RV College of Engineering®

Civil Engineering

Bachelor of Engineering (B.E)

Scheme And Syllabus Of III & IV Semester
(2022 Scheme)

B.E. Programs : AS, BT, CH, CS, CS - AI, CS - CD, CS - CY, CV, EC, EE, ET, IM, IS, ME.
M. Tech (13) MCA, M.Sc. (Engg.)
Ph.D. Programs : All Departments are recognized as Research Centres by VTU Except AI & AS

2024

99TH
NIRF RANKING IN ENGINEERING (2024)

TIMES HIGHER EDUCATION WORLD UNIVERSITY RANKINGS-2023
1501+
TIMES HIGHER EDUCATION WORLD UNIVERSITY RANKINGS-2023 (ASIA)
501-600

EDUFUTURE EXCELLENCE AWARD
BEST PRIVATE ENGINEERING UNIVERSITY (SOUTH)
BY ZEE DIGITAL

1001+
SUBJECT RANKING (ENGINEERING)

801+
SUBJECT RANKING (COMPUTER SCIENCE)

IIRF 2023
ENGINEERING RANKING INDIA
NATIONAL RANK-10
STATE RANK - 2
ZONE RANK - 5

QS-IGUAGE DIAMOND UNIVERSITY RATING (2021-2024)

CURRICULUM STRUCTURE

61 CREDITS PROFESSIONAL CORES (PC)

23 CREDITS BASIC SCIENCE

22 CREDITS ENGINEERING SCIENCE

18 CREDITS PROJECT WORK / INTERNSHIP

12 CREDITS* OTHER ELECTIVES & AEC

12 CREDITS PROFESSIONAL ELECTIVES

12 CREDITS HUMANITIES & SOCIAL SCIENCE

160 CREDITS TOTAL

*ABILITY ENHANCEMENT COURSES (AEC), UNIVERSAL HUMAN VALUES (UHV), INDIAN KNOWLEDGE SYSTEM (IKS), YOGA.

17
Centers of Excellence

11
Centers of Competence

212
Publications On Web Of Science

669
Publications Scopus (2023 - 24)

1093
Citations

70
Patents Filed

39
Patents Granted

61
Published Patents

11
Skill Based Laboratories Across Four Semesters

MOUS: 90+WITH INSDUSTRIES / ACADEMIC INSTITUTIONS IN INDIA & ABROAD

EXECUTED MORE THAN RS.40 CRORES WORTH SPONSORED RESEARCH PROJECTS & CONSULTANCY WORKS SINCE 3 YEARS

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2024

Vision

Excel in Education, Research and Consultancy in Civil Engineering with emphasis on Sustainable Development

Mission

1. Disseminating and integrating the knowledge of civil Engineering and allied fields
2. Enhancing industry-institute interaction leading to interdisciplinary research.
3. Imbibing wide-range of skills in cutting-edge technology for sustainable development.
4. Motivate entrepreneurship and professional ethics to serve the society.

Program Educational Objectives

After successful completion of the program, the graduates will be able to

PEO1: Successfully address technological and managerial challenges.

PEO2: Professionally design and execute Civil Engineering projects.

PEO3: Pursue advanced education, research and continue life-long learning process to remain active professionals.

PEO4: Play key roles in addressing societal needs through interdisciplinary approach.

