9">HTML5: Overview of HTML5 and other web technologies – HTML5 and its essentials – Fundamentals of HTML5 –Working with text and organizing text in HTML – Working with links and URLs.</td></tr>
<tr><td colspan="9">UNIT – II</td></tr>
<tr><td colspan="9">Images: Working with images – Image maps – Creating tables, frames. CSS: Overview of CSS – Backgrounds and color gradients in CSS – Fonts and text styles – List styles – Table layouts</td></tr>
<tr><td colspan="9">UNIT – III</td></tr>
<tr><td colspan="9">JavaScript: Overview of java script – Functions, Events, Java script Objects – Working with browser objects – Document object – Document object model – Validation, errors, and exception handling in JavaScript.</td></tr>
<tr><td colspan="9">UNIT – IV</td></tr>
<tr><td colspan="9">Forms: What’s a Form? What Controls are available? Creating a form and adding HTML controls – Submitting data from forms – Customizing controls in CSS – Form validation using Java Script – Interactive elements.</td></tr>
<tr><td colspan="9">UNIT – V</td></tr>
<tr><td colspan="9">Introduction to PHP: Installing and Configuring PHP: Building PHP with Apache on Windows– The basics of PHP scripts. The Building blocks of PHP: Variables – Data types – Operators and expressions – Constants. Creating forms – Accessing form input with user defined arrays – Combining HTML and PHP code on a single page – XAMPP server configuration.</td></tr>
<tr><td colspan="9">Text Books</td></tr>
<tr><td colspan="9">1. HTML5 Black Book, 2nd Edition, Dreamtech Press, 2016.</td></tr>
<tr><td colspan="9">2. Deitel and Deitel and Nieto, Internet and World Wide Web - How to Program, Prentice Hall, 5th Edition, 2011.</td></tr>
<tr><td colspan="9">3. Julie C. Meloni, PHP MySQL and Apache, SAMS Teach Yourself, Pearson Education, 2007.</td></tr>
<tr><td colspan="9">Reference Books</td></tr>
<tr><td colspan="9">1. Uttam K. Roy, Web Technologies, Oxford Higher Education, 1st edition, 2015.</td></tr>
<tr><td colspan="9">2. Robert Pattinson, Beginners Guide for HTML and CSS Web Design and Web Development, 2018.</td></tr>
</table>

3. Jeffrey C and Jackson, *Web Technologies A Computer Science Perspective*, Pearson Education, 2011.
4. Gopalan N.P. and Akilandeswari J., *Web Technology*, Prentice Hall of India, 2011.

Online Learning Resources

1. https://www.tutorialspoint.com/Html/index.htm
2. https://www.w3.org/Style/CSS/
3. https://www.w3schools.com/php/

Question Paper Pattern:

Sessional Exam: The question paper for Sessional Examination shall be for 40 marks. The question paper shall consist of Four Questions and all questions are compulsory. Question No.1 contains Five short answer questions (2marks each) for a total of 10 marks. Remaining Three Questions shall be EITHER/OR type descriptive questions for 10 marks each. Each of these descriptive questions may contain sub-questions.

End Exam: The question paper for End Examination shall be for 70 marks. The question paper shall contain Six Questions and all questions are compulsory. Question No.1 shall contain Ten short answer questions (2 marks each) for a total of 20 marks, with Two short answer questions from each unit. Remaining Five Questions (each question covering one unit of syllabus) carrying 10 marks each shall be EITHER/OR type descriptive questions and may contain sub-questions.

INTRODUCTION TO INFORMATION SYSTEMS (IIS)

VI Semester : CE, EEE, ME, and ECE					Scheme : 2023			
Course Code	Category	Hours/Week			Credits	Maximum Marks		
OE610	OE-II	L/D	T	P	C	Continuous Internal Assessment	End Exam	Total
		3	-	-	3	30	70	100
Sessional Exam Duration : 2 Hrs					End Exam Duration: 3 Hrs			

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

CO1: Understand the concepts of Computer architecture and functionalities of System Software.

CO2: Understand the page replacement and CPU Scheduling Algorithms.

CO3: Understand the phases of software development life cycle and process models.

CO4: Design ER model for real life scenarios.

CO5: Apply SQL commands to create, update, modify, retrieve and normalization on the databases.

UNIT – I

Fundamentals of Computers & Computer Architecture: Introduction – Organization of a small computer – Central processing unit – Execution cycle – Instruction categories – Measure of CPU performance – Memory, Input/output devices, BUS, addressing modes.
System Software: Assemblers, Loaders and linkers – Compilers and interpreters.

UNIT – II

Operating System: Introduction – Memory management schemes – Page replacement algorithms – Process management – CPU scheduling algorithms.
Software engineering: Software engineering: Introduction to Software engineering – Life cycle of a software project – Software development models.

UNIT – III

Relational Database Management System: Introduction to DBMS – The database technology – Data models – Database users.
Entity Relationship (E-R) Modeling: Introduction, – Notations – Modeling E-R diagrams – Case studies – Merits and demerits of E-R modeling.

UNIT – IV

Structured Query Language (SQL): Introduction to SQL – Data types – Data definition language commands – Data manipulation language commands and data control language commands – Candidate key, Primary key, Foreign key, Select clause, Where clause, Logical connectives – AND, OR, Range search, Pattern matching, Order By, Group By, Set Operations – Union, intersect and minus, Aggregate functions, Join operations.

UNIT – V

Normalization: Introduction, Need for Normalization – Process of normalization – Types of normal forms (1NF, 2NF, 3NF & BCNF) – Merits and demerits of normalization.

Text Books

1. Campus Connect Foundation Program – Computer Hardware and System Software Concepts, Programming Fundamentals- Vol. – 1, INFOSYS.
2. Campus Connect Foundation Program – Relational Database Management System, Client Server Concepts, Introduction to Web Technologies - Vol. – 4, INFOSYS.
3. Henry F. Korth & Abraham Silberschatz, *Data Base System Concepts*, McGraw Hill, 5th

Edition, 2005.

Reference Books

1. M. Morris Mano, *Computer System Architecture*, Pearson Education, 3rd Edition, 2011.
2. Sommerville, *Software Engineering*, Pearson education, 7th Edition, 2008.
3. Raghu Ramakrishna and Johannes Gehrke, *Data Base Management Systems*, Tata McGraw Hill, 3rd Edition, 2003.
4. Tanenbaum, *Modern Operating System*, Pearson Education, 2000.

Online Learning Resources

1. https://www.w3schools.com/sql/
2. https://www.geeksforgeeks.org/dbms/
3. https://www.tutorialride.com/software-engineering/software-engineering-tutorial.htm

Question Paper Pattern:

Sessional Exam: The question paper for Sessional Examination shall be for 40 marks. The question paper shall consist of Four Questions and all questions are compulsory. Question No.1 contains Five short answer questions (2marks each) for a total of 10 marks. Remaining Three Questions shall be EITHER/OR type descriptive questions for 10 marks each. Each of these descriptive questions may contain sub-questions.

End Exam: The question paper for End Examination shall be for 70 marks. The question paper shall contain Six Questions and all questions are compulsory. Question No.1 shall contain Ten short answer questions (2 marks each) for a total of 20 marks, with Two short answer questions from each unit. Remaining Five Questions (each question covering one unit of syllabus) carrying 10 marks each shall be EITHER/OR type descriptive questions and may contain sub-questions.

OPTIMIZATION TECHNIQUES (OT)

<table>
<tr><td colspan="5">VI Semester : All Branches except ME</td><td colspan="4">Scheme : 2023</td></tr>
<tr><td>Course Code</td><td>Category</td><td colspan="3">Hours/Week</td><td>Credits</td><td colspan="3">Maximum Marks</td></tr>
<tr><td rowspan="2">OE611</td><td rowspan="2">OE-II</td><td>L/D</td><td>T</td><td>P</td><td>C</td><td>Continuous Internal Assessment</td><td>End Exam</td><td>Total</td></tr>
<tr><td>3</td><td>-</td><td>-</td><td>3</td><td>30</td><td>70</td><td>100</td></tr>
<tr><td colspan="5">Sessional Exam Duration : 2 Hrs</td><td colspan="4">End Exam Duration: 3 Hrs</td></tr>
<tr><td colspan="9"></td></tr>
<tr><td colspan="9">Course Outcomes :At the end of the course the student will be able to</td></tr>
<tr><td colspan="9">CO1: Understand the meaning, purpose, tools of Operations Research and linear programming in solving practical problems in industry.</td></tr>
<tr><td colspan="9">CO2: Interpret the transportation models' solutions and infer solutions to the real-world problems.</td></tr>
<tr><td colspan="9">CO3: Develop mathematical skills to analyze and solve nonlinear programming models arising from a wide range of applications.</td></tr>
<tr><td colspan="9">CO4: Apply the concept of non-linear programming for solving the problems involving non-linear constraints and objectives</td></tr>
<tr><td colspan="9">CO5: Apply the concept of unconstrained geometric programming for solving the problems L2, L3 involving non-linear constraints and objectives.</td></tr>
<tr><td colspan="9">UNIT – I</td></tr>
<tr><td colspan="9">Linear Programming-I: Introduction – Applications of linear programming – Standard form of a linear programming problem, Geometry of linear programming problems – Basic definitions in linear programming. Simplex method – Simplex algorithm and two phase simplex method – Big-M method.</td></tr>
<tr><td colspan="9">UNIT – II</td></tr>
<tr><td colspan="9">Linear Programming-II: Duality in Linear Programming:
Symmetric primal-dual relations – General primal-dual relations – Duality theorem – Dual simplex method – Transportation problem and assignment problem – Complementary slackness theorem</td></tr>
<tr><td colspan="9">UNIT – III</td></tr>
<tr><td colspan="9">Non-linear Programming: Unconstrained Optimization Techniques: Introduction – Classification of unconstrained minimization methods,
Direct Search Methods: Random search methods – Descent method and Fletcher Powell method – Grid search method.</td></tr>
<tr><td colspan="9">UNIT – IV</td></tr>
<tr><td colspan="9">Non-linear Programming: Constrained Optimization Techniques:
Introduction – Characteristics of a constrained problem – Random search methods – Complex method – Sequential linear programming – Basic approach in methods of feasible directions – Zoutendijk's method of feasible directions: direction finding problem – Determination of step length – Termination criteria.</td></tr>
<tr><td colspan="9">UNIT – V</td></tr>
<tr><td colspan="9">Geometric Programming :
Unconstrained Minimization Problems: solution of unconstrained geometric programming using differential calculus and arithmetic-geometric inequality.
Constrained Minimization Problems: Solution of a constrained geometric programming problem – primal-dual programming in case of less-than inequalities – geometric</td></tr>
</table>

programming with mixed inequality constraints.

Text Books

1. Singiresu S Rao., *Engineering Optimization: Theory and Practices*, New Age Int. (P) Ltd. Publishers, New Delhi.
2. J. C. Panth, *Introduction to Optimization Techniques*, Jain Brothers, New Delhi.

Reference Books

1. Harvey M. Wagner, *Principles of Operation Research*, Printice Hall of India Pvt. Ltd. New Delhi.
2. Peressimi A.L., Sullivan F.E., Vhl, J. J. *Mathematics of Non-linear Programming*, Springer, Verlag.

Online Learning Resources

Question Paper Pattern:

Sessional Exam: The question paper for Sessional Examination shall be for 40 marks. The question paper shall consist of Four Questions and all questions are compulsory. Question No.1 contains Five short answer questions (2marks each) for a total of 10 marks. Remaining Three Questions shall be EITHER/OR type descriptive questions for 10 marks each. Each of these descriptive questions may contain sub-questions.

End Exam: The question paper for End Examination shall be for 70 marks. The question paper shall contain Six Questions and all questions are compulsory. Question No.1 shall contain Ten short answer questions (2 marks each) for a total of 20 marks, with Two short answer questions from each unit. Remaining Five Questions (each question covering one unit of syllabus) carrying 10 marks each shall be EITHER/OR type descriptive questions and may contain sub-questions.

PHYSICS OF ELECTRONIC MATERIALS AND DEVICES (PEMD)

VI Semester : All Branches					Scheme : 2023			
Course Code	Category	Hours/Week			Credits	Maximum Marks		
OE612	OE-II	L/D	T	P	C	Continuous Internal Assessment	End Exam	Total
		3	-	-	3	30	70	100
Sessional Exam Duration : 2 Hrs					End Exam Duration: 3 Hrs			

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

CO1: Understand crystal growth and thin film preparation.

CO2: Summarize the basic concepts of semi-conductors.

CO3: Illustrate the working of various semi-conductor devices

CO4: Analyze various luminescent phenomena and the devices based on the concepts

CO5: Explain the working of different display devices

UNIT – I

Fundamentals of Materials Science: Introduction – Phase rule – Phase diagram – Elementary idea of nucleation and growth – Methods of crystal growth. The basic idea of point, line, and planar defects – Concept of thin films – Preparation of thin films – Deposition of thin film using sputtering methods (RF and glow discharge).

UNIT – II

Semiconductors: Introduction – Charge carriers in semiconductors – Effective mass – Diffusion and drift – Diffusion and recombination – Diffusion length. The Fermi level & Fermi-Dirac distribution – Electron and Hole in quantum well – Change of electron-hole concentration – Qualitative analysis – Temperature dependency of carrier concentration – Conductivity and mobility – Effects of temperature and doping on mobility – High field effects.

UNIT – III

Physics of Semiconductor Devices: Introduction – Band structure – PN junctions and their typical characteristics under equilibrium and under bias – Hetero junctions – Transistors – MOSFETs.

UNIT – IV

Excitons and Luminescence:

Luminescence: Different types of luminescence – Basic definitions – Light emission in solids – Inter-band luminescence – Direct and indirect gap materials.

Photo luminescence: General principles of photoluminescence – Excitation and relaxation – OLED – Quantum-dot.

Electro-luminescence: General principles of electroluminescence – Light emitting diode – Diode laser.

UNIT – V

Display devices: LCD – Three-dimensional display: Holographic display – Light-field displays: Head-mounted display – MOEMS (Micro-Opto-Electro-Mechanical Systems) and MEMS displays.

Text Books

1. S.O Kasap, *Principles of Electronic Materials and Devices*, McGraw Hill Education (India) Pvt. Ltd., 4th edition, 2021.
2. *Semiconductor Physics & Devices: Basic Principles*, 4th Edition, McGraw Hill, 2012.

Reference Books

1. B.G. Streetman and S. Banerjee, *Solid State Electronic Devices*, PHI Learning, 6th edition.

2. Eugene A. Irene, *Electronic Materials Science*, Wiley, 2005.

3. Grover and Jamwal, *Electronic Components and Materials*, Dhanpat Rai and Co., New Delhi, 2012.

4. Wei Gao, Zhengwei Li, Nigel Sammes, *An Introduction to Electronic Materials for Engineer*, World Scientific Publishing Co. Pvt. Ltd. 2nd Edition, 2011.

Online Learning Resources

1.https://nptel.ac.in/courses/113/106/113106062/https://onlinecourses.nptel.ac.in/noc20_ph24/preview

Question Paper Pattern:

Sessional Exam: The question paper for Sessional Examination shall be for 40 marks. The question paper shall consist of Four Questions and all questions are compulsory. Question No.1 contains Five short answer questions (2marks each) for a total of 10 marks. Remaining Three Questions shall be EITHER/OR type descriptive questions for 10 marks each. Each of these descriptive questions may contain sub-questions.

End Exam: The question paper for End Examination shall be for 70 marks. The question paper shall contain Six Questions and all questions are compulsory. Question No.1 shall contain Ten short answer questions (2 marks each) for a total of 20 marks, with Two short answer questions from each unit. Remaining Five Questions (each question covering one unit of syllabus) carrying 10 marks each shall be EITHER/OR type descriptive questions and may contain sub-questions.

CHEMISTRY OF POLYMERS AND APPLICATION (CPA)

VI Semester : All Branches					Scheme : 2023			
Course Code	Category	Hours/Week			Credits	Maximum Marks		
		L/D	T	P	C	Continuous Internal Assessment	End Exam	Total
OE613	OE-II	3	-	-	3	30	70	100
Sessional Exam Duration : 2 Hrs					End Exam Duration: 3 Hrs			

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

CO1: Classify the polymers, explain polymerization mechanism, differentiate addition, condensation polymerizations, and describe measurement of molecular weight of polymer.

CO2: Describe the physical and chemical properties of natural polymers and modified cellulosics.

CO3: Differentiate bulk, solution, suspension and emulsion polymerization; describe fibers and elastomers, Identify the thermosetting and thermo polymers.

CO4: Identify types of polymer networks, describe methods involve in hydrogel reparation, Explain applications of hydrogels in drug delivery.

CO5: Explain classification and mechanism of conducting and degradable polymers.

UNIT – I

Polymers-Basics and Characterization: Basic concepts: monomers, repeating units, degree of polymerization, linear, branched and network polymers, classification of polymers.
Polymerization: Addition, condensation, copolymerization and coordination polymerization. Average molecular weight concepts: number, weight and viscosity average molecular weights, polydispersity and molecular weight distribution. Measurement of molecular weight: End group, viscosity, light scattering, osmotic and ultracentrifugation methods, analysis and testing of polymers.

UNIT – II

Natural Polymers & Modified Cellulosics: Natural Polymers: Chemical & Physical structure, properties, source, important chemical modifications, applications of polymers such as cellulose, lignin, starch, rosin, shellac, latexes, vegetable oils and gums, proteins.
Modified Cellulosics: Cellulose esters and ethers such as Ethyl cellulose, CMC, HPMC, cellulose acetals, Liquid crystalline polymers; specialty plastics- PES, PAES, PEEK, PEA.

UNIT – III

Synthetic Polymers: Addition and condensation polymerization processes – Bulk, Solution, Suspension and Emulsion polymerization. Preparation and significance, classification of polymers based on physical properties. Thermoplastics – Thermosetting plastics, fibers and elastomers – General Applications. Preparation of Polymers based on different types of monomers, Olefin polymers (PE, PVC), Butadiene polymers (BUNA-S, BUNA-N), nylons, Urea-formaldehyde, phenol-formaldehyde, Melamine Epoxy and Ion exchange resins.

UNIT – IV

Hydrogels of Polymer Networks: Definitions of Hydrogel, polymer networks – Types of polymer networks – Methods involved in hydrogel preparation – Classification, Properties of hydrogels – Applications of hydrogels in drug delivery.

UNIT – V

Conducting and Degradable Polymers:
Conducting Polymers: Introduction – Classification, Mechanism of conduction in Poly

Acetylene, Poly Aniline, Poly Thiophene, Doping, Applications.
Degradable Polymers: Introduction – Classifications, Examples – Mechanism of degradation, poly lactic acid, Nylon-6, Polyesters, applications.

Text Books

1. Billmayer, *A Text book of Polymer Science*
2. G.S. Mishra, *Polymer Chemistry*
3. Gowarikar, *Polymer Chemistry*

Reference Books

1. K.J. Saunders, *Organic polymer Chemistry*, Chapman and Hall.
2. B. Miller, *Advanced Organic Chemistry*, Prentice Hall.
3. Premamoy Ghosh, *Polymer Science and Technology*, 3rd edition, McGraw Hill, 2010.

Online Learning Resources

Question Paper Pattern:

Sessional Exam: The question paper for Sessional Examination shall be for 40 marks. The question paper shall consist of Four Questions and all questions are compulsory. Question No.1 contains Five short answer questions (2marks each) for a total of 10 marks. Remaining Three Questions shall be EITHER/OR type descriptive questions for 10 marks each. Each of these descriptive questions may contain sub-questions.

End Exam: The question paper for End Examination shall be for 70 marks. The question paper shall contain Six Questions and all questions are compulsory. Question No.1 shall contain Ten short answer questions (2 marks each) for a total of 20 marks, with Two short answer questions from each unit. Remaining Five Questions (each question covering one unit of syllabus) carrying 10 marks each shall be EITHER/OR type descriptive questions and may contain sub-questions.

ACADEMIC WRITING AND PUBLIC SPEAKING (AWPS)

VI Semester : All Branches						Scheme : 2023		
Course Code	Category	Hours/Week			Credits	Maximum Marks		
OE614	OE-II	L/D	T	P	C	Continuous Internal Assessment	End Exam	Total
		3	-	-	3	30	70	100
Sessional Exam Duration : 2 Hrs						End Exam Duration: 3 Hrs		

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

CO1: Understand various elements of academic writing.

CO2: Identify sources and avoid plagiarism.

CO3: Demonstrate the knowledge in writing a research paper.

CO4: Analyse different types of essays.

CO5: Assess the speeches of others and know the positive strengths of speakers.

CO6: Build confidence in giving an impactful presentation to the audience.