Program Specific Outcomes

1. Apply knowledge of fundamental aspects to analyze and design civil engineering structures.

2. Provide sustainable solutions to civil engineering problems.

3. Employ codal provisions to arrive at comprehensive solutions to address societal needs

4. Exhibit communication and teamwork skills.

ABBREVIATIONS

Sl. No.	Abbreviation	Meaning
1.	VTU	Visvesvaraya Technological University
2.	BS	Basic Sciences
3.	CIE	Continuous Internal Evaluation
4.	SEE	Semester End Examination
5.	PE	Professional Core Elective
6.	GE	Global Elective
7.	HSS	Humanities and Social Sciences
8.	PY	Physics
9.	CY	Chemistry
10.	MA	Mathematics
11.	AS	Aerospace Engineering
12.	AI & ML	Artificial Intelligence & Machine Learning
13.	BT	Biotechnology
14.	CH	Chemical Engineering
15.	CS	Computer Science & Engineering
16.	CV	Civil Engineering
17.	EC	Electronics & Communication Engineering
18.	EE	Electrical & Electronics Engineering
19.	EI	Electronics & Instrumentation Engineering
20.	ET	Electronics & Telecommunication Engineering
21.	IM	Industrial Engineering & Management
22.	IS	Information Science & Engineering
23.	ME	Mechanical Engineering

INDEX

B.E. IN

CIVIL ENGINEERING

III SEMESTER													
Sl. No.	**Course Code**	**Course Title**	**Credit Allocation**				**BoS**	**Category**	**CIE Duration (H)**	**Max Marks CIE**		**SEE Duration (H)**	**Max Marks SEE**	
			L	**T**	**P**	**Total**				**Theory**	**Lab**		**Theory**	**Lab**
1	MA231TD	Applied Mathematics for Civil Engineering	3	1	0	4	MA	Theory	1.5	100	--	3	100	--
2	XX232TX	Basket Courses - Group A	3	0	0	3	BT/CV/ME	Theory	1.5	100	--	3	100	--
3	CV233AI	Surveying	3	0	1	4	CV	Theory & Lab	1.5	100	50	3	100	50
4	CV234AI	Concrete Technology	3	0	1	4	CV	Theory & Lab	1.5	100	50	3	100	50
5	CV235AI	Mechanics of Materials	3	0	1	4	CV	Theory & Lab	1.5	100	50	3	100	50
6	HS237LX	Ability Enhancement Courses - Group C	0	0	2	2	HS	Lab	1	--	50	2	--	50
7	CS139AT	Bridge Course: C Programming	2	0	0	Audit	CS	Theory (Audit Course)	--	--	--	--	--	--
		Total				**21**								

Group A: Basket Courses (Students can select any ONE COURSE out of THREE COURSES in ODD Sem & ONE COURSE out of remaining courses in EVEN Sem)								
2	CV	CV232TA	Environment & Sustainability	3	0	0	3	Theory
	ME	ME232TB	Material Science for Engineers	3	0	0	3	Theory
	BT	BT232TC	Bio Safety Standards and Ethics	3	0	0	3	Theory

Ability Enhancement Course-Group B								
Sl. No.	**BoS**	**Course Code**	**Course Title**	**L**	**T**	**P**	**Credits**	**Category**
6	HS	HS237LA	National Service Scheme	0	0	2	2	LAB
	HS	HS237LB	National Cadet Corps	0	0	2	2	LAB
	HS	HS237LC	Physical Education : Sports & Athletics	0	0	2	2	LAB
	HS	HS237LD	Music	0	0	2	2	LAB
	HS	HS237LE	Dance	0	0	2	2	LAB
	HS	HS237LF	Theater (Light Camera & Action)	0	0	2	2	LAB
	HS	HS237LG	Art Work & Painting	0	0	2	2	LAB
	HS	HS237LH	Photography & Film Making	0	0	2	2	LAB