UNIT – I

***Introduction to Academic Writing*:**
***Academic Writing*:** Introduction
***Essential Features of Academic Writing*:** Courtesy, Clarity, Conciseness, Correctness, Coherence, Completeness
***Types of Academic Writing*:** Descriptive, Analytical, Persuasive, Critical writing

UNIT – II

***Academic Journal Article*:**
***Art of condensation*:** summarizing and paraphrasing
Abstract Writing
***Writing*:** Project Proposal, an application for internship, Technical/Research/Journal Paper Writing, Conference Paper Writing
Editing and Proofreading
Understanding and avoiding Plagiarism

UNIT – III

***Essay Writing & Writing Reviews*:**
***Types of Essays*:** Compare and Contrast Essay, Argumentative Essay, Exploratory Essay
Features and analysis of sample essays
Writing a Book Report
Summarizing
Writing a Book/Film Review
Writing a Statement of Purpose (SoP)

UNIT – IV

Public Speaking:
Public Speaking: Introduction, Nature, characteristics, and significance
Presentation skills: 4 P's of Presentation, Stage Dynamics, Answering Strategies during presentations
Analysis of impactful speeches
Types of speeches for academic events

UNIT – V

***Public Speaking and Non-Verbal Delivery*:** Body Language, Facial Expressions, Kinesics,

Oculesics, Proxemics, Haptics, Chronomics, Paralanguage, Signs
Text Books
1. *Critical Thinking, Academic Writing and Presentation Skills*: MG University, Edition Paperback, Pearson Education; First edition, 1 January 2010.
2. Pease, Allan & Barbara. *The Definitive Book of Body Language,* RHUS Publishers, 2016.
Reference Books
1. Alice Savage, Masoud Shafiei, *Effective Academic Writing,* 2nd edition, Oxford University Press, 2014
2. Shalini Verma, *Body Language*, S Chand Publications, 2011.
3. Sanjay Kumar and Pushpalata, *Communication Skills*, Oxford, 2nd edition, 2015.
4. Sharon Gerson, Steven Gerson, *Technical Communication Process and Product*, Pearson, New Delhi, 2014
5. Elbow, Peter, *Writing with Power,* OUP USA, 1998
Online Learning Resources
1. https://youtu.be/NNhTIT81nH8
2. https://www.youtube.com/watch?v=478ccrWKY-A
3. https://www.youtube.com/watch?v=nzGo5ZC1gMw
4. https://www.youtube.com/watch?v=Qve0ZBmJMh4
5. https://courses.lumenlearning.com/publicspeakingprinciples/chapter/chapter-12nonverbal-aspects-of delivery/
6. https://onlinecourses.nptel.ac.in/noc21_hs76/preview
7. https://archive.nptel.ac.in/courses/109/107/109107172/#
8. https://archive.nptel.ac.in/courses/109/104/109104107/
Question Paper Pattern:
Sessional Exam: The question paper for Sessional Examination shall be for 40 marks. The question paper shall consist of Four Questions and all questions are compulsory. Question No.1 contains Five short answer questions (2marks each) for a total of 10 marks. Remaining Three Questions shall be EITHER/OR type descriptive questions for 10 marks each. Each of these descriptive questions may contain sub-questions. **End Exam:** The question paper for End Examination shall be for 70 marks. The question paper shall contain Six Questions and all questions are compulsory. Question No.1 shall contain Ten short answer questions (2 marks each) for a total of 20 marks, with Two short answer questions from each unit. Remaining Five Questions (each question covering one unit of syllabus) carrying 10 marks each shall be EITHER/OR type descriptive questions and may contain sub-questions.

MATHEMATICAL FOUNDATION OF QUANTUM TECHNOLOGIES (MFQT)

VI Semester : All Branches					Scheme : 2023			
Course Code	Category	Hours/Week			Credits	Maximum Marks		
OE615	OE-II	L/D	T	P	C	Continuous Internal Assessment	End Exam	Total
		3	-	-	3	30	70	100
Sessional Exam Duration : 2 Hrs					End Exam Duration: 3 Hrs			

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

CO1: Understand the Transformation theory and Hilbert space.

CO2: Analyze the properties and operators of Hilbert space and apply Eigen values to it.

CO3: Apply statistics to measure theory, uncertainty relations and radiation theory.

CO4: Evaluate problems on reversibility, equilibrium and macroscopic measurements.

CO5: Formulate problems of composite system and measuring process.

UNIT – I

Introductory Considerations: The origin of the transformation theory – The original formulation of quantum mechanics – The equivalence of the two theories: (i) The transformation theory, (ii) Hilbert space.

UNIT – II

Abstract Hilbert Space: The definition of Hilbert space – The geometry of Hilbert space – Degression on the conditions A-E – Closed linear manifolds – Operators in Hilbert space – The Eigen value problem – Continuation – Initial consideration concerning the Eigen value problem – Degression on the existence and uniqueness of solutions of the Eigen value problems – Cumulative operators – The trace.

UNIT – III

The Quantum Statistics: The statistical assertions of quantum mechanics – The statistical interpretation – Simultaneous measurability and measurability in general – Uncertainty relations – Projections as propositions – Radiation theory.

UNIT – IV

Deductive Development of the Theory and General Considerations: The fundamental basis of the statistical theory – Conclusions from experiments. Measurement and reversibility – Thermodynamics considerations – Reversibility and equilibrium problems – The Macroscopic measurement.

UNIT – V

The Measuring Process: Formulation of the problems – Composite systems – Discussion of the measuring process.

Text Books

1. John von Neumann and Robert T Beyer, *Mathematical Foundations of Quantum Mechanics*, Princeton Univ. Press, 1996.
2. Srinivas, M. D., *Measurements and Quantum Probabilities*, University Press, Hyderabad, 2001.

Reference Books

1. Leonard Schiff, *Quantum Mechanics*, McGraw Hill, 2010.
2. Parthasarathy. K. R., *Mathematical Foundations of Quantum*, Hindustan Book Agency,

New Delhi.

3. Gerad Tesch, *Mathematical Methods in Quantum Mechanics with Application to Schrodinger Operators*, Graduate Studies in Mathematics, 99, AMS, Providence, 2009.

Online Learning Resources

Question Paper Pattern:

Sessional Exam: The question paper for Sessional Examination shall be for 40 marks. The question paper shall consist of Four Questions and all questions are compulsory. Question No.1 contains Five short answer questions (2marks each) for a total of 10 marks. Remaining Three Questions shall be EITHER/OR type descriptive questions for 10 marks each. Each of these descriptive questions may contain sub-questions.

End Exam: The question paper for End Examination shall be for 70 marks. The question paper shall contain Six Questions and all questions are compulsory. Question No.1 shall contain Ten short answer questions (2 marks each) for a total of 20 marks, with Two short answer questions from each unit. Remaining Five Questions (each question covering one unit of syllabus) carrying 10 marks each shall be EITHER/OR type descriptive questions and may contain sub-questions.

Open Elective – III

S. No.	Subject Code	Course Name	Offering Department	Eligible Branches
1	OE701	Building Materials and Services	CE	All Branches Except CE
2	OE702	Environmental Impact Assessment	CE	All Branches
3	OE703	Smart Grid Technologies	EEE	All Branches Except EEE
4	OE704	3D Printing Technologies	ME	All Branches Except ME
5	OE705	Composite Materials	ME	All Branches
6	OE706	Applications of Microprocessors and Microcontrollers	ECE	All Branches Except EEE and ECE
7	OE707	Introduction to Data Base Systems	CSE	CE,EEE,ME, and ECE
8	OE708	Cyber Security	CSE	CE,EEE,ME, and ECE
9	OE709	Modern C++	CSE	All Branches
10	OE710	Wavelet Transforms and its Applications	HBS	All Branches
11	OE711	Smart Materials and Devices		
12	OE712	Green Chemistry and Catalysis for Sustainable Environment		
13	OE713	Employability Skills		
14	OE714	Introduction to Quantum Mechanics		

BUILDING MATERIALS AND SERVICES (BMS)

<table>
<tr><td colspan="5">VII Semester : All Branches except CE</td><td colspan="4">Scheme : 2023</td></tr>
<tr><td>Course Code</td><td>Category</td><td colspan="3">Hours/Week</td><td>Credits</td><td colspan="3">Maximum Marks</td></tr>
<tr><td rowspan="2">OE701</td><td rowspan="2">OE-III</td><td>L/D</td><td>T</td><td>P</td><td>C</td><td>Continuous Internal Assessment</td><td>End Exam</td><td>Total</td></tr>
<tr><td>3</td><td>-</td><td>-</td><td>3</td><td>30</td><td>70</td><td>100</td></tr>
<tr><td colspan="5">Sessional Exam Duration : 2 Hrs</td><td colspan="4">End Exam Duration: 3 Hrs</td></tr>
<tr><td colspan="9"></td></tr>
<tr><td colspan="9">Course Outcomes : At the end of the course the student will be able to</td></tr>
<tr><td colspan="9">CO1: Understand the properties, classifications, and applications of building materials like stones, bricks, tiles, wood, aluminum, and plastics.</td></tr>
<tr><td colspan="9">CO2: Analyze the composition, manufacturing process, and properties of cement and admixtures.</td></tr>
<tr><td colspan="9">CO3: Apply knowledge of building components such as lintels, arches, stairs, floors, roofs, foundations.</td></tr>
<tr><td colspan="9">CO4: Evaluate masonry, mortars, finishing techniques, and formwork systems.</td></tr>
<tr><td colspan="9">CO5: Assess various building services including plumbing, ventilation, acoustics, and fire protection.</td></tr>
<tr><td colspan="9">UNIT – I</td></tr>
<tr><td colspan="9">Building Materials:
Building stones – Classifications – Properties – Structural requirements.
Bricks – Composition of brick earth – Qualities of good brick – Types of brick.
Tiles – Characteristics of good tile – Types of tiles.
Wood – Structure – Types and properties – Seasoning.
Other materials: Properties and uses of steel, Aluminum and plastics.</td></tr>
<tr><td colspan="9">UNIT – II</td></tr>
<tr><td colspan="9">Cement & Admixtures:
Types of cement – Ingredients of cement – Manufacture – Chemical composition – Hydration – Field & lab tests – Fineness – Consistency – Initial & final setting – Soundness.
Admixtures – Mineral & Chemical admixtures – Uses</td></tr>
<tr><td colspan="9">UNIT – III</td></tr>
<tr><td colspan="9">Building Components:
Foundations – Types.
Floors – Types of floors.
Roofs – Flat, curved, trussed.
Stair Cases – Terminology – Types.
Lintels and Arches.</td></tr>
<tr><td colspan="9">UNIT – IV</td></tr>
<tr><td colspan="9">Mortars: Lime and cement mortars
Masonry: Bonds in brick masonry and stone masonry
Finishers: Plastering – Pointing – Painting.
Form Work: Types – Requirements – Scaffolding.</td></tr>
<tr><td colspan="9">UNIT – V</td></tr>
<tr><td colspan="9">Building Services:
Plumbing Services: Water Distribution – Sanitary – Lines & Fittings.
Ventilations: Functional requirements – Natural and mechanical ventilation</td></tr>
</table>

Acoustics: Characteristic – Absorption – Acoustic design.
Fire Protection: Fire hazards – Classification of fire resistant materials and constructions.

Text Books

1. Arora & Bindra, *Building Materials and Construction*, Dhanpat Rai Publications.
2. G C Sahu, Joygopal Jena, *Building Materials and Construction*, McGraw Hill Pvt. Ltd., 2015.

Reference Books

1. B. C. Punmia, Ashok Kumar Jain and Arun Kumar Jain, *Building Construction*, Laxmi Publications (P) Ltd., New Delhi.
2. P. C. Varghese, *Building Materials*, Prentice Hall of India, 2015.
3. N.Subramanian, *Building Materials Testing and Sustainability*, Oxford Higher Education, 2019.
4. R. Chudley, *Construction Technology*, Longman Publishing Group, 1973.
5. S. K. Duggal, *Building Materials*, Oxford & IBH Publishing Co. Ltd., New Delhi, 2019.

Online Learning Resources

1. https://archive.nptel.ac.in/courses/105/102/105102088/

Question Paper Pattern:

Sessional Exam: The question paper for Sessional Examination shall be for 40 marks. The question paper shall consist of Four Questions and all questions are compulsory. Question No.1 contains Five short answer questions (2marks each) for a total of 10 marks. Remaining Three Questions shall be EITHER/OR type descriptive questions for 10 marks each. Each of these descriptive questions may contain sub-questions.

End Exam: The question paper for End Examination shall be for 70 marks. The question paper shall contain Six Questions and all questions are compulsory. Question No.1 shall contain Ten short answer questions (2 marks each) for a total of 20 marks, with Two short answer questions from each unit. Remaining Five Questions (each question covering one unit of syllabus) carrying 10 marks each shall be EITHER/OR type descriptive questions and may contain sub-questions.

ENVIRONMENTAL IMPACT ASSESSMENT (EIA)

VII Semester : All Branches					Scheme : 2023			
Course Code	Category	Hours/Week			Credits	Maximum Marks		
		L/D	T	P	C	Continuous Internal Assessment	End Exam	Total
OE702	OE-III	3	-	-	3	30	70	100
Sessional Exam Duration : 2 Hrs					End Exam Duration: 3 Hrs			

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

CO1: Apply various methodologies for conducting Environmental Impact Assessments.

CO2: Analyze the impact of land-use changes on soil, water, and air quality.

CO3: Evaluate the environmental impact on vegetation, wildlife, and conduct risk assessments.

CO4: Develop environmental audit reports and assess compliance with environmental policies.

CO5: Interpret and apply environmental acts and regulations related to EIA.

UNIT – I

Concepts and Methodologies of EIA

Initial environmental examination – Elements of EIA – Factors affecting EIA – Impact evaluation and analysis – Preparation of environmental base map – Classification of environmental parameters – Criteria for the selection of EIA methodology – EIA methods – Ad-hoc methods – Matrix methods – Network method – Environmental media quality index method – Overlay methods and cost/benefit analysis.

UNIT – II

Impact of Developmental Activities and Land Use

Introduction and methodology for the assessment of soil and ground water – Delineation of study area – Identification of actives – Procurement of relevant soil quality – Impact prediction – Assessment of impact significance – Identification and incorporation of mitigation measures – EIA in surface water – Air and biological environment – Methodology for the assessment of impacts on surface water environment – Air pollution sources – Generalized approach for assessment of air pollution impact.

UNIT – III

Assessment of Impact on Vegetation, Wildlife and Risk Assessment

Introduction – Assessment of impact of development activities on vegetation and wildlife, environmental impact of deforestation – Causes and effects of deforestation – Risk assessment and treatment of uncertainty – Key stages in performing environmental risk assessment – Advantages of environmental risk assessment.

UNIT – IV

Environmental Audit

Introduction – Environmental audit – Environmental legislation – Objectives of environmental audit – Types of environmental audit – Audit protocol – Stages of environmental audit – Onsite activities – Evaluation of audit data and preparation of audit report.

UNIT – V

Environmental Acts and Notifications

The environmental protection act – The water preservation act – The air (prevention &

control of pollution act) – Wild life act – Provisions in the EIA notification – Procedure for environmental clearance – Procedure for conducting environmental impact assessment report – Evaluation of EIA report – Environmental legislation objectives – Evaluation of audit data and preparation of audit report – Post audit activities – concept of ISO and ISO 14000.

Text Books

1. Y. Anjaneyulu, *Environmental Impact Assessment Methodologies*, B. S. Publication, Hyderabad 2nd edition 2011.

2. Canter Larry W., *Environmental Impact Assessment*, McGraw-Hill education, Edi (1996).

Reference Books

1. Peavy, H. S, Rowe, D. R, Tchobanoglous, G., *Environmental Engineering*, McGraw Hill International Editions, New York 1985.

2. Suresh K. Dhaneja, S.K., *Environmental Science and Engineering*, Katania & Sons Publication, New Delhi.

3. J. Glynn and Gary W. Hein Ke, *Environmental Science and Engineering*, Prentice Hall Publishers.

4. H. S. Bhatia, *Environmental Pollution and Control*, Galgotia Publication (P) Ltd., Delhi.

Online Learning Resources

1. https://archive.nptel.ac.in/courses/124/107/124107160/

Question Paper Pattern:

Sessional Exam: The question paper for Sessional Examination shall be for 40 marks. The question paper shall consist of Four Questions and all questions are compulsory. Question No.1 contains Five short answer questions (2marks each) for a total of 10 marks. Remaining Three Questions shall be EITHER/OR type descriptive questions for 10 marks each. Each of these descriptive questions may contain sub-questions.

End Exam: The question paper for End Examination shall be for 70 marks. The question paper shall contain Six Questions and all questions are compulsory. Question No.1 shall contain Ten short answer questions (2 marks each) for a total of 20 marks, with Two short answer questions from each unit. Remaining Five Questions (each question covering one unit of syllabus) carrying 10 marks each shall be EITHER/OR type descriptive questions and may contain sub-questions.

SMART GRID TECHNOLOGIES (SGT)

VII Semester : All Branches except EEE					Scheme : 2023			
Course Code	Category	Hours/Week			Credits	Maximum Marks		
OE703	OE-III	L/D	T	P	C	Continuous Internal Assessment	End Exam	Total
		3	-	-	3	30	70	100
Sessional Exam Duration : 2 Hrs					End Exam Duration: 3 Hrs			

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

CO1: Understanding the concept and evolution of smart grids.

CO2: Analyzing wide area monitoring system and synchrophasor technology.

CO3: Applying smart metering and advanced metering infrastructure (AMI) concepts.

CO4: Evaluating information and communication technology (ICT) systems in smart grids.

CO5: Designing smart grid applications and cyber security measures.

UNIT – I

Introduction to Smart Grid: Evolution of electric grid – Need for smart grid – Difference between conventional & smart grid – Overview of enabling technologies – International experience in smart grid deployment efforts – Smart grid road map for India – Smart grid architecture.

UNIT – II

Wide Area Monitoring System: Fundamentals of synchrophasor technology – Concept and benefits of wide area monitoring system – Structure and functions of Phasor Measuring Unit (PMU) and Phasor Data Concentrator (PDC) – Road map for synchrophasor applications (NAPSI) – Operational experience and blackout analysis using PMU - Case study on PMU.

UNIT – III

Smart Meters: Features and functions of smart meters – Functional specification – Category of smart meters – Automatic Meter Reading (AMR) and Advanced Metering Infrastructure (AMI) drivers and benefits – AMI protocol – Demand side integration: Peak load, Outage and Power quality management.

UNIT – IV

Information and Communication Technology: Overview of smart grid communication system – Modulation and demodulation techniques: Radio communication – Mobile communication – Power line communication – Optical fibre communication – Communication protocol for smart grid.

UNIT – V

Smart Grid Applications and Cyber Security: Applications: Overview and concept of renewable integration – Introduction to distributed generation – Role of protective relaying in smart grid – House area network – Advanced energy storage technology: Flow battery – Fuel cell – SMES – Super capacitors – Plug-in hybrid electric vehicles - Cyber security: Security issues in DG, Distribution automation, AMI, Electric vehicle management systems – Approach to assessment of smart grid cyber security risks – Methodologies – Cyber security requirements – Smart grid information model.

Text Books

1. James Momoh, *SMART GRID: Fundamentals of Design and Analysis*, John Wiley and Sons, New York, 2012.

2. Janaka Ekanayake, Nick Jenkins, Kithsiri Liyanage, Jianzhong Wu, Akihiko Yokoyama, *Smart Grid: Technology and Applications*, John Wiley & Sons, New Jersey, 2012.

Reference Books

1. Power Grid Corporation of India Limited, *Smart Grid Primer*, 1st edition, Power Grid Corporation of India Limited, Bangalore, India, 2013.

2. Fereidoon. P. Sioshansi, *Smart Grid – Integrating Renewable, Distributed and Efficient Energy*, 1st Edition, Academic Press, USA, 2011.

3. Stuart Borlase, *Smart Grids: Infrastructure, Technology and Solutions*, 1st edition, CRC Press Publication, England, 2013.

4. Phadke A G, Thorp J S, *Synchronized Phasor Measurements and Their Applications*, 1st edition, Springer, Newyork, 2012.

Online Learning Resources

1. https://nptel.ac.in/courses/108107113

Question Paper Pattern:

Sessional Exam: The question paper for Sessional Examination shall be for 40 marks. The question paper shall consist of Four Questions and all questions are compulsory. Question No.1 contains Five short answer questions (2marks each) for a total of 10 marks. Remaining Three Questions shall be EITHER/OR type descriptive questions for 10 marks each. Each of these descriptive questions may contain sub-questions.

End Exam: The question paper for End Examination shall be for 70 marks. The question paper shall contain Six Questions and all questions are compulsory. Question No.1 shall contain Ten short answer questions (2 marks each) for a total of 20 marks, with Two short answer questions from each unit. Remaining Five Questions (each question covering one unit of syllabus) carrying 10 marks each shall be EITHER/OR type descriptive questions and may contain sub-questions.

3D PRINTING TECHNOLOGIES (3DPT)

VII Semester : All Branches except ME					Scheme : 2023			
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
		L/D	**T**	**P**	**C**	**Continuous Internal Assessment**	**End Exam**	**Total**
OE704	**OE-III**	**3**	**-**	**-**	**3**	**30**	**70**	**100**
Sessional Exam Duration : 2 Hrs					**End Exam Duration: 3 Hrs**			

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

CO1: Explain the fundamentals of AM, its process steps, classification, materials, and **describe** Vat Photo-polymerization methods with applications.

CO2: Explain material jetting, binder jetting, and FDM processes in terms of materials, working principles, benefits, and **illustrate** their applications.

CO3: Explain the working of sheet lamination, 3DP, and powder bed fusion processes, and **analyze** their advantages and industrial use cases.

CO4: **Describe** directed energy deposition AM processes, benefits, and applications.

CO5: **Explain** post-processing techniques in AM and **understand the concepts of** direct and indirect rapid tooling methods with examples.

UNIT – I

Introduction to Additive Manufacturing: Introduction to AM – AM evolution – Distinction between AM & CNC machining – Steps in AM – Classification of AM processes – Advantages of AM and types of materials for AM.

Vat Photo-polymerization AM Processes: Stereo lithography (SL) – Materials, process modeling – SL resin curing process – SL scan patterns – Micro-Stereo lithography – Mask projection processes – Process benefits and drawbacks – Applications of Vat photo-polymerization, case studies**.**

UNIT – II

Material Jetting AM Processes: Evolution of printing as an additive manufacturing process – Materials – Process benefits and drawbacks – Applications of material jetting processes.

Binder Jetting AM Processes: Materials – Process – Benefits and drawbacks – Research achievements in printing deposition – Technical challenges in printing – Applications of binder jetting processes.

Extrusion-Based AM Processes: Fused Deposition Modelling (FDM) – Principles – Materials – Process modelling – Plotting and path control – Bio-Extrusion – Contour crafting – Process benefits and drawbacks – Applications of extrusion-based processes, case studies.

UNIT – III

Sheet Lamination AM Processes: Bonding mechanisms – Materials – Laminated Object Manufacturing (LOM), Ultrasonic Consolidation (UC) – Gluing – Thermal bonding, LOM and UC applications, case studies.

Three Dimensional Printing (3DP): Principle, Process, Applications, Advantages and disadvantages of 3DP.

Powder Bed Fusion AM Processes: Selective Laser Sintering (SLS), Materials – Powder fusion mechanism and powder handling – Process modelling – SLS Metal and ceramic part creation – Electron Beam melting (EBM), Process, Benefits and Drawbacks, Applications of powder bed fusion processes, case studies**.**

UNIT – IV

Directed Energy Deposition AM Processes: Process, Description, Material Delivery, Laser Engineered Net Shaping (LENS) – Direct Metal Deposition (DMD) – Benefits and drawbacks – Applications of directed energy deposition processes.

UNIT – V

Post Processing of AM Parts: Support material removal – Surface texture improvement – Accuracy improvement – Aesthetic improvement – Property enhancements using Non-thermal and thermal techniques.

Rapid Tooling: Direct and indirect methods AIM tooling – SLS rapid steel – Direct Laser Metal Sintering (DMLS), Laminate tooling. RTV silicon rubber moulds – Vacuum casting – Reaction Injection Moulding (RIM) –Wax Injection moulding – Spray metal tooling – 3D kelt tool.

Text Books

1. Chua C.K., Leong. K.F, and Lim C, C.S., *Rapid Prototyping Principles and Applications*, World Scientific Publishing Co. Pvt. Ltd.

2. D.T. Pham and S.S. Dimov, *Rapid Manufacturing the Technologies and Applications of Rapid Prototyping and Rapid Tooling*. Springer Publications.

Reference Books

1. Terry Wholers, Wholers report, Wholers Associates

2. Gibson D. W. Rosen and B. Stucker., *Additive Manufacturing Technologies*, Springer Publication.

Online Learning Resources

1. https://www.nist.gov/additive-manufacturing
2. https://www.metal-am.com/
3. http://additivemanufacturing.com/basics/
4. https://www.3dprintingindustry.com/
5. https://www.thingiverse.com/
6. https://reprap.org/wiki/RepRap

Question Paper Pattern:

Sessional Exam: The question paper for Sessional Examination shall be for 40 marks. The question paper shall consist of Four Questions and all questions are compulsory. Question No.1 contains Five short answer questions (2marks each) for a total of 10 marks. Remaining Three Questions shall be EITHER/OR type descriptive questions for 10 marks each. Each of these descriptive questions may contain sub-questions.

End Exam: The question paper for End Examination shall be for 70 marks. The question paper shall contain Six Questions and all questions are compulsory. Question No.1 shall contain Ten short answer questions (2 marks each) for a total of 20 marks, with Two short answer questions from each unit. Remaining Five Questions (each question covering one unit of syllabus) carrying 10 marks each shall be EITHER/OR type descriptive questions and may contain sub-questions.

COMPOSITE MATERIALS (CM)

VII Semester : All Branches						Scheme : 2023		
Course Code	Category	Hours/Week			Credits	Maximum Marks		
OE705	OE-III	L/D	T	P	C	Continuous Internal Assessment	End Exam	Total
		3	-	-	3	30	70	100
Sessional Exam Duration : 2 Hrs						End Exam Duration: 3 Hrs		

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

CO1: Identify the properties of fiber and matrix materials used in commercial composites.

CO2: Describe the manufacture of polymer matrix composites.

CO3: Understand the metal manufacturing methods.

CO4: Analyze the Hooke's law for different type of materials.

CO5: Understand the elastic behaviour of the unidirectional composite.

UNIT – I

Basic Concepts and Characteristics: Geometric and Physical definitions, natural and man-made composites – Aerospace and structural applications, types and classification of composites.

Reinforcements: Fibers- Glass, Silica, Kevlar, carbon, boron, silicon carbide, and boron carbide fibers – Particulate composites – Polymer composites – Thermoplastics – Thermosets – Metal matrix and ceramic composites

UNIT – II

Manufacturing of Polymer Composites: Autoclave, tape production, moulding methods, filament winding, hand layup, pultrusion – Resin transfer moulding – Injection moulding – Compression moulding – Properties and applications.

UNIT – III

Manufacturing of Metal Matrix Composites: Stir casting – Solid state diffusion technique – Cladding – Hot isostatic pressing – Properties and applications.

Manufacturing of Ceramic Matrix Composites: Liquid metal infiltration – Liquid phase sintering.

Manufacturing of Carbon-Carbon Composites*:* Knitting, Braiding, Weaving – Properties and applications.

UNIT – IV

Coordinate Transformations: Hooke's law for different types of materials – Hooke's law for two dimensional, unidirectional lamina – Transformation of stress and strain – Numerical examples of stress strain transformation.

UNIT – V

Elastic Behaviour of Unidirectional Composites: Elastic constants of lamina – Relationship between engineering constants and reduced stiffness and compliances – Analysis of laminated composites – Constitutive relations.

Text Books

1. R.M. Jones, *Mechanics of Composite Material,* McGraw Hill Company, New York.

2. Isaac and M. Daniel, *Engineering Mechanics of Composite Materials*, Oxford University Press.

Reference Books

1. Madhujit Mukhopadadhyay, *Mechanics of Composite Materials and Structures*, Universities Press

2. L.R. Calcote, *Analysis of Laminated Composite Structure*, Van Nostrand Rainfold.

3. B.D. Agarwal and L. J. Broutman, *Analysis and Performance of Fibre Composites*, Wiley Inter Science, New York.

Online Learning Resources

Question Paper Pattern:

Sessional Exam: The question paper for Sessional Examination shall be for 40 marks. The question paper shall consist of Four Questions and all questions are compulsory. Question No.1 contains Five short answer questions (2marks each) for a total of 10 marks. Remaining Three Questions shall be EITHER/OR type descriptive questions for 10 marks each. Each of these descriptive questions may contain sub-questions.

End Exam: The question paper for End Examination shall be for 70 marks. The question paper shall contain Six Questions and all questions are compulsory. Question No.1 shall contain Ten short answer questions (2 marks each) for a total of 20 marks, with Two short answer questions from each unit. Remaining Five Questions (each question covering one unit of syllabus) carrying 10 marks each shall be EITHER/OR type descriptive questions and may contain sub-questions.

APPLICATIONS OF MICROPROCESSORS AND MICROCONTROLLERS (AMPC)

<table>
<tr><td colspan="5">VII Semester : All Branches except EEE, and ECE</td><td colspan="4">Scheme : 2023</td></tr>
<tr><td>Course Code</td><td>Category</td><td colspan="3">Hours/Week</td><td>Credits</td><td colspan="3">Maximum Marks</td></tr>
<tr><td rowspan="2">OE706</td><td rowspan="2">OE-III</td><td>L/D</td><td>T</td><td>P</td><td>C</td><td>Continuous Internal Assessment</td><td>End Exam</td><td>Total</td></tr>
<tr><td>3</td><td>-</td><td>-</td><td>3</td><td>30</td><td>70</td><td>100</td></tr>
<tr><td colspan="5">Sessional Exam Duration : 2 Hrs</td><td colspan="4">End Exam Duration: 3 Hrs</td></tr>
<tr><td colspan="9"></td></tr>
<tr><td colspan="9">Course Outcomes :At the end of the course the student will be able to</td></tr>
<tr><td colspan="9">CO1: Analyze the architectural concepts of 8086 microprocessor.</td></tr>
<tr><td colspan="9">CO2: Apply the programming model of 8086 in assembly language programming.</td></tr>
<tr><td colspan="9">CO3: Analyze the multiple concepts of 8086 interfacing.</td></tr>
<tr><td colspan="9">CO4: Analyze the architectural concepts the 8051 microcontroller.</td></tr>
<tr><td colspan="9">CO5: Apply the programming model of 8051 in interfacing with peripherals.</td></tr>
<tr><td colspan="9">UNIT – I</td></tr>
<tr><td colspan="9">8086 Architecture: Main features, pin diagram/description, 8086 microprocessor family, internal architecture, bus interfacing unit, execution unit, interrupts and interrupt response, 8086 system timing, minimum mode and maximum mode configuration.</td></tr>
<tr><td colspan="9">UNIT – II</td></tr>
<tr><td colspan="9">8086 Programming: Program development steps, instructions, addressing modes, assembler directives, writing simple programs with an assembler, assembly language program development tools.</td></tr>
<tr><td colspan="9">UNIT – III</td></tr>
<tr><td colspan="9">8086 Interfacing: Semiconductor memories interfacing (RAM, ROM) – Intel 8255 programmable peripheral interface – Interfacing switches and LEDS – Interfacing seven segment displays, software and hardware interrupt applications, Intel 8251 USART architecture and interfacing – Intel 8237a DMA controller, stepper motor, A/D and D/A converters – Need for 8259 programmable interrupt controllers.</td></tr>
<tr><td colspan="9">UNIT – IV</td></tr>
<tr><td colspan="9">8051 Microcontroller: Architecture of 8051 – Special Function Registers (SFRs) – I/O Pins Ports and Circuits – Instruction set – Addressing modes – Assembly language programming.</td></tr>
<tr><td colspan="9">UNIT – V</td></tr>
<tr><td colspan="9">Interfacing Microcontroller: Programming 8051 Instruction set – Addressing modes – Programming Switches – LEDs, Displays – Seven segment – LCD – Sensors – Stepper motor and waveform generation – Comparison of microprocessor, microcontroller, PIC and ARM processors.</td></tr>
<tr><td colspan="9">Text Books</td></tr>
<tr><td colspan="9">1. K M Bhurchandi, A K Ray, Advanced Microprocessors and Peripherals, 3rd edition, McGraw Hill Education, 2017.</td></tr>
<tr><td colspan="9">2. Mazidi Muhammad Ali, Mazidi Janice Gillespie & Mc Kinlay Rolin D, The 8051Microcontroller and Embedded Systems, 2nd Edition, Pearson Education, 2008.</td></tr>
<tr><td colspan="9">3. Raj Kamal, Microcontrollers: Architecture, Programming, Interfacing and System Design, 2nd edition, Pearson, 2012.</td></tr>
</table>

Reference Books

1. John Uffenbeck, *The 8086/8088 Family: Design, Programming, and Interfacing*, 3rd Edition, Pearson Ed, 2006.

2. Kenneth J. Ayala, *The 8051 Microcontroller*, Penram International Publication Ltd., 2006.

Online Learning Resources

1. www.nptel.onlinecourseac.in/.microprocessorsandmicrocontrollers
2. https://onlinecourses.nptel.ac.in/noc18_ec03/

Question Paper Pattern:

Sessional Exam: The question paper for Sessional Examination shall be for 40 marks. The question paper shall consist of Four Questions and all questions are compulsory. Question No.1 contains Five short answer questions (2marks each) for a total of 10 marks. Remaining Three Questions shall be EITHER/OR type descriptive questions for 10 marks each. Each of these descriptive questions may contain sub-questions.

End Exam: The question paper for End Examination shall be for 70 marks. The question paper shall contain Six Questions and all questions are compulsory. Question No.1 shall contain Ten short answer questions (2 marks each) for a total of 20 marks, with Two short answer questions from each unit. Remaining Five Questions (each question covering one unit of syllabus) carrying 10 marks each shall be EITHER/OR type descriptive questions and may contain sub-questions.

INTRODUCTION TO DATABASE SYSTEMS (IDBS)

<table>
<tr><td colspan="5">VII Semester : CE, EEE, ME, and ECE</td><td colspan="4">Scheme : 2023</td></tr>
<tr><td>Course Code</td><td>Category</td><td colspan="3">Hours/Week</td><td>Credits</td><td colspan="3">Maximum Marks</td></tr>
<tr><td rowspan="2">OE707</td><td rowspan="2">OE-III</td><td>L/D</td><td>T</td><td>P</td><td>C</td><td>Continuous Internal Assessment</td><td>End Exam</td><td>Total</td></tr>
<tr><td>3</td><td>-</td><td>-</td><td>3</td><td>30</td><td>70</td><td>100</td></tr>
<tr><td colspan="5">Sessional Exam Duration : 2 Hrs</td><td colspan="4">End Exam Duration: 3 Hrs</td></tr>
<tr><td colspan="9"></td></tr>
<tr><td colspan="9">Course Outcomes :At the end of the course the student will be able to</td></tr>
<tr><td colspan="9">CO1: Understand the basic concepts of database management systems.</td></tr>
<tr><td colspan="9">CO2: Analyze a given database application scenario to use ER model for conceptual design of the database.</td></tr>
<tr><td colspan="9">CO3: Utilize SQL proficiently to address diverse query challenges.</td></tr>
<tr><td colspan="9">CO4: Employ normalization methods to enhance database structure.</td></tr>
<tr><td colspan="9">CO5: Assess and implement transaction processing, concurrency control and database recovery protocols in databases.</td></tr>
<tr><td colspan="9">UNIT – I</td></tr>
<tr><td colspan="9">Introduction: Data base system – Characteristics (Database vs. File System) – Database users – Advantages of database systems – Database applications – Brief introduction of different data models – Concepts of schema – Instance and data independence – Three tier schema architecture for data independence – Database system structure, environment – Centralized and client server architecture for the database.</td></tr>
<tr><td colspan="9">UNIT – II</td></tr>
<tr><td colspan="9">Entity Relationship Model: Introduction – The building blocks of an entity relationship diagram – Classification of entity sets – Attribute classification – Relationship degree – Relationship classification – Reducing ER diagram to tables – Enhanced entity-relationship model (EER model) – Generalization and specialization – IS A relationship and attribute inheritance – Multiple inheritance – Constraints on specialization and generalization – Advantages of ER modelling.</td></tr>
<tr><td colspan="9">UNIT – III</td></tr>
<tr><td colspan="9">Schema Refinement (Normalization): Purpose of normalization or schema refinement – Concept of functional dependency – Normal forms based on functional dependency Lossless join and dependency preserving decomposition – (1NF, 2NF and 3 NF) – Concept of surrogate key – Boyce-Codd normal form(BCNF) – MVD – Fourth normal form(4NF) – Fifth normal form (5NF)</td></tr>
<tr><td colspan="9">UNIT – IV</td></tr>
<tr><td colspan="9">Structured Query Language: Introduction – History of SQL standard – Commands in SQL – Data types in SQL – Data definition language – Selection operation – Projection operation – Aggregate functions – Data manipulation language – Table modification commands – Join operation – Set operations, View, Sub Query.</td></tr>
<tr><td colspan="9">UNIT – V</td></tr>
<tr><td colspan="9">PL/SQL: Introduction – Shortcomings of SQL – Structure of PL/SQL – PL/SQL language elements – Data types – Operators precedence – Control structure – Steps to create a PL/SQL, Program, Iterative control, Procedure, Function – Database triggers – Types of triggers.</td></tr>
<tr><td colspan="9">Text Books</td></tr>
</table>

1. Raghurama Krishnan, Johannes Gehrke, *Database Management Systems*, 3rd edition, TMH.
2. Silberschatz, Korth, Sudarsan, *Database System Concepts*, 5th edition.
3. Steve Tale, *SQL: The Ultimate Beginners Guide*.

Reference Books

1. C J Date, *Introduction to Database Systems*, 8th edition, Pearson.
2. Ramez Elmasri, Shamkant B. Navathe, *Database Management System*, 6th edition, Pearson.
3. Corlos Coronel, Steven Morris, Peter Robb, *Database Principles Fundamentals of Design Implementation and Management,* Cengage Learning.

Online Learning Resources

1. https://nptel.ac.in/courses/106/105/106105175/
2. https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_012758066672820224 56_shared/overview
3. Oracle SQL Developer - Full Course
4. https://www.youtube.com/watch?v=9ic3KEH4Ah4

Question Paper Pattern:

Sessional Exam: The question paper for Sessional Examination shall be for 40 marks. The question paper shall consist of Four Questions and all questions are compulsory. Question No.1 contains Five short answer questions (2marks each) for a total of 10 marks. Remaining Three Questions shall be EITHER/OR type descriptive questions for 10 marks each. Each of these descriptive questions may contain sub-questions.

End Exam: The question paper for End Examination shall be for 70 marks. The question paper shall contain Six Questions and all questions are compulsory. Question No.1 shall contain Ten short answer questions (2 marks each) for a total of 20 marks, with Two short answer questions from each unit. Remaining Five Questions (each question covering one unit of syllabus) carrying 10 marks each shall be EITHER/OR type descriptive questions and may contain sub-questions.

CYBER SECURITY (CS)

<table>
<tr><td colspan="5">VII Semester : CE, EEE, ME, and ECE</td><td colspan="4">Scheme : 2023</td></tr>
<tr><td>Course Code</td><td>Category</td><td colspan="3">Hours/Week</td><td>Credits</td><td colspan="3">Maximum Marks</td></tr>
<tr><td rowspan="2">OE708</td><td rowspan="2">OE-III</td><td>L/D</td><td>T</td><td>P</td><td>C</td><td>Continuous Internal Assessment</td><td>End Exam</td><td>Total</td></tr>
<tr><td>3</td><td>-</td><td>-</td><td>3</td><td>30</td><td>70</td><td>100</td></tr>
<tr><td colspan="5">Sessional Exam Duration : 2 Hrs</td><td colspan="4">End Exam Duration: 3 Hrs</td></tr>
<tr><td colspan="9"></td></tr>
<tr><td colspan="9">Course Outcomes :At the end of the course the student will be able to</td></tr>
<tr><td colspan="9">CO1: Classify the cybercrimes and understand the Indian ITA 2000.</td></tr>
<tr><td colspan="9">CO2: Analyse the vulnerabilities in any computing system and find the solutions.</td></tr>
<tr><td colspan="9">CO3: Predict the security threats of the future.</td></tr>
<tr><td colspan="9">CO4: Investigate the protection mechanisms.</td></tr>
<tr><td colspan="9">CO5: Design security solutions for organizations.</td></tr>
<tr><td colspan="9">UNIT – I</td></tr>
<tr><td colspan="9">Introduction to Cyber Crime: Introduction – Cybercrime and information security – Who are cybercriminals – Classifications of cybercrimes, and Cybercrime: The legal perspectives and Indian perspective – Cybercrime and the Indian ITA 2000, A global perspective on cybercrimes.</td></tr>
<tr><td colspan="9">UNIT – II</td></tr>
<tr><td colspan="9">Cyber Offenses: How Criminals Plan Them: Introduction – How Criminals plan the attacks – Social engineering – Cyber stalking – Cyber cafe and cybercrimes – Botnets: The fuel for cybercrime, Attack vector, Cloud computing.</td></tr>
<tr><td colspan="9">UNIT – III</td></tr>
<tr><td colspan="9">Cyber Crime: Mobile and Wireless Devices: Introduction – Proliferation of mobile and wireless devices – Trends in mobility – Credit card frauds in mobile and wireless computing era – Security challenges posed by mobile devices – Registry settings for mobile devices – Authentication service security – Attacks on mobile/cell phones.</td></tr>
<tr><td colspan="9">UNIT – IV</td></tr>
<tr><td colspan="9">Tools and Methods Used in Cyber Crime: Introduction – Proxy servers and anonymizers – Phishing – Password cracking – Key loggers and spywares – Virus and worms – Trojan horse and Backdoors – Steganography – DoS and DDoS attacks – SQL injection – Buffer overflow.</td></tr>
<tr><td colspan="9">UNIT – V</td></tr>
<tr><td colspan="9">Cyber Security: Organizational Implications: Introduction – Cost of cybercrimes and IPR issues – Web threats for organizations – Security and privacy implications – Social media marketing: Security risks and perils for organizations – Social computing and the associated challenges for organizations.</td></tr>
<tr><td colspan="9">Text Books</td></tr>
<tr><td colspan="9">1. Nina Godbole and Sunil Belapure, Cyber Security: Understanding Cyber Crimes, Computer Forensics and Legal Perspectives, Wiley India.</td></tr>
<tr><td colspan="9"></td></tr>
<tr><td colspan="9">Reference Books</td></tr>
<tr><td colspan="9">1. James Graham, Richard Howard and Ryan Otson, Cyber Security Essentials, CRC Press.</td></tr>
<tr><td colspan="9">2. Chwan Hwa (John) Wu, J. David Irwin, Introduction to Cyber Security, CRC Press, T&F Group.</td></tr>
</table>

Online Learning Resources
1. https://onlinecourses.nptel.ac.in/noc23_cs127/preview
2. https://www.udemy.com/course/cybersecurity-from-beginner-to-expert
Question Paper Pattern:
Sessional Exam: The question paper for Sessional Examination shall be for 40 marks. The question paper shall consist of Four Questions and all questions are compulsory. Question No.1 contains Five short answer questions (2marks each) for a total of 10 marks. Remaining Three Questions shall be EITHER/OR type descriptive questions for 10 marks each. Each of these descriptive questions may contain sub-questions. **End Exam:** The question paper for End Examination shall be for 70 marks. The question paper shall contain Six Questions and all questions are compulsory. Question No.1 shall contain Ten short answer questions (2 marks each) for a total of 20 marks, with Two short answer questions from each unit. Remaining Five Questions (each question covering one unit of syllabus) carrying 10 marks each shall be EITHER/OR type descriptive questions and may contain sub-questions.