B.E. IN

CIVIL ENGINEERING

IV SEMESTER													
Sl. No.	**Course Code**	**Course Title**	**Credit Allocation**				**BoS**	**Category**	**CIE Duration (H)**	**Max Marks CIE**		**SEE Duration (H)**	**Max Marks SEE**	
			L	**T**	**P**	**Total**				**Theory**	**Lab**		**Theory**	**Lab**
1	MA241AT	Probability Theory and Linear Programming	3	0	0	3	MA	Theory	1.5	100	--	3	100	--
2	XX242TX	Basket Courses - Group A	3	0	0	3	BT/CV/ME	Theory	1.5	100	--	3	100	--
3	CV343AI	Mechanics of Fluids	3	0	1	4	CV	Theory & Lab	1.5	100	50	3	100	50
4	CV244AI	Building Planning and Drawing	3	0	1	4	CV	Theory & Lab	1.5	100	50	3	100	50
5	CV345AT	Structural Analysis	3	0	0	3	CV	Theory	1.5	100	--	3	100	--
6	CV246TX	Professional Elective Courses - Group B	2	0	0	2	CV	Theory (NPTEL)	1	100	--	3	100	--
7	CV247DL	Design Thinking Lab	0	0	2	2	CV	Lab	--	--	50	2	--	50
8	HS248AT	Universal Human Values II	2	0	0	2	HS	Theory	1	50	--	2	50	--
9	MA149AT	Bridge Course: Mathematics	2	0	0	Audit	MA	Theory	--	--	--	--	--	--
		Total				**23**								

Group A: Basket Courses (Students can select any ONE COURSE out of THREE COURSES in ODD Sem & ONE COURSE out of remaining courses in EVEN Sem)								
2	CV	CV242TA	Environment & Sustainability	3	0	0	3	Theory
	ME	ME242TB	Material Science for Engineers	3	0	0	3	Theory
	BT	BT242TC	Bio Safety Standards and Ethics	3	0	0	3	Theory

Professional Elective Courses - Group B (NPTEL Course)								
Sl. No.	**BoS**	**Course Code**	**Course Title**	**L**	**T**	**P**	**Total**	**Category**
6	CV	CV246TA	Ecology and Environment	2	0	0	2	NPTEL
	CV	CV246TB	Remote Sensing and GIS	2	0	0	2	NPTEL
	CV	CV246TC	River Engineering	2	0	0	2	NPTEL
	CV	CV246TD	Project Planning & Control	2	0	0	2	NPTEL
	CV	CV246TE	Sustainable Engineering Concepts and Life Cycle Analysis	2	0	0	2	NPTEL
	CV	CV246TF	Building Energy Systems and Auditing	2	0	0	2	NPTEL
	CV	CV246TG	Interior Design	2	0	0	2	NPTEL

Semester: III						
APPLIED MATHEMATICS FOR CIVIL ENGINEERING (Theory) (CV)						
Course Code	**:**	MA231TD		**CIE**	**:**	**100 Marks**
Credits: L: T: P	**:**	3:1:0		**SEE**	**:**	**100 Marks**
Total Hours	**:**	45L+30T		**SEE Duration**	**:**	**3.00 Hours**

Unit-I	**09 Hrs**
Multivariate Statistics: Spearman rank correlation, multivariate data, multiple and partial correlation. Multiple linear regression. Analysis of variance. Implementation using MATLAB.	
Unit – II	**09 Hrs**
Complex Analysis: Complex function, analytic function, Cauchy-Riemann equations, harmonic functions. Construction of analytic function– Milne -Thomson method. Taylor, Maclaurin, Laurent series. Zeros and poles, Residue theorem. Implementation using MATLAB.	
Unit –III	**09 Hrs**
Partial Differential Equations: Formation of partial differential equations by elimination of arbitrary constants and functions, Solution of Lagrange linear equation. Solution of partial differential equations by method of separation of variables. Solution to wave and heat equations in one dimension and Laplace equation in two dimensions by the method of separation of variables. Implementation using MATLAB.	
Unit –IV	**09 Hrs**
Numerical Methods for Partial Differential Equations: Numerical solutions to partial differential equations – Finite difference approximation to derivatives, solution of Laplace equation in two-dimension, heat and wave equations in one dimension (explicit methods). Implementation using MATLAB.	
Unit –V	**09 Hrs**
Calculus of Variations: Introduction to variation of functionals, extremal of functional, Euler equation– special cases, problems. Geodesics, Hanging cable and Brachistochrone problems. Exploring geodesics graphically using MATLAB.	