MODERN C++ (MC)

<table>
<tr><td colspan="5">VII Semester : All Branches</td><td colspan="4">Scheme : 2023</td></tr>
<tr><td>Course Code</td><td>Category</td><td colspan="3">Hours/Week</td><td>Credits</td><td colspan="3">Maximum Marks</td></tr>
<tr><td rowspan="2">OE709</td><td rowspan="2">OE-III</td><td>L/D</td><td>T</td><td>P</td><td>C</td><td>Continuous Internal Assessment</td><td>End Exam</td><td>Total</td></tr>
<tr><td>3</td><td>-</td><td>-</td><td>3</td><td>30</td><td>70</td><td>100</td></tr>
<tr><td colspan="5">Sessional Exam Duration : 2 Hrs</td><td colspan="4">End Exam Duration: 3 Hrs</td></tr>
<tr><td colspan="9"></td></tr>
<tr><td colspan="9">Course Outcomes :At the end of the course the student will be able to</td></tr>
<tr><td colspan="9">CO1: Distinguish the procedural and object oriented paradigm along with principles.</td></tr>
<tr><td colspan="9">CO2: Understand dynamic memory management techniques using pointers, constructors, destructors.</td></tr>
<tr><td colspan="9">CO3: Understand the concept of function overloading, operator overloading, virtual functions and polymorphism.</td></tr>
<tr><td colspan="9">CO4: Classify inheritance with the understanding of early and late binding.</td></tr>
<tr><td colspan="9">CO5: Illustrate the process of data file manipulations using C++.</td></tr>
<tr><td colspan="9">CO6: Analyze an ability to incorporate Exception handling in object oriented program.</td></tr>
<tr><td colspan="9">UNIT – I</td></tr>
<tr><td colspan="9">Object-Oriented Thinking: Different paradigms for problem solving – Need for OOP paradigm – Differences between OOP and Procedure oriented programming – Overview of OOP concepts Abstraction, Encapsulation, Inheritance and Polymorphism.
C++ Basics: Structure of a C++ program, Data types – Declaration of variables – Expressions, Operators, Operator Precedence, Evaluation of expressions, Type conversions, Pointers, Arrays, Pointers and Arrays, Strings, Structures, References. Flow control statement- if, switch, while, for, do, break, continue, go to statements. Functions – Scope of variables, Parameter passing, Default arguments, inline functions, Recursive functions, Pointers to functions</td></tr>
<tr><td colspan="9">UNIT – II</td></tr>
<tr><td colspan="9">C++ Classes and Data Abstraction: Class definition, Class structure, Class objects, Class scope, this pointer, Friends to a class, Static class members, Constant member functions, Constructors and Destructors, Dynamic creation and destruction of objects, Data abstraction, ADT and information hiding.</td></tr>
<tr><td colspan="9">UNIT – III</td></tr>
<tr><td colspan="9">Inheritance: Defining a class hierarchy – Different forms of inheritance – Defining the base and derived classes – Access to the base class members – Base and derived class construction – Destructors – Virtual base class.</td></tr>
<tr><td colspan="9">UNIT – IV</td></tr>
<tr><td colspan="9">Virtual Functions and Polymorphism: Static and dynamic binding, virtual functions – Dynamic binding through virtual functions – Virtual function call mechanism – Pure virtual functions – Abstract classes – Implications of polymorphic use of classes – Virtual destructors.</td></tr>
<tr><td colspan="9">UNIT – V</td></tr>
<tr><td colspan="9">C++ I/O: I/O using C functions – Stream classes hierarchy – Stream I/O – File streams and string streams – Overloading operators – Error handling during file operations – Formatted I/O
Exception Handling: Benefits of exception handling – Throwing an exception – The try</td></tr>
</table>

block – Catching an exception – Exception objects – Exception specifications.
Text Books
1. Herbert Schildt, *The Complete Reference C++*, 4th Edition, Tata McGraw Hill.
2. Walter Savitch, *Problem solving with C++: The Object of Programming*, 4th Edition, Pearson Education.
Reference Books
1. B. Stroutstrup, *The C++ Programming Language,* 3rd Edition, Pearson Education
2. T. Gaddis, J. Walters and G. Muganda, *OOP in C++,* 3rd Edition, Wiley Dream Tech Press.
3. R. Lafore, *Object Oriented Programming in C++,* 3rd Edition, Galigotia Publications Pvt. Ltd.
Online Learning Resources
1. https://nptel.ac.in/courses/106105234
2. https://www.geeksforgeeks.org/cpp/c-plus-plus/
3. https://www.tutorialspoint.com/cplusplus/index.htm
Question Paper Pattern:
Sessional Exam: The question paper for Sessional Examination shall be for 40 marks. The question paper shall consist of Four Questions and all questions are compulsory. Question No.1 contains Five short answer questions (2marks each) for a total of 10 marks. Remaining Three Questions shall be EITHER/OR type descriptive questions for 10 marks each. Each of these descriptive questions may contain sub-questions. **End Exam:** The question paper for End Examination shall be for 70 marks. The question paper shall contain Six Questions and all questions are compulsory. Question No.1 shall contain Ten short answer questions (2 marks each) for a total of 20 marks, with Two short answer questions from each unit. Remaining Five Questions (each question covering one unit of syllabus) carrying 10 marks each shall be EITHER/OR type descriptive questions and may contain sub-questions.

WAVELET TRANSFORMS AND ITS APPLICATIONS (WTA)

VII Semester : All Branches					Scheme : 2023			
Course Code	Category	Hours/Week			Credits	Maximum Marks		
OE710	OE-III	L/D	T	P	C	Continuous Internal Assessment	End Exam	Total
		3	-	-	3	30	70	100
Sessional Exam Duration : 2 Hrs					End Exam Duration: 3 Hrs			

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

CO1: Understand wavelets and wavelet basis and characterize continuous and discrete wavelet transforms.

CO2: Illustrate the multi resolution analysis ad scaling functions.

CO3: Implement discrete wavelet transforms with multirate digital filters.

CO4: Understand multi resolution analysis and identify various wavelets and evaluate their time- frequency resolution properties.

CO5: Design certain classes of wavelets to specification and justify the basis of the application of wavelet transforms to different fields.

UNIT – I

Wavelets: Wavelets and wavelet expansion systems – Wavelet expansion – Wavelet transform – Wavelet system – More specific characteristics of wavelet systems – Haar scaling functions and wavelets – Effectiveness of wavelet analysis – The discrete wavelet transform – The discrete time and continuous wavelet transforms.

UNIT – II

A Multi resolution Formulation of Wavelet Systems: Signal spaces – The scaling function – Multire solution analysis – The wavelet functions – The discrete wavelet transform – A Parseval's theorem – Display of the discrete wavelet transform and the wavelet expansion.

UNIT – III

***Filter Banks and the Discrete Wavelet Transform*: A**nalysis – From fine scale to coarse scale – Filtering and down-sampling or decimating – Synthesis – From coarse scale to fine scale – Filtering and up-sampling or stretching – Input coefficients – Lattices and lifting – Different points of view.

UNIT – IV

Time-Frequency and Complexity: Multire solution versus time – Frequency analysis – Periodic versus non-periodic discrete wavelet transforms – The discrete wavelet transform versus the discrete – Time wavelet transform – Numerical complexity of the discrete wavelet transform.

UNIT – V

***Bases and Matrix Examples*:** Bases – Orthogonal bases and Bi-orthogonal bases – Matrix examples – Fourier series example – Sine expansion example – Frames and tight frames – Matrix examples – Sine expansion as a tight fame example.

Text Books

1. C. Sidney Burrus, Ramesh A. Gopinath, *Introduction to Wavelets and Wavelets Transforms*, Prentice Hall, 1997.

2. James S. Walker, *A Primer on Wavelets and their Scientific Applications*, CRC Press, 1999.

Reference Books

1. Raghuveer Rao, *Wavelet Transforms*, Pearson Education, Asia
2. C.S. Burrus, Ramose and A. Gopinath, *Introduction to Wavelets and Wavelet Transform*, Prentice Hall Inc.

Online Learning Resources

Question Paper Pattern:

Sessional Exam: The question paper for Sessional Examination shall be for 40 marks. The question paper shall consist of Four Questions and all questions are compulsory. Question No.1 contains Five short answer questions (2marks each) for a total of 10 marks. Remaining Three Questions shall be EITHER/OR type descriptive questions for 10 marks each. Each of these descriptive questions may contain sub-questions.

End Exam: The question paper for End Examination shall be for 70 marks. The question paper shall contain Six Questions and all questions are compulsory. Question No.1 shall contain Ten short answer questions (2 marks each) for a total of 20 marks, with Two short answer questions from each unit. Remaining Five Questions (each question covering one unit of syllabus) carrying 10 marks each shall be EITHER/OR type descriptive questions and may contain sub-questions.

SMART MATERIALS AND DEVICES (SMD)

VII Semester : All Branches						Scheme : 2023		
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
		L/D	**T**	**P**	**C**	**Continuous Internal Assessment**	**End Exam**	**Total**
OE711	**OE-III**	**3**	**-**	**-**	**3**	**30**	**70**	**100**
Sessional Exam Duration : 2 Hrs						**End Exam Duration: 3 Hrs**		

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

CO1: Provide exposure to smart materials and their engineering applications.

CO2: Impart knowledge on the basics and phenomenon behind the working of smart materials.

CO3: Explain the properties exhibited by smart materials.

CO4: Educate various techniques used to synthesize and characterize smart materials.

CO5: Identify the required smart material for distinct applications/devices.

UNIT – I

***Introduction to Smart Materials*:** Historical account of the discovery and development of smart materials – Shape memory materials, chromo active materials, magnet orheological materials, photoactive materials, polymers and polymer composites (Basics).

UNIT – II

***Properties of Smart Materials*:** Optical, Electrical, Dielectric, Piezoelectric, Ferroelectric, Pyroelectric and Magnetic properties of smart materials.

UNIT – III

***Synthesis of Smart Materials*:** Chemical route: Chemical vapour deposition – Sol-gel technique – Hydrothermal method – Mechanical alloying and thin film deposition techniques – Chemical etching – Spray pyrolysis.

UNIT – IV

***Characterization Techniques*:** Powder X-ray diffraction – Raman spectroscopy (RS) – UV-visible spectroscopy – Scanning electron microscopy (SEM) – Transmission electron microscopy (TEM) – Atomic force microscopy (AFM).

UNIT – V

***Smart Materials Based Devices*:** Devices based on smart materials – Shape memory alloys in robotic hands, piezoelectric based devices, MEMS and intelligent devices.

Text Books

1. Yaser Dahman, *Nanotechnology and Functional Materials for Engineers*, Elsevier, 2017.
2. E. Zschech, C. Whelan, T. Mikolajick, *Materials for Information Technology: Devices*, Interconnects and Packaging Springer-Verlag London Limited, 2005.

Reference Books

1. Gauenzi P., *Smart Structures*, Wiley, 2009.
2. Mahmood Ali of khazraei, *Handbook of Functional Nanomaterials*, Vol. (1&2), Nova Publishers, 2014.
3. Chaudhery Mustansar Hussain, Paolo Di Sia, *Handbook of Smart Materials, Technologies, and Devices: Applications of Industry - 4.0*, Springer, 2022.
4. Mohsen Shahinpoor, *Fundamentals of Smart Materials*, Royal Society of Chemistry, 2020.

Online Learning Resources
Question Paper Pattern:
Sessional Exam: The question paper for Sessional Examination shall be for 40 marks. The question paper shall consist of Four Questions and all questions are compulsory. Question No.1 contains Five short answer questions (2marks each) for a total of 10 marks. Remaining Three Questions shall be EITHER/OR type descriptive questions for 10 marks each. Each of these descriptive questions may contain sub-questions. **End Exam:** The question paper for End Examination shall be for 70 marks. The question paper shall contain Six Questions and all questions are compulsory. Question No.1 shall contain Ten short answer questions (2 marks each) for a total of 20 marks, with Two short answer questions from each unit. Remaining Five Questions (each question covering one unit of syllabus) carrying 10 marks each shall be EITHER/OR type descriptive questions and may contain sub-questions.

GREEN CHEMISTRY AND CATALYSIS FOR SUSTAINABLE ENVIRONMENT (GCSE)

VII Semester : All Branches					Scheme : 2023			
Course Code	Category	Hours/Week			Credits	Maximum Marks		
OE712	OE-III	L/D	T	P	C	Continuous Internal Assessment	End Exam	Total
		3	-	-	3	30	70	100
Sessional Exam Duration : 2 Hrs					End Exam Duration: 3 Hrs			

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

CO1: Understand principle and concepts of green chemistry.

CO2: Understand the types of catalysis and industrial applications.

CO3: Apply green solvents in chemical synthesis.

CO4: Enumerate different sourced of green energy.

CO5: Apply alternative greener methods foe chemical reactions.

UNIT – I

Principles and Concepts of Green Chemistry: Introduction – Green chemistry principles, sustainable development and green chemistry – E factor – Atom economy – Atom economic Reactions – Rearrangement and addition reactions and atom un- economic reactions – Substitution, elimination and wittig reactions, Reducing toxicity – Waste - problems and prevention: Design for degradation – Polymer recycling.

UNIT – II

***Catalysis and Green Chemistry*:** Introduction – Types of catalysis – Heterogeneous catalysis: Basics of heterogeneous catalysis, Zeolite and the bulk chemical industry – Heterogeneous catalysis in the fine chemical and pharmaceutical industries – Catalytic converters – Homogeneous catalysis: Transition metal catalysts with Phosphine Ligands, Greener Lewis Acids, and Phase transfer catalysis, Bio- catalysis and Photo-catalysis with examples.

UNIT – III

***Green Solvents in Chemical Synthesis*:** Green Solvents: Concept, Tools and techniques for solvent selection – Supercritical fluids: Super critical carbondioxide, super critical water, Polyethyleneglycol (PEG), Ionic liquids – Recyling of green solvents.

UNIT – IV

***Emerging Greener Technologies*:** Biomass as renewable resource –, Energy: Energy from Biomass, Solar Power, Chemicals from Renewable Feedstock‘s – Chemicals from fatty acids, Polymers from renewable resources – Alternative economies: The Syngas economy – The Bio refinery – Design for energy efficiency – Mechanochemical synthesis.

UNIT – V

***Alternative Greener Methods*:** Photochemical Reactions – Examples, Advantages and challenges – Photoredox catalysis – Single electron transfer reactions (SET), Examples of Photochemical reactions – Microwave-assisted reactions and Sonochemical reactions, examples and applications.

Text Books

1. M. Lancaster, *Green Chemistry an Introductory Text*, Royal Society of Chemistry, 2002.
2. Paul T. Anastas and John C. Warner, *Green Chemistry Theory and Practice*, 4th Edition, Oxford University Press, USA.

Reference Books

1. Sanjay K. Sharma and Ackmez Mudhoo, *Green Chemistry for Environmental Sustainability*, First Edition, CRC Press, 2010.

2. Alvise Perosa and Maurizio Selva, *Hand Book of Green chemistry Volume 8: Green Nanoscience*, wiley-VCH, 2013.

Online Learning Resources

Question Paper Pattern:

Sessional Exam: The question paper for Sessional Examination shall be for 40 marks. The question paper shall consist of Four Questions and all questions are compulsory. Question No.1 contains Five short answer questions (2marks each) for a total of 10 marks. Remaining Three Questions shall be EITHER/OR type descriptive questions for 10 marks each. Each of these descriptive questions may contain sub-questions.

End Exam: The question paper for End Examination shall be for 70 marks. The question paper shall contain Six Questions and all questions are compulsory. Question No.1 shall contain Ten short answer questions (2 marks each) for a total of 20 marks, with Two short answer questions from each unit. Remaining Five Questions (each question covering one unit of syllabus) carrying 10 marks each shall be EITHER/OR type descriptive questions and may contain sub-questions.

EMPLOYABILITY SKILLS (ES)

<table>
<tr><td colspan="5">VII Semester : All Branches</td><td colspan="4">Scheme : 2023</td></tr>
<tr><td>Course Code</td><td>Category</td><td colspan="3">Hours/Week</td><td>Credits</td><td colspan="3">Maximum Marks</td></tr>
<tr><td rowspan="2">OE713</td><td rowspan="2">OE-III</td><td>L/D</td><td>T</td><td>P</td><td>C</td><td>Continuous Internal Assessment</td><td>End Exam</td><td>Total</td></tr>
<tr><td>3</td><td>-</td><td>-</td><td>3</td><td>30</td><td>70</td><td>100</td></tr>
<tr><td colspan="5">Sessional Exam Duration : 2 Hrs</td><td colspan="4">End Exam Duration: 3 Hrs</td></tr>
<tr><td colspan="9"></td></tr>
<tr><td colspan="9">Course Outcomes : At the end of the course the student will be able to</td></tr>
<tr><td colspan="9">CO1: Understand the importance of goals and try to achieve them.</td></tr>
<tr><td colspan="9">CO2: Explain the significance of self-management.</td></tr>
<tr><td colspan="9">CO3: Apply the knowledge of writing skills in preparing eye-catchy resumes.</td></tr>
<tr><td colspan="9">CO4: Analyse various forms of Presentation skills.</td></tr>
<tr><td colspan="9">CO5: Judge the group behaviour appropriately.</td></tr>
<tr><td colspan="9">CO6: Develop skills required for employability.</td></tr>
<tr><td colspan="9">UNIT – I</td></tr>
<tr><td colspan="9">Goal Setting and Self-Management: Definition, importance, types of goal setting – SMART goal setting – Advantages - Motivation – Intrinsic and extrinsic motivation – Self-Management - Knowing about self – SWOC analysis.</td></tr>
<tr><td colspan="9">UNIT – II</td></tr>
<tr><td colspan="9">Writing Skills: Definition, significance, types of writing skills – Resume writing vs. CV writing – E-Mail writing – Cover letters - E-Mail Etiquette – SoP (Statement of Purpose).</td></tr>
<tr><td colspan="9">UNIT – III</td></tr>
<tr><td colspan="9">Technical Presentation Skills: Nature, meaning & significance of presentation skills – Planning, Preparation, Presentation, Stage Dynamics – Anxiety in public speaking (Glossophobia) – PPT & Poster presentation.</td></tr>
<tr><td colspan="9">UNIT – IV</td></tr>
<tr><td colspan="9">Group Presentation Skills: Body language – Group behaviour - Team dynamics – Leadership skills – Personality manifestation – Group discussion – Debate – Corporate Etiquette.</td></tr>
<tr><td colspan="9">UNIT – V</td></tr>
<tr><td colspan="9">Job Cracking Skills: Nature, characteristics, importance & types of Interviews – Job interviews – Skills for success – Job searching skills – STAR method – FAQs – Answering strategies – Mock interviews.</td></tr>
<tr><td colspan="9">Text Books</td></tr>
<tr><td colspan="9">1. Sabina Pillai, Agna Fernandez, Soft Skills & Employability Skills, Cambridge Publisher, 2014.</td></tr>
<tr><td colspan="9">2. Alka Wadkar, Life Skills for Success, Sage Publications, 2016.</td></tr>
<tr><td colspan="9"></td></tr>
<tr><td colspan="9">Reference Books</td></tr>
<tr><td colspan="9">1. Gangadhar Joshi, Campus to Corporate Paperback, Sage Publications. 2015.</td></tr>
<tr><td colspan="9">2. Sherfield Montogomery Moody, Cornerstone Developing Soft Skills, Pearson Publications, 4th edition, 2008.</td></tr>
<tr><td colspan="9">3. M. Sen Gupta, Skills for Employability, Innovative Publication, 2019.</td></tr>
<tr><td colspan="9">4. Steve Duck and David T McMahan, The Basics of Communication Skills A Relational Perspective, Sage press, 2012.</td></tr>
</table>

Online Learning Resources
1. https://youtu.be/gkLsn4ddmTs
2. https://youtu.be/2bf9K2rRWwo
3. https://youtu.be/FchfE3c2jzc
4. https://youtu.be/xBaLgJZ0t6A?list=PLzf4HHlsQFwJZel_j2PUy0pwjVUgj7KlJ
5. https://www.youtube.com/c/skillopedia/videos
6. https://onlinecourses.nptel.ac.in/noc25_hs96/preview
7. https://onlinecourses.nptel.ac.in/noc21_hs76/preview
8. https://archive.nptel.ac.in/courses/109/107/109107172/#
9. https://archive.nptel.ac.in/courses/109/104/109104107/
Question Paper Pattern:
Sessional Exam: The question paper for Sessional Examination shall be for 40 marks. The question paper shall consist of Four Questions and all questions are compulsory. Question No.1 contains Five short answer questions (2marks each) for a total of 10 marks. Remaining Three Questions shall be EITHER/OR type descriptive questions for 10 marks each. Each of these descriptive questions may contain sub-questions. **End Exam:** The question paper for End Examination shall be for 70 marks. The question paper shall contain Six Questions and all questions are compulsory. Question No.1 shall contain Ten short answer questions (2 marks each) for a total of 20 marks, with Two short answer questions from each unit. Remaining Five Questions (each question covering one unit of syllabus) carrying 10 marks each shall be EITHER/OR type descriptive questions and may contain sub-questions.

INTRODUCTION TO QUANTUM MECHANICS (IQM)

VII Semester : All Branches					Scheme : 2023			
Course Code	Category	Hours/Week			Credits	Maximum Marks		
		L/D	T	P	C	Continuous Internal Assessment	End Exam	Total
OE714	OE-III	3	-	-	3	30	70	100
Sessional Exam Duration : 2 Hrs					End Exam Duration: 3 Hrs			

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

CO1: Explain the key principles of quantum mechanics and wave-particle duality.

CO2: Apply Schrödinger equations to solve one-dimensional quantum problems.

CO3: Solve quantum mechanical problems using operator and matrix methods.

CO4: Evaluate quantum states using Dirac notation and expectation values.

CO5: Analyze angular momentum and spin systems using Pauli matrices and operators.

UNIT – I

Principles of Quantum Mechanics

Introduction: Limitations of classical mechanics – Difficulties with classical theories of black body radiation and origin of quantum theory of radiation. Wave-particle duality: de Broglie wavelength – Heisenberg uncertainty principle – Schrödinger time independent and time dependent wave equation – Solution of the time dependent Schrödinger equation – Concept of stationary states – Physical significance of wave function (ψ), Orthogonal, Normalized and Orthonormal functions.

UNIT – II

One Dimensional Problems and Solutions

Potential step – Reflection and transmission at the interface. Potential well: Square well potential with rigid walls – Square well potential with finite walls. Potential barrier: Penetration of a potential barrier (tunneling effect). Periodic potential and harmonic oscillator – Energy Eigen functions and Eigen values.

UNIT – III

Operator Formalism

Operators, Operator Algebra, Eigen values and Eigen vectors – Postulates of quantum mechanics – Matrix representation of wave functions and linear operators.

UNIT – IV

Mathematical Tools for Quantum Mechanics

The concept of row and column matrices – Matrix algebra – Hermitian operators – definition. Dirac's bra and ket notation – Expectation values – Heisenberg (operator) representation of harmonic oscillator – Ladder operators and their significance.

UNIT – V

Angular Momentum and Spin

Angular momentum operators: Definition – Eigen functions and Eigen values of AM operators. Matrix representation of angular momentum operators – System with spin half (1/2) – Spin angular momentum – Pauli's spin matrices. Clebsch-Gordon coefficients. Rigid Rotator: Eigen functions and Eigen values.

Text Books

1. A. Messaia Noth, *Quantum Mechanics*, Vol.1, Holland Pub. Co., Amsterdam, 1961.
2. P.M. Mathews and K. Venkatesam, *A Text Book of Quantum Mechanics*, Tata McGraw

Hill, New Delhi, 1976.

3. R.H. Dicke and J.P. Witke, *Introduction to Quantum Mechanics*, Addison-Wisley Pub. Co. Inc., London, 1960.

4. S.L. Gupta, V. Kumar, H.V. Sarama and R.C. Sharma, *Quantum Mechanics*, Jai Prakash Nath & Co., Meerut, 1996.

Reference Books

1. L.I. Schiff, *Quantum Mechanics*, McGraw Hill Book Co., Tokyo, 1968.

2. Richard L. Liboff, *Introduction to Quantum Mechanics*, Pearson Education Ltd., Fourth edition, 2003.

Online Learning Resources

1. https://archive.nptel.ac.in/courses/115/101/115101107/
2. https://archive.nptel.ac.in/courses/122/106/122106034/
3. https://nptel.ac.in/courses/115106066

Question Paper Pattern:

Sessional Exam: The question paper for Sessional Examination shall be for 40 marks. The question paper shall consist of Four Questions and all questions are compulsory. Question No.1 contains Five short answer questions (2marks each) for a total of 10 marks. Remaining Three Questions shall be EITHER/OR type descriptive questions for 10 marks each. Each of these descriptive questions may contain sub-questions.

End Exam: The question paper for End Examination shall be for 70 marks. The question paper shall contain Six Questions and all questions are compulsory. Question No.1 shall contain Ten short answer questions (2 marks each) for a total of 20 marks, with Two short answer questions from each unit. Remaining Five Questions (each question covering one unit of syllabus) carrying 10 marks each shall be EITHER/OR type descriptive questions and may contain sub-questions.

Open Elective – IV

S. No.	Subject Code	Course Name	Offering Department	Eligible Branches
1	OE715	Geo-Spatial Technologies	CE	All Branches Except CE
2	OE716	Solid Waste Management	CE	All Branches
3	OE717	Electric Vehicles	EEE	All Branches Except EEE
4	OE718	Total Quality Management	ME	All Branches Except ME
5	OE719	Safety in Engineering Industry	ME	All Branches
6	OE720	Transducers and Sensors	ECE	All Branches Except ECE
7	OE721	Drone Technology	ECE	All Branches
8	OE722	Introduction to Computer Networks	CSE	CE,EEE,ME, and ECE
9	OE723	Internet of Things	CSE	CE,EEE,ME, and ECE
10	OE724	Multimedia & Animation	CSE	All Branches
11	OE725	Advanced Information Systems	CSE	CE,EEE,ME, and ECE
12	OE726	Quantum Computing	CSE	All Branches
13	OE727	Financial Mathematics	HBS	All Branches
14	OE728	Sensors and Actuators for Engineering Applications		
15	OE729	Chemistry of Nanomaterials and Applications		
16	OE730	Literary Vibes		

GEO-SPATIAL TECHNOLOGIES (GST)

VII Semester : All Branches except CE					Scheme : 2023			
Course Code	Category	Hours/Week			Credits	Maximum Marks		
		L/D	T	P	C	Continuous Internal Assessment	End Exam	Total
OE715	OE-IV	3	-	-	3	30	70	100
Sessional Exam Duration : 2 Hrs					End Exam Duration: 3 Hrs			

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

CO1: Understand raster-based spatial analysis techniques, including query, overlay, and cost- distance analysis.

CO2: Analyze vector-based spatial analysis techniques such as topology, overlay, and proximity analysis.

CO3: Apply network analysis techniques for geocoding, shortest path analysis, and location- allocation problems.

CO4: Evaluate surface and geostatistical analysis methods, including terrain modeling, watershed analysis, and spatial interpolation.

CO5: Assess GIS customization, Web GIS, and mobile mapping techniques for real-world applications.

UNIT – I

Raster Analysis

Raster data exploration: Query analysis – Local operations – Map algebra – Reclassification – Logical and arithmetic overlay operations – Neighborhood operations – Aggregation – Filtering – Zonal operations – Statistical analysis – Cost- distance analysis – Least cost path.

UNIT – II

Vector Analysis

Non-topological analysis: Attribute database query – Structured query language – Coordinate transformation – Summary statistics – Calculation of area, perimeter and distance – Topological analysis: Reclassification – Aggregation – Overlay analysis: Point-in-polygon, Line-in-polygon, Polygon-on-polygon – Clip, erase, identity, union, intersection – Proximity analysis: buffering.

UNIT – III

Network Analysis

Network – Introduction – Network data model – Elements of network – Building a network database – Geocoding – Address matching – Shortest path in a network – Time and distance based shortest path analysis – Driving directions – Closest facility analysis – Catchment / service area analysis – Location – Allocation analysis.

UNIT – IV

Surface and Geostatistical Analysis

Surface data – Sources of X,Y, Z data – DEM, TIN – Terrain analysis – Slope, aspect, viewshed – Watershed analysis – Watershed boundary – Flow direction – Flow accumulation – Drainage network – Spatial interpolation: IDW, Spline, Kriging, Variogram.

UNIT – V

Customisation, Web GIS, Mobile Mapping

Customisation of GIS: Need – Uses – Scripting languages – Embedded scripts: Web GIS:

Web GIS architecture – Advantages of web GIS, Web applications – Location based services: Emergency and business solutions.

Text Books

1. Kang Tsung Chang, *Introduction to Geographical Information System*, 4th Ed., Tata McGraw Hill Edition, 2008.

2. Lo, C.P. and Yeung, Albert K.W., *Concepts and Techniques of Geographic Information Systems,* Prentice Hall, 2002.

Reference Books

1. Michael N. Demers, *Fundamentals of Geographic Information Systems*, Wiley, 2009.

2. Ian Heywood, Sarah Cornelius, Steve Carver, Srinivasaraju, *An Introduction to Geographical Information Systems*, Pearson Education, 2nd Edition, 2007.

3. John Peter Wilson, *The Handbook of Geographic Information Science*, Blackwell Pub., 2008.

Question Paper Pattern:

Sessional Exam: The question paper for Sessional Examination shall be for 40 marks. The question paper shall consist of Four Questions and all questions are compulsory. Question No.1 contains Five short answer questions (2marks each) for a total of 10 marks. Remaining Three Questions shall be EITHER/OR type descriptive questions for 10 marks each. Each of these descriptive questions may contain sub-questions.

End Exam: The question paper for End Examination shall be for 70 marks. The question paper shall contain Six Questions and all questions are compulsory. Question No.1 shall contain Ten short answer questions (2 marks each) for a total of 20 marks, with Two short answer questions from each unit. Remaining Five Questions (each question covering one unit of syllabus) carrying 10 marks each shall be EITHER/OR type descriptive questions and may contain sub-questions.

SOLID WASTE MANAGEMENT (SWM)

VII Semester : All Branches					Scheme : 2023			
Course Code	Category	Hours/Week			Credits	Maximum Marks		
		L/D	T	P	C	Continuous Internal Assessment	End Exam	Total
OE716	OE-IV	3	-	-	3	30	70	100
Sessional Exam Duration : 2 Hrs					End Exam Duration: 3 Hrs			

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

CO1: Understand the types, sources, and characteristics of solid waste, along with regulatory frameworks.

CO2: Analyze engineering systems for solid waste collection, storage, and transportation.

CO3: Apply resource and energy recovery techniques for sustainable solid waste management.

CO4: Evaluate landfill design, construction, and environmental impact mitigation strategies.

CO5: Assess hazardous waste management techniques, including biomedical and e-waste

UNIT – I

Solid Waste

Definitions – Types of solid wastes – Sources of solid wastes – Characteristics and perspectives – Properties of solid wastes – Sampling of solid wastes – Elements of solid waste management – Integrated solid waste management – Solid waste management rules 2016.

UNIT – II

Engineering Systems for Solid Waste Management

Solid waste generation – On-site handling – Storage and processing – Collection of solid wastes – Stationary container system and hauled container systems – Route planning – Transfer and transport – Processing techniques.

UNIT – III

Engineering Systems for Resource and Energy Recovery

Processing techniques – Materials recovery systems – Recovery of biological conversion products – Composting – Pre and post processing – Types of composting – Critical parameters – Problems with composing – Recovery of thermal conversion products – Pyrolisis, gasification, RDF – Recovery of energy from conversion products – Materials and energy recovery systems.

UNIT – IV

Landfills

Evolution of landfills – Types and construction of landfills – Design considerations – Life of landfills – Landfill problems – Lining of landfills – Types of liners – Leachate pollution and control – Monitoring landfills – Landfills reclamation.

UNIT – V

Hazardous Waste Management

Sources and characteristics – Effects on environment – Risk assessment – Disposal of hazardous wastes – Secured landfills – Incineration – Monitoring – Biomedical waste disposal – E-waste management – Nuclear wastes – Industrial waste management.

Text Books

1. Tchobanoglous G, Theisen H and Vigil S A, *Integrated Solid Waste*

Management, Engineering Principles and Management Issues, McGraw-Hill, 1993.

2. Vesilind P A, Worrell W and Reinhart D, *Solid Waste Engineering*, Brooks/Cole Thomson Learning Inc., 2002.

Reference Books

1. Peavy, H.S, Rowe, D.R., and G. Tchobanoglous, *Environmental Engineering*, McGraw Hill Inc., New York, 1985.

2. Qian X, Koerner RM and Gray DH, *Geotechnical Aspects of Landfill Design and Construction*, Prentice Hall, 2002.

Question Paper Pattern:

Sessional Exam: The question paper for Sessional Examination shall be for 40 marks. The question paper shall consist of Four Questions and all questions are compulsory. Question No.1 contains Five short answer questions (2marks each) for a total of 10 marks. Remaining Three Questions shall be EITHER/OR type descriptive questions for 10 marks each. Each of these descriptive questions may contain sub-questions.

End Exam: The question paper for End Examination shall be for 70 marks. The question paper shall contain Six Questions and all questions are compulsory. Question No.1 shall contain Ten short answer questions (2 marks each) for a total of 20 marks, with Two short answer questions from each unit. Remaining Five Questions (each question covering one unit of syllabus) carrying 10 marks each shall be EITHER/OR type descriptive questions and may contain sub-questions.

ELECTRIC VEHICLES (EV)

<table>
<tr><td colspan="5">VII Semester : All Branches except EEE</td><td colspan="4">Scheme : 2023</td></tr>
<tr><td>Course Code</td><td>Category</td><td colspan="3">Hours/Week</td><td>Credits</td><td colspan="3">Maximum Marks</td></tr>
<tr><td rowspan="2">OE717</td><td rowspan="2">OE-IV</td><td>L/D</td><td>T</td><td>P</td><td>C</td><td>Continuous Internal Assessment</td><td>End Exam</td><td>Total</td></tr>
<tr><td>3</td><td>-</td><td>-</td><td>3</td><td>30</td><td>70</td><td>100</td></tr>
<tr><td colspan="5">Sessional Exam Duration : 2 Hrs</td><td colspan="4">End Exam Duration: 3 Hrs</td></tr>
<tr><td colspan="9"></td></tr>
<tr><td colspan="9">Course Outcomes :At the end of the course the student will be able to</td></tr>
<tr><td colspan="9">CO1: Understand and differentiate between Conventional Vehicle and Electric Vehicles, electro mobility and environmental issues of EVs.</td></tr>
<tr><td colspan="9">CO2: Understand Various dynamics of Electric Vehicles.</td></tr>
<tr><td colspan="9">CO3: Remember and understand various configurations in parameters of EV system and dynamic aspects of EV.</td></tr>
<tr><td colspan="9">CO4: Analyze fuel cell technologies in EV and HEV systems.</td></tr>
<tr><td colspan="9">CO5: Analyze the battery charging and controls required of EVs.</td></tr>
<tr><td colspan="9">UNIT – I</td></tr>
<tr><td colspan="9">Introduction to EV Systems and Energy Sources: Past, Present and Future of EV – EV concept – EV technology – State-of-the Art of EVs – EV configuration – EV system- Fixed and variable gearing – Single and multiple motor drive – In-wheel drives – EV parameters: Weight, size, force and energy, performance parameters. Electro mobility and the environment – History of electric power trains – Carbon emissions from fuels – Green houses and pollutants – Comparison of conventional, battery, hybrid and fuel cell electric systems.</td></tr>
<tr><td colspan="9">UNIT – II</td></tr>
<tr><td colspan="9">EV Propulsion and Dynamics: Choice of electric propulsion system – Block diagram – Concept of EV motors – Single and multi- motor configurations – Fixed and variable geared transmission – In-wheel motor configuration – Classification – Electric motors used in current vehicle applications – Recent EV motors – Vehicle load factors – Vehicle acceleration.</td></tr>
<tr><td colspan="9">UNIT – III</td></tr>
<tr><td colspan="9">Fuel Cells: Introduction of fuel cells – Basic operation – Model – Voltage, power and efficiency – Power plant system – Characteristics – Sizing – Example of fuel cell electric vehicle – Introduction to HEV – Brake specific fuel consumption – Comparison of series – Parallel hybrid systems- Examples.</td></tr>
<tr><td colspan="9">UNIT – IV</td></tr>
<tr><td colspan="9">Battery Charging and Control
Battery Charging: Basic requirements – Charger architecture – Charger functions – Wireless charging – Power factor correction.
Control: Introduction- Modeling of electro mechanical system – Feedback controller design approach – PI controller‘s designing – Torque-loop, Speed control loop compensation – Acceleration of battery electric vehicle.</td></tr>
<tr><td colspan="9">UNIT – V</td></tr>
<tr><td colspan="9">Energy Storage Technologies: Role of energy storage systems – Thermal, mechanical, chemical, electrochemical, electrical efficiency of energy storage systems – Super capacitors – Superconducting Magnetic Energy Storage (SMES) – SOC – SoH – Fuel cells – G2V –</td></tr>
</table>

V2G – Energy storage in micro-grid and smart grid – Energy management with storage systems – Battery SCADA.
Text Books
1. C.C Chan, K.T Chau, *Modern Electric Vehicle Technology*, Oxford University Press Inc., New York, 1st Edition, 2001
2. Ali Emadi, *Advanced Electric Drive Vehicles*, CRC Press, 1st Edition, 2017.
Reference Books
1. Iqbal Husain, *Electric and Hybrid Vehicles Design Fundamentals*, CRC Press 2021, 3rd Edition.
2. Francisco Díaz-González, Andreas Sumper, Oriol Gomis-Bellmunt, *Energy Storage in Power Systems*, Wiley Publication, ISBN: 978-1-118-97130-7, 1st Edition, 2016.
3. A.G. Ter-Gazarian, *Energy Storage for Power Systems*, The Institution of Engineering and Technology (IET) Publication, UK, (ISBN: 978-1-84919-219-4), Second Edition, 2011.
4. Mehrdad Ehsani, Yimi Gao, Sebastian E. Gay, Ali Emadi, *Modern Electric, Hybrid Electric and Fuel Cell Vehicles: Fundamentals, Theory and Design*, CRC Press, 1st Edition, 2004.
5. James Larminie, John Lowry, *Electric Vehicle Technology Explained*, Wiley, 2nd Edition, 2003.
Online Learning Resources
1. https://nptel.ac.in/courses/108/102/108102121/
2. https://nptel.ac.in/syllabus/108103009
Question Paper Pattern:
Sessional Exam: The question paper for Sessional Examination shall be for 40 marks. The question paper shall consist of Four Questions and all questions are compulsory. Question No.1 contains Five short answer questions (2marks each) for a total of 10 marks. Remaining Three Questions shall be EITHER/OR type descriptive questions for 10 marks each. Each of these descriptive questions may contain sub-questions. **End Exam:** The question paper for End Examination shall be for 70 marks. The question paper shall contain Six Questions and all questions are compulsory. Question No.1 shall contain Ten short answer questions (2 marks each) for a total of 20 marks, with Two short answer questions from each unit. Remaining Five Questions (each question covering one unit of syllabus) carrying 10 marks each shall be EITHER/OR type descriptive questions and may contain sub-questions.

TOTAL QUALITY MANAGEMENT (TQM)

<table>
<tr><td colspan="5">VII Semester : All Branches except ME</td><td colspan="4">Scheme : 2023</td></tr>
<tr><td>Course Code</td><td>Category</td><td colspan="3">Hours/Week</td><td>Credits</td><td colspan="3">Maximum Marks</td></tr>
<tr><td rowspan="2">OE718</td><td rowspan="2">OE-IV</td><td>L/D</td><td>T</td><td>P</td><td>C</td><td>Continuous Internal Assessment</td><td>End Exam</td><td>Total</td></tr>
<tr><td>3</td><td>-</td><td>-</td><td>3</td><td>30</td><td>70</td><td>100</td></tr>
<tr><td colspan="5">Sessional Exam Duration : 2 Hrs</td><td colspan="4">End Exam Duration: 3 Hrs</td></tr>
<tr><td colspan="9"></td></tr>
<tr><td colspan="9">Course Outcomes :At the end of the course the student will be able to</td></tr>
<tr><td colspan="9">CO1: Understand the basic concepts and evolution of TQM; Professional ethics and quality costs.</td></tr>
<tr><td colspan="9">CO2: Understand the concepts of leadership, quality council, strategic planning and communications.</td></tr>
<tr><td colspan="9">CO3: Apply the methods to improve costumers' satisfactions.</td></tr>
<tr><td colspan="9">CO4: Analyze motivational aspects of employees and functioning of teams.</td></tr>
<tr><td colspan="9">CO5: Apply TQM tools like P-D-S-A cycle, Benchmarking, FMEA towards achieving TQM objectives.</td></tr>
<tr><td colspan="9">UNIT – I</td></tr>
<tr><td colspan="9">Quality: Definition – Dimensions of quality
Total Quality Management (TQM): Definition – Basic concepts of / basic approach to TQM – Benefits of TQM – Barriers / Obstacles to TQM implementation – Evolution of TQM
Ethics: Route causes for unethical behaviour – Ethics management program
Quality costs</td></tr>
<tr><td colspan="9">UNIT – II</td></tr>
<tr><td colspan="9">Leadership: Characteristics of quality leaders – Leadership concepts – Stephen R. Covey's 7 habits of highly effective people – The Deming's philosophy (14 principles)
Quality Council: Composition – Duties of Quality Council
Quality Statements: The Vision and the Mission statements
Seven steps to Strategic Planning
Communications: Interactive and Formal.</td></tr>
<tr><td colspan="9">UNIT – III</td></tr>
<tr><td colspan="9">Customer Satisfaction: Customer Satisfaction and its importance – Customer perception of quality – Methods to improve customer satisfaction – Customer feedback – Handling the customer complaints – Service quality – Customer retention.</td></tr>
<tr><td colspan="9">UNIT – IV</td></tr>
<tr><td colspan="9">Employee Involvement
Motivation: Maslow's hierarchy of needs – Achieving a motivated workforce – Employee empowerment.
Teams: Characteristics of successful teams – Roles of team members – Common barriers to team progress – Suggestion system – Recognition and Reward – Gain sharing – Benefits of employee involvement.</td></tr>
<tr><td colspan="9">UNIT – V</td></tr>
<tr><td colspan="9">TQM Tools
The Problem solving method and P-D-S-A cycle.
Benchmarking: Reasons to benchmark – Process of benchmarking.</td></tr>
</table>

Failure Modes and Effects Analysis (FMEA): Benefits – Stages of FMEA – Adapting FMEA to service sector, Pareto diagram – Cause and effects diagram – Scatter diagram.

Text Books

1. Dale H Besterfield, *Total Quality Management*, Pearson Education, Fourth Edition, 2015.
2. Subburaj Ramaswamy, *Total Quality Management*, Tata McGraw Hill Publishing Company Ltd., 2005.
3. Joel E. Ross, *Total Quality Management*, CRC Press, Third Edition, 2017.

Reference Books

1. Narayana V and Sreenivasan N.S, *Quality Management-Concepts and Tasks*, New Age International, 1996.
2. Robert L. Flood, *Beyond TQM,* John Wiley & Sons Ltd, First Edition, 1993.
3. Samuel Ho, *TQM-An Integrated Approach*, Kogan Page Ltd., USA, 1995.

Online Learning Resources

1. https://www.youtube.com/watch?v=VD6tXadibk0
2. https://www.investopedia.com/terms/t/total-quality-management-tqm.asp
3. https://blog.capterra.com/what-is-total-quality-management/
4. https://nptel.ac.in/courses/110/104/110104080/
5. https://onlinecourses.nptel.ac.in/noc21_mg03/preview
6. https://nptel.ac.in/courses/110/104/110104085/
7. https://nptel.ac.in/noc/courses/noc18/SEM2/noc18-mg39/

Question Paper Pattern:

Sessional Exam: The question paper for Sessional Examination shall be for 40 marks. The question paper shall consist of Four Questions and all questions are compulsory. Question No.1 contains Five short answer questions (2marks each) for a total of 10 marks. Remaining Three Questions shall be EITHER/OR type descriptive questions for 10 marks each. Each of these descriptive questions may contain sub-questions.

End Exam: The question paper for End Examination shall be for 70 marks. The question paper shall contain Six Questions and all questions are compulsory. Question No.1 shall contain Ten short answer questions (2 marks each) for a total of 20 marks, with Two short answer questions from each unit. Remaining Five Questions (each question covering one unit of syllabus) carrying 10 marks each shall be EITHER/OR type descriptive questions and may contain sub-questions.