Course Outcomes: After completing the course, the students will be able to	
CO1:	Illustrate the fundamental concepts of multivariate statistics, complex analysis, partial differential equations and variational problems.
CO2:	Apply the acquired knowledge of multivariate data, complex functions, partial differential equations to solve the problems of civil engineering.
CO3:	Analyze the multilinear regression, variance, variational principles and numerical methods to the real-world problems.
CO4:	Interpret the knowledge of calculus of variation, analytic functions and numerical methods obtained to solve problems arising in many practical situations.

Reference Books	
1	Advanced Engineering Mathematics, Dennis G. Zill, Warren S. Wright, 6th Edition, 2016, Jones and Bartlett publishers, ISBN: 13-978-1284105902.
2	Numerical Methods for Scientific and Engineering Computation, M.K. Jain, S.R.K. Iyenger and R.K. Jain, 6th Edition, 2012, New Age International Publishers, ISBN: 9788122433234, 8122433235.
3	Applied Statistics and Probability for Engineers, Douglas C. Montgomery and George C. Runger, 6th Edition, 2014, John Wiley & Sons, ISBN:13 9781118539712, ISBN (BRV):9781118645062.
4	Higher Engineering Mathematics, B.S. Grewal, 44th Edition, 2015, Khanna Publishers, ISBN: 81-7409-195-5.

RUBRIC FOR THE CONTINUOUS INTERNAL EVALUATION (THEORY)		
#	**COMPONENTS**	**MARKS**
1.	**QUIZZES:** Quizzes will be conducted in online/offline mode. TWO QUIZZES will be conducted & Each Quiz will be evaluated for 10 Marks. **THE SUM OF TWO QUIZZES WILL BE THE FINAL QUIZ MARKS.**	**20**
2.	**TESTS:** Students will be evaluated in test, descriptive questions with different complexity levels (Revised Bloom's Taxonomy Levels: Remembering, Understanding, Applying, Analyzing, Evaluating, and Creating). THREE tests will be conducted **(Two regular tests & One optional Improvement test).** Each test will be evaluated for 50 Marks, adding upto **100** Marks. **FINAL TEST MARKS WILL BE REDUCED TO 40 MARKS.**	**40**
3.	**EXPERIENTIAL LEARNING:** Students will be evaluated for their creativity and practical implementation of the problem. Case study-based teaching learning (05), Program specific requirements (05), Video based seminar/presentation/demonstration (10), MATLAB (20). **ADDING UPTO 40 MARKS**.	**40**
	MAXIMUM MARKS FOR THE CIE THEORY	**100**

RUBRIC FOR SEMESTER END EXAMINATION (THEORY)		
Q. NO.	**CONTENTS**	**MARKS**
	PART A	
1	Objective type questions covering entire syllabus	20
	PART B (Maximum of TWO Sub-divisions only)	

2	Unit 1: (Compulsory)	16
3 & 4	Unit 2: Question 3 or 4	16
5 & 6	Unit 3: Question 5 or 6	16
7 & 8	Unit 4: Question 7 or 8	16
9 & 10	Unit 5: Question 9 or 10	16
	TOTAL	**100**

Semester: III						
ENVIRONMENT & SUSTAINABILITY **Category: Basket Courses - Group A** **Stream: (Common to all Programs)** **(Theory)**						
Course Code	**:**	**CV232TA**		**CIE**	**:**	**100 Marks**
Credits: L:T:P	**:**	**3:0:0**		**SEE**	**:**	**100 Marks**
Total Hours	**:**	**42L**		**SEE Duration**	**:**	**3.0 Hours**