SAFETY IN ENGINEERING INDUSTRY (SEI)

<table>
<tr><td colspan="5">VII Semester : All Branches</td><td colspan="4">Scheme : 2023</td></tr>
<tr><td>Course Code</td><td>Category</td><td colspan="3">Hours/Week</td><td>Credits</td><td colspan="3">Maximum Marks</td></tr>
<tr><td rowspan="2">OE719</td><td rowspan="2">OE-IV</td><td>L/D</td><td>T</td><td>P</td><td>C</td><td>Continuous Internal Assessment</td><td>End Exam</td><td>Total</td></tr>
<tr><td>3</td><td>-</td><td>-</td><td>3</td><td>30</td><td>70</td><td>100</td></tr>
<tr><td colspan="5">Sessional Exam Duration : 2 Hrs</td><td colspan="4">End Exam Duration: 3 Hrs</td></tr>
<tr><td colspan="9"></td></tr>
<tr><td colspan="9">Course Outcomes :At the end of the course the student will be able to</td></tr>
<tr><td colspan="9">CO1: Understand the principles of safety management including safety audit, safety education and accident investigation.</td></tr>
<tr><td colspan="9">CO2: Understand the causes and implication of fire and explosion and the preventive measures.</td></tr>
<tr><td colspan="9">CO3: Understand machine and construction safety assessment and safeguarding methods.</td></tr>
<tr><td colspan="9">CO4: Understand the effect of toxic substances and hazardous chemicals.</td></tr>
<tr><td colspan="9">CO5: Understand the modes of electrical hazards and safety measures in electrical and information technology industries.</td></tr>
<tr><td colspan="9">UNIT – I</td></tr>
<tr><td colspan="9">Safety in Engineering Industry: Safety need – General hazards and control measures in engineering industry – Four significant industrial disasters happened in the world (Bhopal, Chernobyl, Flixborough, Rana plaza) – Safety audit- procedure Accident Investigation: Learning from accident – Layered investigations, Investigation process and summary.</td></tr>
<tr><td colspan="9">UNIT – II</td></tr>
<tr><td colspan="9">Fire Safety: The fire triangle – Explosions – Distinction between fire and explosions – Flammability characteristics of liquids and vapours – Fire protection techniques – Fire extinguishers – Fire hazard and analysis – Prevention of fire – Steps after occurrence of fire – Fire detection – Fire alarmand firefighting systems, Explosion proof equipment and instruments.</td></tr>
<tr><td colspan="9">UNIT – III</td></tr>
<tr><td colspan="9">Machine Safety: Machine guarding – Machine guarding assessment – Safeguarding machines and equipment – Guards – Safeguarding devices – Other potential safeguards.
Construction Safety: Scope – Safety in -Underground works – Above ground works – Under waterworks – Demolition works.</td></tr>
<tr><td colspan="9">UNIT – IV</td></tr>
<tr><td colspan="9">Chemical Safety: Hazardous chemicals, Definition of a hazardous chemical, Toxic effects, Working with toxins, Storing hazardous chemicals, Process hazards, Transportation of hazardous chemicals, Chemical waste management, Hazardous chemical emergency procedures, Worker contamination, Chemicals and worker health.</td></tr>
<tr><td colspan="9">UNIT – V</td></tr>
<tr><td colspan="9">Electrical Safety: Electrical dangers – Electrical pathways – Static electricity – Result of electrical contact – Shock versus electrocution – Electrical burns – Handling electrical hazards – Controlling electrical hazards – Training – Safety and health program.
IT Industry Safety: Hazardous in IT industry – General precautions – Employer’s responsibility – Employees responsibilities – Office ergonomics – Computer workstation –</td></tr>
</table>

Health & safety tips – Laptop safety precautions.
Text Books
1. L.M. Deshmukh, *Industrial Safety and Management*, McGraw Hill Education (India)
2. D. A. Crowl and J. F. Louvar, *Chemical Process Safety (Fundamentals with Applications)*, Prentice Hall, 2011.
3. Reese, Charles D, *Industrial Safety and Health for People-oriented Services*, CRC Press, 2008.
4. M. P. Poonia, S. C. Sharma, *Industrial Safety and Maintenance Management*, Khanna Book Publishing, 2019.
Reference Books
1. Reese, Charles, *Industrial Safety and Health for Infrastructure Services*. CRC Press, 2009.
2. R.K. Jain, Sunil S. Rao, *Industrial Safety and Health and Environment Management Systems*, Khanna Book Publishing, 2000.
3. K.U. Mistry, *Fundamentals of Industrial safety and Health*, Siddharth Prakashan Publisher, 2008.
Online Learning Resources
1. https://archive.nptel.ac.in/courses/110/105/110105094/
Question Paper Pattern:
Sessional Exam: The question paper for Sessional Examination shall be for 40 marks. The question paper shall consist of Four Questions and all questions are compulsory. Question No.1 contains Five short answer questions (2marks each) for a total of 10 marks. Remaining Three Questions shall be EITHER/OR type descriptive questions for 10 marks each. Each of these descriptive questions may contain sub-questions. **End Exam:** The question paper for End Examination shall be for 70 marks. The question paper shall contain Six Questions and all questions are compulsory. Question No.1 shall contain Ten short answer questions (2 marks each) for a total of 20 marks, with Two short answer questions from each unit. Remaining Five Questions (each question covering one unit of syllabus) carrying 10 marks each shall be EITHER/OR type descriptive questions and may contain sub-questions.

TRANSDUCERS AND SENSORS (T&S)

<table>
<tr><td colspan="5">VII Semester : All Branches except ECE</td><td colspan="4">Scheme : 2023</td></tr>
<tr><td>Course Code</td><td>Category</td><td colspan="3">Hours/Week</td><td>Credits</td><td colspan="3">Maximum Marks</td></tr>
<tr><td rowspan="2">OE720</td><td rowspan="2">OE-IV</td><td>L/D</td><td>T</td><td>P</td><td>C</td><td>Continuous Internal Assessment</td><td>End Exam</td><td>Total</td></tr>
<tr><td>3</td><td>-</td><td>-</td><td>3</td><td>30</td><td>70</td><td>100</td></tr>
<tr><td colspan="5">Sessional Exam Duration : 2 Hrs</td><td colspan="4">End Exam Duration: 3 Hrs</td></tr>
<tr><td colspan="9"></td></tr>
<tr><td colspan="9">Course Outcomes :At the end of the course the student will be able to</td></tr>
<tr><td colspan="9">CO1: Understand characteristics of Instrumentation System and the operating principle of motion transducers.</td></tr>
<tr><td colspan="9">CO2: Explore working principles, and applications of different temperature transducers and Piezo-electric sensors.</td></tr>
<tr><td colspan="9">CO3: Gain knowledge on flow transducers and their applications.</td></tr>
<tr><td colspan="9">CO4: Learn the working principles of pressure transducers.</td></tr>
<tr><td colspan="9">CO5: Understand the working principle and applications of force and sound transducers.</td></tr>
<tr><td colspan="9">UNIT – I</td></tr>
<tr><td colspan="9">Introduction: General configuration and functional description of measuring instruments – Static and dynamic characteristics of instrumentation system – Errors in instrumentation system – Active and passive transducers and their classification.
Motion Transducers: Resistive strain gauge – LVDT, RVDT – Capacitive transducers – Piezo-electric transducers – Seismic displacement pick-ups – Vibrometers and accelerometers.</td></tr>
<tr><td colspan="9">UNIT – II</td></tr>
<tr><td colspan="9">Temperature Transducers: Standards and calibration – Fluid expansion and metal expansion type transducers – Bimetallic strip, Thermometer, Thermistor, RTD – Thermocouple and their characteristics. Hall effect transducers – Digital transducers – Proximity devices – Bio-sensors, Smart sensors, Piezo-electric sensors.</td></tr>
<tr><td colspan="9">UNIT – III</td></tr>
<tr><td colspan="9">Flow Transducers: Bernoulli‘s principle and continuity – Orifice plate, Nozzle plate, Venture tube, Rotameter, Anemometers, Electromagnetic flow meter, Impeller meter and Turbid flow meter.</td></tr>
<tr><td colspan="9">UNIT – IV</td></tr>
<tr><td colspan="9">Pressure Transducers: Standards and calibration – Different types of manometers – Elastic transducers – Diaphragm bellows – Bourdon tube – Capacitive and resistive pressure transducers – High and low pressure measurement.</td></tr>
<tr><td colspan="9">UNIT – V</td></tr>
<tr><td colspan="9">Force and Sound Transducers: Proving ring – Hydraulic and pneumatic load cell – Dynamometer and gyroscopes. Sound level meter – Sound characteristics – Microphone.</td></tr>
<tr><td colspan="9">Text Books</td></tr>
<tr><td colspan="9">1. A.K. Sawhney, A course in Electrical and Electronics Measurements and Instrumentation, Dhanpat Rai & Co., Delhi, 3rd edition, 2010.</td></tr>
<tr><td colspan="9">2. Rangan C.S, Sarma G.R and Mani V S V, Instrumentation Devices and Systems, Tata McGraw Hill publications, 2007.</td></tr>
<tr><td colspan="9">Reference Books</td></tr>
<tr><td colspan="9">1. Doebelin. E.O, Measurement Systems Application and Design, McGraw Hill</td></tr>
</table>

International, New York, 2004.
2. Nakra B. Cand Chaudhary K.K, *Instrumentation Measurement and Analysis*, Tata McGraw Hill Publication Ltd., Second Edition, 2006.

Online Learning Resources

Question Paper Pattern:

Sessional Exam: The question paper for Sessional Examination shall be for 40 marks. The question paper shall consist of Four Questions and all questions are compulsory. Question No.1 contains Five short answer questions (2marks each) for a total of 10 marks. Remaining Three Questions shall be EITHER/OR type descriptive questions for 10 marks each. Each of these descriptive questions may contain sub-questions.

End Exam: The question paper for End Examination shall be for 70 marks. The question paper shall contain Six Questions and all questions are compulsory. Question No.1 shall contain Ten short answer questions (2 marks each) for a total of 20 marks, with Two short answer questions from each unit. Remaining Five Questions (each question covering one unit of syllabus) carrying 10 marks each shall be EITHER/OR type descriptive questions and may contain sub-questions.

DRONE TECHNOLOGY (DT)

<table>
<tr><td colspan="5">VII Semester : All Branches</td><td colspan="4">Scheme : 2023</td></tr>
<tr><td>Course Code</td><td>Category</td><td colspan="3">Hours/Week</td><td>Credits</td><td colspan="3">Maximum Marks</td></tr>
<tr><td rowspan="2">OE721</td><td rowspan="2">OE-IV</td><td>L/D</td><td>T</td><td>P</td><td>C</td><td>Continuous Internal Assessment</td><td>End Exam</td><td>Total</td></tr>
<tr><td>3</td><td>-</td><td>-</td><td>3</td><td>30</td><td>70</td><td>100</td></tr>
<tr><td colspan="5">Sessional Exam Duration : 2 Hrs</td><td colspan="4">End Exam Duration: 3 Hrs</td></tr>
<tr><td colspan="9"></td></tr>
<tr><td colspan="9">Course Outcomes : At the end of the course the student will be able to</td></tr>
<tr><td colspan="9">CO1: Understand the historical development of unmanned aerial vehicles.</td></tr>
<tr><td colspan="9">CO2: Understand different drone parts and their contribution for successful flight operation.</td></tr>
<tr><td colspan="9">CO3: Identify the battery to be used for UAV application.</td></tr>
<tr><td colspan="9">CO4: Understand work in go f motor that can be used in UAV.</td></tr>
<tr><td colspan="9">CO5: Classify different microcontrollers and flight controllers.</td></tr>
<tr><td colspan="9">UNIT – I</td></tr>
<tr><td colspan="9">Introduction to Drones and Their Applications: Definition of drones – History of drones – Structural classification of drones: fixed wing structure, lighter than air systems, rotary wings aircraft and applications of drones.</td></tr>
<tr><td colspan="9">UNIT – II</td></tr>
<tr><td colspan="9">Components of Drones: Classifications of drone structures and their suitability – Applications and uses of drone frame materials – Classifications and applicability of propeller motors – Drone materials, design parameters for propellers – Composition and structuring of electronic speed controller – Flight control board – Characteristics of FCB and their structure.</td></tr>
<tr><td colspan="9">UNIT – III</td></tr>
<tr><td colspan="9">Battery and its Management: Introduction of Battery – Description of Li-Po Battery – Charging / Discharging of battery. Back up – Ratings, Shelf life, Maintenance and safety of Battery – Selection criteria of battery for drone application.</td></tr>
<tr><td colspan="9">UNIT – IV</td></tr>
<tr><td colspan="9">Sensors: Wi-Fi devices – RADAR and range finder – GPS receiver, Gyro sensor, Speed and Distance sensor, Image sensor, TOF sensor, Chemical sensor – Cameras in drones and selection criteria of camera for different range – Barometers, Accelerometer, Magnetometer – Remote control for drone.
Motors: Difference between AC and DC motors and stepper motor – Brushed and brushless motors – Brief idea of motor capabilities for a drone build – Selection criterion of motor for drone application – Working and application of BLDC motor.</td></tr>
<tr><td colspan="9">UNIT – V</td></tr>
<tr><td colspan="9">Connections and Interfaces of Devices in Drone: Brief introduction of RS232, RS422, RS485, UART ports. Different types of connectors and their specifications. Microcontroller interfacing techniques.
Introduction to Drone Programming: Introduction to programming language used in drone: Cand Python – Installation of cards – Auto Pilot software i.e. Ardupilot, Openpilot.</td></tr>
<tr><td colspan="9">Text Books</td></tr>
<tr><td colspan="9">1. Terry Kil by and Belinda Kil, Make: Getting Started with Drones, Maker Media, Inc., 2016.</td></tr>
<tr><td colspan="9">2. Vasilis Tzivaras, Building a Quadcopter with Arduino, Packt Publishing, 2016.</td></tr>
</table>

3. Donald Norris, *Build Your Own Quadcopter - Power Up Your Designs with the Parallax Elev - 8*, McGraw Hill Education, 2014.

Reference Books

1. Baichtal, *Building Your Own Drones: A Beginners' Guide to Drones, UAVs, and ROVs*, Que Publishing, 2016.

2. Austin, *Unmanned Aircraft Systems-UAVS Design, Development and Deployment*, Wiley, 2010.

3. Sebbane, *Smart Autonomous Aircraft: Flight Control and Planning for UAV*, CRC Press, 2015.

4. Zavrsnik, *Drones and Unmanned Aerial Systems: Legal and Social Implications for Security and Surveillance*, Springer, 2015.

Online Learning Resources

1. https://www.dronezon.com/learn-about-drones-quadcopters/
2. http://ardupilot.org/copter/docs/advanced-multicopter-design.html

Question Paper Pattern:

Sessional Exam: The question paper for Sessional Examination shall be for 40 marks. The question paper shall consist of Four Questions and all questions are compulsory. Question No.1 contains Five short answer questions (2marks each) for a total of 10 marks. Remaining Three Questions shall be EITHER/OR type descriptive questions for 10 marks each. Each of these descriptive questions may contain sub-questions.

End Exam: The question paper for End Examination shall be for 70 marks. The question paper shall contain Six Questions and all questions are compulsory. Question No.1 shall contain Ten short answer questions (2 marks each) for a total of 20 marks, with Two short answer questions from each unit. Remaining Five Questions (each question covering one unit of syllabus) carrying 10 marks each shall be EITHER/OR type descriptive questions and may contain sub-questions.

INTRODUCTION TO COMPUTER NETWORKS (ICN)

<table>
<tr><td colspan="5">VII Semester : CE, EEE, ME, and ECE</td><td colspan="4">Scheme : 2023</td></tr>
<tr><td>Course Code</td><td>Category</td><td colspan="3">Hours/Week</td><td>Credits</td><td colspan="3">Maximum Marks</td></tr>
<tr><td rowspan="2">OE722</td><td rowspan="2">OE-IV</td><td>L/D</td><td>T</td><td>P</td><td>C</td><td>Continuous Internal Assessment</td><td>End Exam</td><td>Total</td></tr>
<tr><td>3</td><td>-</td><td>-</td><td>3</td><td>30</td><td>70</td><td>100</td></tr>
<tr><td colspan="5">Sessional Exam Duration : 2 Hrs</td><td colspan="4">End Exam Duration: 3 Hrs</td></tr>
<tr><td colspan="9"></td></tr>
<tr><td colspan="9">Course Outcomes : At the end of the course the student will be able to</td></tr>
<tr><td colspan="9">CO1: Describe the architecture of the internet, reference models, and explain different types of transmission media used in networking.</td></tr>
<tr><td colspan="9">CO2: Apply error detection and correction techniques and analyze data link layer protocols and LAN technologies.</td></tr>
<tr><td colspan="9">CO3: Explain routing algorithms and the structure of the network layer, including internetworking.</td></tr>
<tr><td colspan="9">CO4: Analyze the working of transport layer protocols like TCP and UDP, including concepts of connection management and congestion control.</td></tr>
<tr><td colspan="9">CO5: Explain the principles of network applications and describe the functionality of protocols such as HTTP, SMTP, DNS, and peer-to-peer systems, including multimedia streaming and content delivery networks.</td></tr>
<tr><td colspan="9">UNIT – I</td></tr>
<tr><td colspan="9">Computer Networks and the Internet: What is the Internet? The network edge – The network core – Delay, loss, and throughput in packet switched networks – Reference models – Example networks – Guided transmission media – Wireless transmission.</td></tr>
<tr><td colspan="9">UNIT – II</td></tr>
<tr><td colspan="9">The Data Link Layer, Access Networks, and LANs: Data link layer design issues – Error detection and correction – Elementary data link protocols – Sliding window protocols – Introduction to the link layer – Error-detection and correction techniques – Multiple access links and protocols – Switched local area networks.
Link Virtualization: A network as a link layer – Data center networking – Retrospective: A day in the life of a web page request.</td></tr>
<tr><td colspan="9">UNIT – III</td></tr>
<tr><td colspan="9">The Network Layer: Routing algorithms – Internetworking – The network layer in the internet.</td></tr>
<tr><td colspan="9">UNIT – IV</td></tr>
<tr><td colspan="9">The Transport Layer: Connectionless Transport: UDP – The internet transport protocols: TCP – Congestion control.</td></tr>
<tr><td colspan="9">UNIT – V</td></tr>
<tr><td colspan="9">Principles of Network Applications: Principles of network applications – The web and HTTP – Electronic mail in the internet – DNS – The internet‘s directory service – Peer-to-Peer applications – Video streaming and content distribution networks.</td></tr>
<tr><td colspan="9">Text Books</td></tr>
<tr><td colspan="9">1. Andrew S. Tanenbaum, David J wetherall, Computer Networks, 5th Edition, Pearson.</td></tr>
<tr><td colspan="9">2. James F. Kurose, Keith W. Ross, Computer Networking: A Top-Down Approach, Pearson, 6th edition, 2019.</td></tr>
<tr><td colspan="9"></td></tr>
</table>

Reference Books
1. Forouzan, *Data communications and Networking*, McGraw Hill Publication, 5th Edition.
2. Youlu Zheng, Shakil Akthar, *Networks for Computer Scientists and Engineers*, Oxford Publishers, 2016.
Online Learning Resources
1. https://nptel.ac.in/courses/106/105/106105183
2. https://gaia.cs.umass.edu/kurose_ross/interactive/
3. https://www.netacad.com/courses/packet-tracer
4. https://www.geeksforgeeks.org/computer-network-tutorials/
Question Paper Pattern:
Sessional Exam: The question paper for Sessional Examination shall be for 40 marks. The question paper shall consist of Four Questions and all questions are compulsory. Question No.1 contains Five short answer questions (2marks each) for a total of 10 marks. Remaining Three Questions shall be EITHER/OR type descriptive questions for 10 marks each. Each of these descriptive questions may contain sub-questions. **End Exam:** The question paper for End Examination shall be for 70 marks. The question paper shall contain Six Questions and all questions are compulsory. Question No.1 shall contain Ten short answer questions (2 marks each) for a total of 20 marks, with Two short answer questions from each unit. Remaining Five Questions (each question covering one unit of syllabus) carrying 10 marks each shall be EITHER/OR type descriptive questions and may contain sub-questions.

INTERNET OF THINGS (IOT)

VII Semester : CE, EEE, ME, and ECE						Scheme : 2023		
Course Code	Category	Hours/Week			Credits	Maximum Marks		
		L/D	T	P	C	Continuous Internal Assessment	End Exam	Total
OE723	OE-IV	3	-	-	3	30	70	100
Sessional Exam Duration : 2 Hrs						End Exam Duration: 3 Hrs		

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

CO1: Understand general concepts of Internet of Things.

CO2: Apply design concept to IoT solutions.

CO3: Analyze various M2M and IoT architectures.

CO4: Evaluate design issues in IoT applications.

CO5: Create IoT solutions using sensors, actuators and devices.

UNIT – I

Introduction to Internet of Things (IoT): Definition and characteristics of IoT – Physical design of IoT – IoT protocols – IoT communication models – IoT Communication APIs – Embedded systems.

UNIT – II

***Prototyping IoT Objects using Microprocessor/Microcontroller*:** Working principles of sensors and actuators, setting up the board – Programming for IoT – Reading from sensors. Communication: communication through Bluetooth, Wi-Fi.

UNIT – III

***IoT Architecture and Protocols*:** Architecture reference model- Introduction – IoT reference model – Protocols- 6LowPAN – RPL, CoAP, MQTT, IoT frameworks – Thing speak.

UNIT – IV

***Device Discovery and Cloud Services for IoT*:** Device discovery capabilities – Registering a device – Deregister a device – Introduction to cloud storage models and communication APIs Web-Server – Web server for IoT.

UNIT – V

***UAV IoT* :** Introduction to Unmanned Aerial Vehicles/Drones – Drone types, Applications: Defence, Civil, Environmental Monitoring; UAV elements and sensors – Arms, motors, Electronic Speed Controller (ESC), GPS, IMU, Ultra sonic sensors; UAV software – Arudpilot, Mission Planner, Internet of Drones (IoD)- Case study Flyt Base.

Text Books

1. Vijay Madisetti and Arshdeep Bahga, *Internet of Things (A Hands-on-Approach)*, 1st Edition, VPT, 2014.
2. K Valavanis, George J Vachtsevanos, *Handbook of Unmanned Aerial Vehicles*, New York, Springer, Boston, Massachusetts, Credo Reference, 2016.

Reference Books

1. Jan Holler, VlasiosTsiatsis, Catherine Mulligan, Stefan Avesand, Stamatis Karnouskos, David Boyle, *From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence*, 1st Edition, Academic Press, 2014.
2. Pethuru Raj, Anupama C. Raman, *The Internet of Things, Enabling Technologies and Use Cases,* CRC Press.

3. Francis daCosta, *Rethinking the Internet of Things: A Scalable Approach to Connecting Everything*, 1st Edition, Apress Publications, 2013

4. Cuno Pfister, *Getting Started with the Internet of Things*, O'Reilly Media, 2011, ISBN: 9781-4493- 9357-1

5. DGCA RPAS *Guidance Manual*, Revision 3, 2020.

6. John Baichtal, *Building Your Own Drones: A Beginners' Guide to Drones, UAVs, and ROVs.*

Online Learning Resources

1. https://www.arduino.cc/
2. https://www.raspberrypi.org/
3. https://nptel.ac.in/courses/106105166/5
4. https://nptel.ac.in/courses/108108098/4

Question Paper Pattern:

Sessional Exam: The question paper for Sessional Examination shall be for 40 marks. The question paper shall consist of Four Questions and all questions are compulsory. Question No.1 contains Five short answer questions (2marks each) for a total of 10 marks. Remaining Three Questions shall be EITHER/OR type descriptive questions for 10 marks each. Each of these descriptive questions may contain sub-questions.

End Exam: The question paper for End Examination shall be for 70 marks. The question paper shall contain Six Questions and all questions are compulsory. Question No.1 shall contain Ten short answer questions (2 marks each) for a total of 20 marks, with Two short answer questions from each unit. Remaining Five Questions (each question covering one unit of syllabus) carrying 10 marks each shall be EITHER/OR type descriptive questions and may contain sub-questions.

MULTIMEDIA & ANNIMATION (MMA)

VII Semester : All Branches					Scheme : 2023			
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
		L/D	**T**	**P**	**C**	**Continuous Internal Assessment**	**End Exam**	**Total**
OE724	**OE-IV**	**3**	**-**	**-**	**3**	**30**	**70**	**100**
Sessional Exam Duration : 2 Hrs					**End Exam Duration: 3 Hrs**			

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

CO1: Understand the basic components of a multimedia project.

CO2: Understand the usage of text and formats in multimedia.

CO3: Understand the audio digitization, audio file format and audio software.

CO4: Understand the colour, image, image formats and Correction in multimedia.

CO5: Understand the digital video standards, formats and basic principles behind animation and Techniques.

UNIT – I

***Introduction to Multimedia*:** What is multimedia – Components of multimedia – Web and Internet multimedia applications – Transition from conventional media to digital media.

UNIT – II

***Computer Fonts and Hypertext*:** Usage of text in Multimedia – Families and faces of fonts, outline fonts, bitmap fonts, International character sets and hypertext, Digital fonts techniques.

UNIT – III

***Audio Fundamentals and Representations*:** Digitization of sound, frequency and bandwidth, decibel system, data rate, audio file format, Sound synthesis, MIDI, wavetable, Compression and transmission of audio on Internet – Adding sound to your multimedia project – Audio software and hardware.

UNIT – IV

***Image Fundamentals and Representations*:** Colour science, Colour, Colour models, Colour palettes, Dithering, 2D Graphics.

***Image Compression and File Formats*:** GIF, JPEG, JPEG 2000, PNG, TIFF, EXIF, PS, PDF – Basic image processing – Use of image editing software – White balance correction – Dynamic range correction – Gamma correction – Photo retouching.

UNIT – V

***Video and Animation*:** Video basics – How video works – Broadcast video standards – Analog video – Digital video – Video Recording and tape formats – Shooting and editing video – Video compression and file formats – Video compression based on motion compensation, MPEG-1, MPEG-2, MPEG-4, MPEG-7, MPEG-21, Animation: Cell animation – Computer animation – Morphing.

Text Books

1. Tay Vaughan, *Multimedia Making it Work*, Tata McGraw Hill, 2008.
2. Rajneesh Aggarwal & B.B. Tiwari, *Multimedia Systems*, Excel Publication, New Delhi, 2007.
3. Li & Drew, *Fundamentals of Multimedia*, Pearson Education, 2009.

Reference Books

1. Parekh Ranjan, *Principles of Multimedia*, Tata McGraw Hill, 2007.
2. Anirban Mukhopadhyay and Arup Chattopadhyay, *Introduction to Computer Graphics and Multimedia*, Vikas Publishing House, Second Edition.

Online Learning Resources

1. https://www.wisdomjobs.com/e-university/multimedia-tutorial-270.html
2. http://www.multimediatrainingvideos.com/
3. https://www.tutpad.com/tag/multimedia

Question Paper Pattern:

Sessional Exam: The question paper for Sessional Examination shall be for 40 marks. The question paper shall consist of Four Questions and all questions are compulsory. Question No.1 contains Five short answer questions (2marks each) for a total of 10 marks. Remaining Three Questions shall be EITHER/OR type descriptive questions for 10 marks each. Each of these descriptive questions may contain sub-questions.

End Exam: The question paper for End Examination shall be for 70 marks. The question paper shall contain Six Questions and all questions are compulsory. Question No.1 shall contain Ten short answer questions (2 marks each) for a total of 20 marks, with Two short answer questions from each unit. Remaining Five Questions (each question covering one unit of syllabus) carrying 10 marks each shall be EITHER/OR type descriptive questions and may contain sub-questions.

ADVANCED INFORMATION SYSTEMS (AIS)

VII Semester : CE, EEE, ME, and ECE					Scheme : 2023			
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
		L/D	**T**	**P**	**C**	**Continuous Internal Assessment**	**End Exam**	**Total**
OE725	**OE-IV**	**3**	**-**	**-**	**3**	**30**	**70**	**100**
Sessional Exam Duration : 2 Hrs					**End Exam Duration: 3 Hrs**			

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

CO1: Demonstrate the Object oriented concepts.

CO2: Interpret different types of Inheritance and Polymorphism.

CO3: Classify layer functionalities of OSI reference model and TCP Protocol suite.

CO4: Summarize the concepts of internetworking, security and IP addressing.

CO5: Demonstrate different types of protocols and web contents used in web design

UNIT – I

***Introduction to Object Oriented Concepts*:** Introduction – Programming techniques – Introduction to object oriented concepts – Concept of structured procedural programming – Class, object.

***Characteristics of Objects*:** Data abstraction – Classification, encapsulation and message passing – Access specifiers in class, UML class diagrams.

UNIT – II

***Advanced Concepts in Object Oriented Technology*:** Relationships – Inheritance – Protected access specifier – Multiple and multilevel inheritance – Generalization and specialization – Abstract classes – Polymorphism – Implementation of OOC through C++.

UNIT – III

***Introduction to Computer Networks*:** Introduction – Network topology – OSI reference model – TCP protocol suite – Routing devices – Types of networks.

UNIT – IV

***Internetworking*:** Protocols for Internetworking, Internet Address and Domains, Packets, Packet Switched Networks, Virtual Private Networks, and Working of Internet.

UNIT – V

***Introduction to Web Technology*:** Introduction – Hyper Text Transfer Protocol (HTTP), File Transfer Protocol (FTP), Domain Name Server (DNS), Web applications, Types of web content – Multi-Tier web applications – Performance of Web Applications.

Text Books

1. Campus Connect Foundation Programme, *Object Oriented Concepts – System.*
2. *Campus Connect Foundation Programme – Computer Hardware and System Software,* Vol. 3, INFOSYS Concepts.

Reference Books

1. *Campus Connect Foundation Programme – Relational Database Management System*, Client Server.

Online Learning Resources

1. https://www.tutorialspoint.com/cplusplus/
2. https://www.geeksforgeeks.org/computer-network-tutorials/

Question Paper Pattern:

Sessional Exam: The question paper for Sessional Examination shall be for 40 marks. The question paper shall consist of Four Questions and all questions are compulsory. Question No.1 contains Five short answer questions (2marks each) for a total of 10 marks. Remaining Three Questions shall be EITHER/OR type descriptive questions for 10 marks each. Each of these descriptive questions may contain sub-questions.

End Exam: The question paper for End Examination shall be for 70 marks. The question paper shall contain Six Questions and all questions are compulsory. Question No.1 shall contain Ten short answer questions (2 marks each) for a total of 20 marks, with Two short answer questions from each unit. Remaining Five Questions (each question covering one unit of syllabus) carrying 10 marks each shall be EITHER/OR type descriptive questions and may contain sub-questions.

QUANTUM COMPUTING (QC)

VII Semester : All Branches						Scheme : 2023		
Course Code	Category	Hours/Week			Credits	Maximum Marks		
		L/D	T	P	C	Continuous Internal Assessment	End Exam	Total
OE726	OE-IV	3	-	-	3	30	70	100
Sessional Exam Duration : 2 Hrs						End Exam Duration: 3 Hrs		

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

CO1: Explain the fundamental concepts of quantum mechanics used in computing.

CO2: Construct and analyze quantum circuits using standard gates.

CO3: Apply quantum algorithms like Deutsch-Jozsa, Grover's, and Shor's.

CO4: Develop simple quantum programs using Qiskit or similar platforms.

CO5: Analyze applications and challenges of quantum computing in real-world domains.

UNIT – I

Fundamentals of Quantum Mechanics and Linear Algebra: Classical vs. Quantum computation – Complex numbers, Vectors, and Matrices – Hilbert spaces and Dirac notation – Quantum states and Qubits – Superposition and measurement – Tensor products and Multi-Qubit systems.

UNIT – II

Quantum Gates and Circuits : Quantum logic gates: Pauli, Hadamard, Phase, Controlled gates and CNOT – Unitary operations and reversibility – Quantum circuit representation – Quantum teleportation – Simulation of quantum circuits.

UNIT – III

Quantum Algorithms and Complexity: Quantum parallelism and interference – Deutsch and Deutsch-Jozsa algorithms – Grover's search algorithm – Shor's factoring algorithm – Quantum Fourier transform – Complexity classes: BQP, P, NP, and QMA.

UNIT – IV

Quantum Programming and Simulation Platforms : Introduction to Qiskit and IBM quantum experience – Writing quantum circuits in Qiskit – Measuring Qubits and results – Classical-Quantum hybrid programs – Noisy Intermediate-Scale Quantum (NISQ) systems – Limitations and current state of quantum hardware.

UNIT – V

Applications and Future of Quantum Computing: Quantum Machine Learning: Basics and models – Quantum cryptography and quantum key distribution – Quantum algorithms in AI and optimization – Quantum advantage and supremacy – Ethical and societal impact of quantum technologies – Future trends and research directions.

Text Books

1. Michael A. Nielsen, Isaac L. Chuang, *Quantum Computation and Quantum Information*, Cambridge University Press, 10th Anniversary Edition, 2010.
2. Eleanor Rieffel and Wolfgang Polak, *Quantum Computing: A Gentle Introduction*, MIT Press, 2011.
3. Chris Bernhardt, *Quantum Computing for Everyone*, MIT Press, 2019.

Reference Books

1. David McMahon, *Quantum Computing Explained*, Wiley, 2008.
2. Phillip Kaye, Raymond Laflamme, Michele Mosca, *An Introduction to Quantum Computing*, Oxford University Press, 2007.
3. Scott Aaronson, *Quantum Computing Since Democritus*, Cambridge University Press, 2013.

Online Learning Resources

1. IBM Quantum Experience and Qiskit Tutorials
2. Coursera – *Quantum Mechanics and Quantum Computation* by UC Berkeley
3. edX – *The Quantum Internet and Quantum Computers*
4. YouTube – *Quantum Computing for the Determined* by Michael Nielsen
5. Qiskit Textbook – *IBM Quantum*

Question Paper Pattern:

Sessional Exam: The question paper for Sessional Examination shall be for 40 marks. The question paper shall consist of Four Questions and all questions are compulsory. Question No.1 contains Five short answer questions (2marks each) for a total of 10 marks. Remaining Three Questions shall be EITHER/OR type descriptive questions for 10 marks each. Each of these descriptive questions may contain sub-questions.

End Exam: The question paper for End Examination shall be for 70 marks. The question paper shall contain Six Questions and all questions are compulsory. Question No.1 shall contain Ten short answer questions (2 marks each) for a total of 20 marks, with Two short answer questions from each unit. Remaining Five Questions (each question covering one unit of syllabus) carrying 10 marks each shall be EITHER/OR type descriptive questions and may contain sub-questions.

FINANCIAL MATHEMATICS (FM)

VII Semester : All Branches						Scheme : 2023		
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
		L/D	**T**	**P**	**C**	**Continuous Internal Assessment**	**End Exam**	**Total**
OE727	**OE-IV**	**3**	**-**	**-**	**3**	**30**	**70**	**100**
Sessional Exam Duration : 2 Hrs						**End Exam Duration: 3 Hrs**		

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

CO1: Explain fundamental financial concepts, including arbitrage, valuation, and risk.

CO2: Apply stochastic models, including Brownian motion and Stochastic Differential Equations (SDEs), in financial contexts.

CO3: Analyze mathematical techniques for pricing options and financial derivatives.

CO4: Evaluate interest rate models and bond pricing methodologies.

CO5: Utilize computational techniques such as Monte Carlo simulations for financial modeling.

UNIT – I

***Asset Pricing and Risk Management*:** Fundamental financial concepts: Returns, arbitrage, valuation, and pricing – Asset/Liability management, investment income, capital budgeting, and contingent cash flows – One-period model: Securities, payoffs, and the no-arbitrage principle – Option contracts: Speculation and hedging strategies – CAP Model – Efficient market hypothesis.

UNIT – II

***Stochastic Models in Finance*:** Random walks and Brownian motion – Introduction to Stochastic Differential Equations (SDEs): Drift and diffusion. Ito calculus: Ito‘s Lemma, Ito Integral, and Ito Isometry.

UNIT – III

***Interest Rate and Credit Modelling*:** Interest rate models and bond markets – Short-rate models: Vasicek, Cox-Ingersoll-Ross (CIR), Hull & White models – Credit risk modelling: Hazard function and hazard rate.

UNIT – IV

***Fixed-Income Securities and Bond Pricing*:** Characteristics of fixed-income products: Yield, duration, and convexity – Yield curves, forward rates, and zero-coupon bonds. Stochastic interest rate models and bond pricing PDE – Yield curve fitting and calibration techniques – Mortgage backed securities.

UNIT – V

***Exotic Options and Computational Finance*:** Stochastic volatility models and the Feynman-Kac theorem – Exotic options: Barriers, Asians, and Look backs – Monte Carlo methods for derivative pricing – Black-Scholes-Merton model: Derivation and applications.

Text Books

1. Ales Cerny, *Mathematical Techniques in Finance: Tools for Incomplete Markets,* Princeton University Press.

2. S.R. Pliska, *Introduction to Mathematical Finance: Discrete-Time Models*, Cambridge University Press.

Reference Books

1. Ioannis Karatzas& Steven E. Shreve, *Methods of Mathematical Finance*, Springer, New

York.

2. John C. Hull, *Options, Futures, and Other Derivatives*, Pearson.

Online Learning Resources

Question Paper Pattern:

Sessional Exam: The question paper for Sessional Examination shall be for 40 marks. The question paper shall consist of Four Questions and all questions are compulsory. Question No.1 contains Five short answer questions (2marks each) for a total of 10 marks. Remaining Three Questions shall be EITHER/OR type descriptive questions for 10 marks each. Each of these descriptive questions may contain sub-questions.

End Exam: The question paper for End Examination shall be for 70 marks. The question paper shall contain Six Questions and all questions are compulsory. Question No.1 shall contain Ten short answer questions (2 marks each) for a total of 20 marks, with Two short answer questions from each unit. Remaining Five Questions (each question covering one unit of syllabus) carrying 10 marks each shall be EITHER/OR type descriptive questions and may contain sub-questions.

SENSORS AND ACTUATORS FOR ENGINEERING APPLICATIONS (SAEA)

<table>
<tr><td colspan="5">VII Semester : All Branches</td><td colspan="4">Scheme : 2023</td></tr>
<tr><td>Course Code</td><td>Category</td><td colspan="3">Hours/Week</td><td>Credits</td><td colspan="3">Maximum Marks</td></tr>
<tr><td rowspan="2">OE728</td><td rowspan="2">OE-IV</td><td>L/D</td><td>T</td><td>P</td><td>C</td><td>Continuous Internal Assessment</td><td>End Exam</td><td>Total</td></tr>
<tr><td>3</td><td>-</td><td>-</td><td>3</td><td>30</td><td>70</td><td>100</td></tr>
<tr><td colspan="5">Sessional Exam Duration : 2 Hrs</td><td colspan="4">End Exam Duration: 3 Hrs</td></tr>
<tr><td colspan="9"></td></tr>
<tr><td colspan="9">Course Outcomes :At the end of the course the student will be able to</td></tr>
<tr><td colspan="9">CO1: To provide exposure to various kinds of sensors and actuators and their engineering applications.</td></tr>
<tr><td colspan="9">CO2: To impart knowledge on the basic laws and phenomenon behind the working of sensors and actuators.</td></tr>
<tr><td colspan="9">CO3: To explain the operating principles of various sensors and actuators.</td></tr>
<tr><td colspan="9">CO4: To educate the fabrication of sensors.</td></tr>
<tr><td colspan="9">CO5: To explain the required sensor and actuator for interdisciplinary application.</td></tr>
<tr><td colspan="9">UNIT – I</td></tr>
<tr><td colspan="9">Introduction to Sensors and Actuators
Sensors: Types of sensors: temperature, pressure, strain, active and passive sensors – General characteristics of sensors (Principles only) – Deposition: Chemical vapor deposition, Pattern: photolithography and Etching: Dry and wet etching.
Actuators: Functional diagram of actuators – Types of actuators and their basic principle of working: Pneumatic, Electromagnetic, Piezo-electric and Piezo-resistive actuators – Applications of actuators.</td></tr>
<tr><td colspan="9">UNIT – II</td></tr>
<tr><td colspan="9">Temperature and Mechanical Sensors
Temperature Sensors: Types of temperature sensors and their basic principle of working – Thermo- resistive sensors: Thermistors – Thermo-electric sensors: Thermocouples, PN junction temperature sensors.
Mechanical Sensors: Types of mechanical sensors and their basic principle of working – Force sensors: Strain gauges, Tactile sensors, Pressure sensors: Piezoresistive, Variable Reluctance Sensor (VRP).</td></tr>
<tr><td colspan="9">UNIT – III</td></tr>
<tr><td colspan="9">Optical and Acoustic Sensors
Optical Sensors: Basic principle and working of : Photodiodes, Phototransistors and Photo resistors based sensors, Photomultipliers – Infrared sensors: Thermal, Passive infrared fiber based sensors and Thermopiles
Acoustic Sensors: Principle and working of Ultrasonic sensors – Piezo-electric resonators – Microphones.</td></tr>
<tr><td colspan="9">UNIT – IV</td></tr>
<tr><td colspan="9">Magnetic and Electromagnetic Sensors: Motors as actuators (linear, rotational, stepping motors) – Magnetic valves, inductive sensors (LVDT, RVDT, and Proximity) – Hall Effect sensors – Magneto-resistive sensors – Magnetostrictive sensors and actuators.</td></tr>
<tr><td colspan="9">UNIT – V</td></tr>
<tr><td colspan="9">Chemical and Radiation Sensors
Chemical Sensors: Principle and working of Electro-chemical, Thermo-chemical, Gas, pH,</td></tr>
</table>

Humidity and moisture sensors.

***Radiation Sensors*:** Principle and working of Ionization detectors, Scintillation detectors, Semiconductor radiation detectors and Microwave sensors (resonant, reflection, transmission).

Text Books

1. Clarence W. deSilva, *Sensors and Actuators*, CRC Press, 2nd Edition, 2015.
2. D.A. Halland, C.E. Millar, *Sensors and Actuators*, CRC Press, 1999.

Reference Books

1. D. Patranabhis, *Sensors and Transducers*, Prentice Hall of India Pvt. Ltd., 2003.
2. John G. Webster, *Measurement, Instrumentation, and Sensors Handbook,* CRC Press 1999.
3. Henry Bolte, *Sensors – A Comprehensive Sensors*, John Wiley.
4. Stefan Johann Rupitsch, *Hand book of modern sensors*, Springer.

Online Learning Resources

Question Paper Pattern:

Sessional Exam: The question paper for Sessional Examination shall be for 40 marks. The question paper shall consist of Four Questions and all questions are compulsory. Question No.1 contains Five short answer questions (2marks each) for a total of 10 marks. Remaining Three Questions shall be EITHER/OR type descriptive questions for 10 marks each. Each of these descriptive questions may contain sub-questions.

End Exam: The question paper for End Examination shall be for 70 marks. The question paper shall contain Six Questions and all questions are compulsory. Question No.1 shall contain Ten short answer questions (2 marks each) for a total of 20 marks, with Two short answer questions from each unit. Remaining Five Questions (each question covering one unit of syllabus) carrying 10 marks each shall be EITHER/OR type descriptive questions and may contain sub-questions.

CHEMISTRY OF NANO MATERIALS AND APPLICATIONS (CNMA)

VII Semester : All Branches						Scheme : 2023		
Course Code	Category	Hours/Week			Credits	Maximum Marks		
OE729	OE-IV	L/D	T	P	C	Continuous Internal Assessment	End Exam	Total
		3	-	-	3	30	70	100
Sessional Exam Duration : 2 Hrs						End Exam Duration: 3 Hrs		

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

CO1: Classify the nano structure materials; describe scope of nano science and importance of technology.

CO2: Describe the top-down approach, Explain aerosol synthesis and plasma arc technique, Differentiate chemical vapor deposition method and electrode position method, Discuss about high energy ball milling.

CO3: Discuss different technique for characterization of nano material, Explain electron Microscopy techniques for characterization of nano material, Describe BET method for surface area analysis.

CO4: Explain synthesis and properties and applications of nano materials, Discuss about fullerenes and carbon nano tubes, Differentiate nano magnetic materials and thermo electric materials, nonlinear optical materials.

CO5: Illustrate advance engineering applications of Water treatment, sensors, electronic devices, medical domain, civil engineering, chemical engineering, metallurgy and mechanical engineering, food science, agriculture, pollutants degradation.

UNIT – I

***Basics and Characterization of Nanomaterials*:** Introduction – Scope of nano science and nano technology – Nano science in nature – Classification of nano structured materials – Importance of nano materials.

UNIT – II

***Synthesis of Nanomaterials*:** Top-Down approach – Inert gas condensation – Arc discharge method – Aerosol synthesis – Plasma arc technique – Ion sputtering – Laser ablation, laser pyrolysis, and chemical vapour deposition method – Electro deposition method – High energy ball milling method.

***Synthetic Methods*:** Bottom-Up approach – Sol-gel synthesis – Micro emulsions orrever semicelles – Co-precipitation method – Solvo thermal synthesis – Hydrothermal synthesis – Microwave heating synthesis and sonochemical synthesis.

UNIT – III

***Techniques for characterization*:** Diffraction technique – Spectroscopy techniques – Electron microscopy techniques for the characterization of nanomaterials – BET method for surface area analysis – Dynamic light scattering for particle size determination.

UNIT – IV

***Studies of Nano-structured Materials*:** Synthesis, properties and applications of the following nanomaterials -fullerenes, carbon nanotubes, 2D-nanomaterial (Graphene), core-shell, magnetic nanoparticles, thermoelectric materials, non-linear optical materials.

UNIT – V

***Advanced Engineering Applications of Nanomaterials*:** Applications of nano particle, nano rods, nano wires, water treatment, sensors, electronic devices, medical domain, civil

engineering, chemical engineering, metallurgy and mechanical engineering, food science, agriculture, pollutants degradation.

Text Books

1. T Pradeep, *Nano: The Essentials*, McGraw Hill, 2007.
2. B.S. Murthy, P Shankar, Baldev Rai, B.B. Rath and James Murday, *Textbook of Nanoscience and Nanotechnology*, University Press, 2012.

Reference Books

1. Ludovico Cademrtiri and Geoffrey A. Ozin & Geoffrey A. Ozin, *Concepts of Nanochemistry*, Wiley, VCH, 2011.
2. Guozhong Cao, *Nanostructures & Nanomaterials - Synthesis, Properties & Applications*, Imperial College Press, 2007.

Online Learning Resources

Question Paper Pattern:

Sessional Exam: The question paper for Sessional Examination shall be for 40 marks. The question paper shall consist of Four Questions and all questions are compulsory. Question No.1 contains Five short answer questions (2marks each) for a total of 10 marks. Remaining Three Questions shall be EITHER/OR type descriptive questions for 10 marks each. Each of these descriptive questions may contain sub-questions.

End Exam: The question paper for End Examination shall be for 70 marks. The question paper shall contain Six Questions and all questions are compulsory. Question No.1 shall contain Ten short answer questions (2 marks each) for a total of 20 marks, with Two short answer questions from each unit. Remaining Five Questions (each question covering one unit of syllabus) carrying 10 marks each shall be EITHER/OR type descriptive questions and may contain sub-questions.

LITERARY VIBES (LB)

VII Semester : All Branches					Scheme : 2023			
Course Code	Category	Hours/Week			Credits	Maximum Marks		
OE730	OE-IV	L/D	T	P	C	Continuous Internal Assessment	End Exam	Total
		3	-	-	3	30	70	100
Sessional Exam Duration : 2 Hrs					End Exam Duration: 3 Hrs			

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

CO1: Identify genres, literary techniques and creative uses of language in literary texts.

CO2: Explain the relevance of themes found in literary texts to contemporary, personal and cultural values and to historical forces.

CO3: Apply knowledge and understanding of literary texts when responding to others' problems and their own and make evidence-based arguments.

CO4: Analyze the underlying meanings of the text by using the elements of literary texts.

CO5: Evaluate theirown work and that of others critically.

CO6: Develop as creative, effective, independent and reflective students who are able to make informed choices in process and performance.

UNIT – I

Poetry:

1. Ulysses- Alfred Lord Tennyson
2. Ain't I woman?-Sojourner Truth
3. The Second Coming-W.B. Yeats
4. Where the Mind is Without Fear-Rabindranath Tagore

UNIT – II

Drama: Twelfth Night- William Shakespeare

Shakespeare -life and works

1. Plot & sub-plot and Historical background of the play
2. Themes and Criticism
3. Style and literary elements
4. Characters and characterization

UNIT – III

Short Story:

1. The Luncheon - Somerset Maugham
2. The Happy Prince-Oscar Wild
3. Three Questions – Leo Tolstoy
4. Grief –Antony Chekov

UNIT – IV

Prose: Essay and Autobiography

1. My struggle for an Education-Booker T Washington
2. The Essentials of Education-Richard Livingston
3. The story of My Life-Helen Keller
4. Student Mobs-JB Priestly

UNIT – V

Novel: Hard Times- Charles Dickens

1. Charles Dickens-Life and works

2. Plot and Historical background of the novel 3. Themes and criticism 4. Style and literary elements 5. Characters and characterization
Text Books
1. Charles Dickens, *Hard Times*, Sangam Abridged Texts, Vantage Press, 1983
2. Dent JC. William Shakespeare, *Twelfth Night*, Oxford University Press, 2016.
Reference Books
1. WJ Long, *History of English Literature*, Rupa Publications India, First Edition, 4 October 2015.
2. RK Kaushik And SC Bhatia, *Essays, Short Stories and One Act Plays*, Oxford University Press, 2018.
3. Dhanvel, SP, *English and Soft Skills*, Orient Blackswan, 2017.
4. *New Horizon*, Pearson publications, New Delhi, 2014.
5. Vimala Ramarao, *Explorations Volume-II*, Prasaranga Bangalore University, 2014.
6. Dev Neira, Anjana & Co., *Creative Writing: A Beginner's Manual*, Pearson India, 2008.
Online Learning Resources
1. https://www.litcharts.com/poetry/alfred-lord-tennyson/ulysses
2. https://www.litcharts.com/lit/ain-t-i-a-woman/summary-and-analysis
3. https://englishliterature.education/articles/poetry-analysis/the-second-coming-by-w-b-yeats-critical-analysis-summary-and-line-by-line-explanation/#google_vignette
4. https://sirjitutorials.com/where-the-mind-is-without-fear-poem-notes-explanation/
5. https://www.litcharts.com/lit/twelfth-night/themes
6. https://smartenglishnotes.com/2021/11/28/the-luncheon-summary-characters-themes-and-irony
Question Paper Pattern:
Sessional Exam: The question paper for Sessional Examination shall be for 40 marks. The question paper shall consist of Four Questions and all questions are compulsory. Question No.1 contains Five short answer questions (2marks each) for a total of 10 marks. Remaining Three Questions shall be EITHER/OR type descriptive questions for 10 marks each. Each of these descriptive questions may contain sub-questions. **End Exam:** The question paper for End Examination shall be for 70 marks. The question paper shall contain Six Questions and all questions are compulsory. Question No.1 shall contain Ten short answer questions (2 marks each) for a total of 20 marks, with Two short answer questions from each unit. Remaining Five Questions (each question covering one unit of syllabus) carrying 10 marks each shall be EITHER/OR type descriptive questions and may contain sub-questions.

MANAGEMENT ELECTIVE

1. Project Management
2. Business Ethics and Corporate Governance
3. E- Business
4. Management Science

PROJECT MANAGEMENT (PM)

(Management Elective)

VII Semester : CE						**Scheme : 2023**		
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
		L	**T**	**P**	**C**	**Continuous Internal Assessment**	**End Exam**	**Total**
CE402		**2**	**-**	**-**	**2**	**30**	**70**	**100**
Sessional Exam Duration: 2 Hrs						**End Exam Duration: 3 Hrs**		

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

CO1: Apply the planning, scheduling and network techniques in construction management.

CO2: Analyze the network analysis and computation problems using CPM and PERT.

CO3: Evaluate the project cost analysis for network planning and concept of project management software.

CO4: Analyze the principles of tenders, organization, arbitration and Procedure of contract documents.

CO5: Analyze the engineering economics, solving of cash flow problems, safety measures, inspection and quality control of work.

UNIT – I

Introduction to Construction Management: Significance – Objectives and functions of construction management. Resources – Stages – Team of construction unit.

Construction Planning and Scheduling: Objectives and importance of planning and Scheduling – Methods of planning and scheduling – Bar charts – Milestone charts.

Network Techniques in Construction management: Elements of network – Network techniques – Breakdown structures – Representation and specifying of activities and events – Rules for network.

UNIT – II

Critical Path Method (CPM): Introduction – Difference between CPM and PERT – Time estimates – Float – Critical path – Network analysis and computation problems.

Program Evaluation and Review Technique (PERT): Introduction, time estimates, slack, critical path – Network analysis and computation problems.

UNIT – III

Cost–Time Analysis in Net Work Planning: Importance of time – Project cost analysis in network planning – Resources allocation.

Introduction to Project Management Software: Introduction to Micro Soft Project (MSP) and Primavera (P6) – Step by step procedure of tools – Advantages of MSP and P6 – Differences between MSP and P6 (Theory Only).

UNIT – IV

Tenders and Contracts: Type of tenders – Principles of tendering – Notice inviting tender – Contracts definition – Essentials – Types – Documents – Conditions of contracts.

Arbitration: Definition – Arbitrator – Arbitration agreement – Qualification of arbitrator – Advantages of arbitration.

Organisation: Principles of organization – Types of organization – Measurement book.

UNIT – V

Engineering Economics: Basic Principles – Equivalence – Cash flow diagram – Single payment present worth factor – Uniform series present worth factor.

Safety, Inspection and Quality Control: Importance of safety – Safety measures – Personal protection equipment – Need for inspection at work – Principles of inspection – Importance of quality – Elements of quality – Organisation for quality control.
Text Books:
1. B.C. Punmia & K.K. Kandelwal, *Project Planning & Control with PERT & CPM*, Laxmi Publications (P) Ltd, New Delhi.
2. J.L. Sharma, *Construction Management and Accounts*, Satya Prakasan (P), New Delhi.
Reference Books:
1. U.K. Shrivastava, *Construction Planning and Management*, Galgotia (P), New Delhi.
2. S. Seetha Raman, *Construction Engineering and Management*, Umesh (P), New Delhi.
3. Chitkara, *Construction Project Management – Planning, Scheduling and Control*, Tata McGraw Hill.
4. Halpin, D.W, *Financial and Cost Concepts for Construction Management*, John Wiley and Sons, New York.
Question Paper Pattern:
Sessional Exam: The question paper for Sessional Examination shall be for 40 marks. The question paper shall consist of Four Questions and all questions are compulsory. Question No.1 contains Five short answer questions (2marks each) for a total of 10 marks. Remaining Three Questions shall be EITHER/OR type descriptive questions for 10 marks each. Each of these descriptive questions may contain sub-questions. **End Exam:** The question paper for End Examination shall be for 70 marks. The question paper shall contain Six Questions and all questions are compulsory. Question No.1 shall contain Ten short answer questions (2 marks each) for a total of 20 marks, with Two short answer questions from each unit. Remaining Five Questions (each question covering one unit of syllabus) carrying 10 marks each shall be EITHER/OR type descriptive questions and may contain sub-questions.

BUSINESS ETHICS AND CORPORATE GOVERNANCE (BECG)

(Management Elective)

VII Semester : All Branches						Scheme : 2023		
Course Code	Category	Hours/Week			Credits	Maximum Marks		
HSM401	BS&H	L/D	T	P	C	Continuous Internal Assessment	End Exam	Total
		2	-	-	2	30	70	100
Sessional Exam Duration : 2 Hrs						End Exam Duration: 3 Hrs		

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

CO1: Understand the Ethics and different types of Ethics.

CO2: Understand business ethics and ethical practices in management.

CO3: Understand the role of ethics in management.

CO4: Apply the knowledge of professional ethics & technical ethics.

CO5: Analyze corporate law, ethics, codes & principles.

CO6: Evaluate corporate governance & corporate scams.

UNIT – I

Ethics

Introduction – Meaning – Nature, scope, significance, loyalty, and ethical behavior – Value systems – Business ethics – Types, characteristics, factors, contradictions and ethical practices in management – Corporate social responsibility – Issues of management – Crisis management.

UNIT – II

Ethics in Management

Introduction – Ethics in production, finance, Human resource management and marketing management – The ethical value system – Universalism, utilitarianism, distributive justice, social contracts, individual freedom of choice, professional codes; Culture and ethics – Ethical values in different cultures – Culture and individual ethics – Professional ethics and technical ethics.

UNIT – III

Corporate Culture

Introduction – Meaning, definition, nature, and significance – Key elements of corporate culture, shared values, beliefs and norms, rituals, symbols and language – Types of corporate culture, hierarchical culture, market driven culture – Organization leadership and corporate culture, leadership styles and their impact on culture, transformational leadership and culture change.

UNIT – IV

Legal Frame Work

Law and ethics – Agencies enforcing ethical business behavior – Legal impact – Environmental protection, fair trade practices, legal compliances, safeguarding health and wellbeing of customers – Corporate law, securities and financial regulations, corporate governance codes and principles.

UNIT – V

Corporate Governance

Introduction – Meaning – Corporate governance code, transparency & disclosure – Role of auditors, board of directors and shareholders. Global issues, accounting and regulatory

frame work – Corporate scams – Committees in India and abroad – Corporate social responsibility – BoDs composition – Cadbury committee – Various committees – Reports – Benefits and limitations.

Text Books

1. Murthy CSV, *Business Ethics and Corporate Governance*, HPH July 2017.
2. Bholananth Dutta, S.K. Podder, *Corporation Governance*, VBH. June 2010.

Reference Books

1. Nirmala, Karunakara Reddy, *Business Ethics and Corporate Governance*, HPH.
2. H.R. Machiraju, *Corporate Governance*, HPH, 2013.
3. K. Venkataramana, *Corporate Governance*, SHBP.
4. N.M. Khandelwal, *Indian Ethos and Values for Managers.*

Question Paper Pattern:

Sessional Exam: The question paper for Sessional Examination shall be for 40 marks. The question paper shall consist of Four Questions and all questions are compulsory. Question No.1 contains Five short answer questions (2marks each) for a total of 10 marks. Remaining Three Questions shall be EITHER/OR type descriptive questions for 10 marks each. Each of these descriptive questions may contain sub-questions.

End Exam: The question paper for End Examination shall be for 70 marks. The question paper shall contain Six Questions and all questions are compulsory. Question No.1 shall contain Ten short answer questions (2 marks each) for a total of 20 marks, with Two short answer questions from each unit. Remaining Five Questions (each question covering one unit of syllabus) carrying 10 marks each shall be EITHER/OR type descriptive questions and may contain sub-questions.

E- BUSINESS (EB)

(Management Elective)

VII Semester : All Branches						**Scheme : 2023**		
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
HSM402	**BS&H**	**L/D**	**T**	**P**	**C**	**Continuous Internal Assessment**	**End Exam**	**Total**
		2	**-**	**-**	**2**	**30**	**70**	**100**
Sessional Exam Duration : 2 Hrs						**End Exam Duration: 3 Hrs**		

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

CO1: Remember E-Business & its nature, scope and functions.

CO2: Understand E-market-Models which are practicing by the organizations.

CO3: Apply the concepts of E-Commerce in the present globalized world.

CO4: Analyze the various E-payment systems & importance of net banking.

CO5: Evaluate market research strategies & E-advertisements.

CO6: Understand importance of E-security & control.

UNIT – I

Electronic Business

Introduction – Nature, meaning, significance, functions and advantages – Definition of electronic business – Functions of Electronic Commerce (EC) – Advantages & disadvantages of E-commerce – E-commerce and E-business – Internet services – Online shopping – E-commerce opportunities for industries.

UNIT – II

Electronic Markets and Business Models

Introduction – E-Shops-E-Malls E-Groceries – Portals – Vertical portals – Horizontal portals – Advantages of portals – Business models – Business to Business (B2B) – Business to Customers (B2C) – Business to Government (B2G) – Auctions – B2B Portals in India.

UNIT – III

Electronic Payment Systems

Introduction to electronic payment systems (EPS) – Types of electronic payments – Credit/debit cards, e-wallets, UPI, and crypto currencies – Smart cards and digital wallets: Features and usage – Electronic Fund Transfer (EFT): Role in business transactions – Infrastructure requirements and regulatory aspects of e-payments.

UNIT – IV

E-Security

Security risks and challenges in electronic commerce – Cyber threats – Phishing, hacking, identity theft, and malware – Digital signatures & certificates – Security protocols over public networks (HTTP, SSL, TLS) – Firewalls in securing e-business platforms.

UNIT – V

E-Marketing

Introduction – Online marketing – Advantages of online marketing – Internet advertisement – Advertisement methods – Conducting online market research – E-marketing planning: Online branding, social media marketing, and email marketing – E-business strategies: Digital advertising, content marketing, and analytics – e-Customer Relationship Management (eCRM); e-Supply Chain management (e-SCM).

Text Books

1. Arati Oturkar & Sunil Khilari, *E-Business*, Everest Publishing House, 2022.
2. P.T.S Joseph, *E-Commerce*, Fourth Edition, Prentice Hall of India, 2011.

Reference Books

1. Debjani, Kamalesh K Bajaj, *E-Commerce*, Second Edition, Tata McGraw Hill, 2005.
2. Dave Chaffey, *E-Commerce E-Management,* Second Edition, Pearson, 2012.
3. Henry Chan, *E-Commerce Fundamentals and Application,* Raymond Leatham Wiley India, 2007.
4. S. Jaiswal, *E-Commerce,* Galgotia Publication Pvt. Ltd., 2003.

Question Paper Pattern:

Sessional Exam: The question paper for Sessional Examination shall be for 40 marks. The question paper shall consist of Four Questions and all questions are compulsory. Question No.1 contains Five short answer questions (2marks each) for a total of 10 marks. Remaining Three Questions shall be EITHER/OR type descriptive questions for 10 marks each. Each of these descriptive questions may contain sub-questions.

End Exam: The question paper for End Examination shall be for 70 marks. The question paper shall contain Six Questions and all questions are compulsory. Question No.1 shall contain Ten short answer questions (2 marks each) for a total of 20 marks, with Two short answer questions from each unit. Remaining Five Questions (each question covering one unit of syllabus) carrying 10 marks each shall be EITHER/OR type descriptive questions and may contain sub-questions.

MANAGEMENT SCIENCE (MS)

(Management Elective)

VII Semester : All Branches						**Scheme : 2023**		
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
HSM403	**BS&H**	**L/D**	**T**	**P**	**C**	**Continuous Internal Assessment**	**End Exam**	**Total**
		2	**-**	**-**	**2**	**30**	**70**	**100**
Sessional Exam Duration : 2 Hrs						**End Exam Duration: 3 Hrs**		

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

CO1: Remember the concepts & principles of management and designs of organization in a practical world.

CO2: Understand the knowledge of work-study principles & quality control techniques in industry

CO3: Apply the process of recruitment & selection in organization.

CO4: Analyze the concepts of HRM & different training methods.

CO5: Evaluate PERT/CPM Techniques for projects of an enterprise and estimate time & cost of project & to analyze the business through SWOT.

CO6: Create awareness on contemporary issues in modern management & technology.

UNIT – I

Introduction to Management

Management – Concept and meaning – Nature-functions – Management as a science and art and both. Schools of management thought – Taylor's scientific theory – Henry Fayol's principles - Elton Mayo's human relations – Organizational designs – Line organization – Line & staff organization – Functional organization – Matrix organization – Project organization – Committee form of organization – Social responsibilities of management.

UNIT – II

Operations Management

Principles and types of plant layout – Methods of production (job, batch and mass production), work study – Statistical quality control – Material management – Objectives – Inventory functions – Types, inventory techniques – EOQ-ABC analysis – Marketing management – Concept – Meaning – Nature – Functions of marketing – Marketing mix – Channels of distribution – Advertisement and sales promotion – Marketing strategies based on product life cycle.

UNIT – III

Human Resources Management (HRM)

HRM – Definition and meaning – Nature – Managerial and operative functions – Job analysis – Human Resource Planning (HRP) – Employee recruitment – Sources of recruitment – Employee selection – Process – Employee training and development – Methods – Performance appraisal concept – Methods of performance appraisal – Placement – Employee induction – Wage and salary administration.

UNIT – IV

Strategic & Project Management

Definition& meaning – Setting of vision – Mission – Goals – Corporate planning process – Environmental scanning – Steps in strategy formulation and implementation – SWOT analysis – Project management – Network analysis – Programme Evaluation and Review

Technique (PERT) – Critical Path Method (CPM) – Identifying critical path – Probability of completing the project within given time – Project cost – Analysis – Project crashing (simple problems).

UNIT – V

Contemporary Issues in Management

Customer Relations Management (CRM) – Total Quality Management (TQM) – Six sigma concept – Supply Chain Management (SCM) – Enterprise Resource Planning (ERP) - Performance management – Employee engagement and retention – Business process re-engineering and bench marking – Knowledge management – Change management – Sustainability and corporate social responsibility.

Text Books

1. Frederick S. Hillier, Mark S. Hillier. *Introduction to Management Science*, October 26, 2023.
2. A.R Aryasri, *Management Science*, TMH, 2019.

Reference Books

1. Stoner, Freeman, Gilbert, *Management*, Pearson Education, New Delhi, 2019.
2. Koontz & Weihrich, *Essentials of Management*, 6/e, TMH, 2005.
3. Thomas N. Duening & John M. Ivancevich, *Management Principles and Guidelines*, Biztantra.
4. Kanishka Bedi, Production and Operations Management, Oxford University Press, 2004.
5. Samuel C. Certo, *Modern Management*, 9/e, PHI, 2005.

Question Paper Pattern:

Sessional Exam: The question paper for Sessional Examination shall be for 40 marks. The question paper shall consist of Four Questions and all questions are compulsory. Question No.1 contains Five short answer questions (2marks each) for a total of 10 marks. Remaining Three Questions shall be EITHER/OR type descriptive questions for 10 marks each. Each of these descriptive questions may contain sub-questions.

End Exam: The question paper for End Examination shall be for 70 marks. The question paper shall contain Six Questions and all questions are compulsory. Question No.1 shall contain Ten short answer questions (2 marks each) for a total of 20 marks, with Two short answer questions from each unit. Remaining Five Questions (each question covering one unit of syllabus) carrying 10 marks each shall be EITHER/OR type descriptive questions and may contain sub-questions.