Unit-I	**10 Hrs**
ENVIRONMENT AND BIODIVERSITY Definition, scope and importance of environment – need for public awareness. Eco-system and Energy flow– ecological succession. Types of biodiversity: genetic, species and ecosystem diversity– values of biodiversity, threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts – endangered and endemic species of India – conservation of biodiversity. **ENVIRONMENTAL POLLUTION** Causes, Effects and Preventive measures of Water, Soil, Air and Noise Pollutions. Solid, Hazardous and E-Waste management. Occupational Health and Safety Management system (OHASMS). Environmental protection, Environmental protection acts.	
Unit – II	**8 Hrs**
RENEWABLE SOURCES OF ENERGY Energy management and conservation, New Energy Sources: Need of new sources. Different types of new energy sources. Energy Cycles, carbon cycle, emission and sequestration, Green Engineering: Sustainable urbanization-Socioeconomical and technological change. Applications of - Hydrogen energy, Ocean energy resources, Tidal energy conversion. Concept, origin and power plants of geothermal energy.	
Unit –III	**8 Hrs**
SUSTAINABILITY AND MANAGEMENT Introduction to Environmental Economics, Environmental Audit, Development, GDP, Sustainability - concept, needs and challenges-economic, social and aspects of sustainability - from unsustainability to sustainability-millennium development goals and protocols. Linear vs. cyclical resource management systems, need for systems thinking and design of cyclical systems, circular economy, industrial ecology, green technology. Specifically apply these concepts to: Water Resources, Energy Resources, Food Resources, Land & Forests, Waste management.	
Unit –IV	**8 Hrs**
Sustainable Development Goals - targets, indicators and intervention areas Climate change - Global, Regional and local environmental issues and possible solutions. Concept of Carbon Credit, Carbon Footprint. Environmental management in industry. **SUSTAINABILITY PRACTICES** Zero waste and R concept, Circular economy, ISO 14000 Series, Material Life cycle assessment. Environmental Impact Assessment. Sustainable habitat: Green buildings, Green materials, Energy efficiency, Sustainable transports.	
Unit –V	**8 Hrs**
Corporate Social Responsibility (CSR) - Meaning & Definition of CSR, History & evolution of CSR. Concept of Charity, Corporate philanthropy, Corporate Citizenship, CSR-an overlapping concept. Concept of sustainability & Stakeholder Management. Relation between CSR and Corporate governance; environmental aspect of CSR; Chronological evolution of CSR in India. Sustainability Reporting: Flavor of GRI, Dow Jones Sustainability Index, CEPI. Investor interest in Sustainability.	

Course Outcomes: After completing the course, the students will be able to: -

CO 1	Understand the basic elements of Environment and its Biodiversity.
CO 2	Explain the various types of pollution and requirement for sustainable strategy for present scenario.
CO 3	Evaluate the different concepts of sustainability and its significance for welfare of all life forms.
CO 4	Recognize the role of Corporate social responsibility in conserving the Environment.

Reference Books	
1.	'Environmental Science and Engineering', Benny Joseph, Tata McGraw-Hill, New Delhi, 2016. ISBN-13 - 978-9387432352
2.	'Introduction to Environmental Engineering and Science', Gilbert M. Masters, Wendell P Ela, 3rd Edition, Pearson Education, 2006. ISBN-13 - 978-0132339346.
3.	Environment Impact Assessment Guidelines, Notification of Government of India, 2006.
4.	A Handbook of Corporate Governance and Social Responsibility (Corporate Social Responsibility), David Crowther and Guler Aras, Gower Publishing Ltd, ISBN - 13 - 978-0566088179.

RUBRIC FOR THE CONTINUOUS INTERNAL EVALUATION (THEORY)		
#	**COMPONENTS**	**MARKS**
1.	**QUIZZES:** Quizzes will be conducted in online/offline mode. TWO QUIZZES will be conducted & Each Quiz will be evaluated for 10 Marks. **THE SUM OF TWO QUIZZES WILL BE THE FINAL QUIZ MARKS.**	**20**
2.	**TESTS:** Students will be evaluated in test, descriptive questions with different complexity levels (Revised Bloom's Taxonomy Levels: Remembering, Understanding, Applying, Analyzing, Evaluating, and Creating). TWO tests will be conducted. Each test will be evaluated for 50 Marks, adding upto 100 Marks. **FINAL TEST MARKS WILL BE REDUCED TO 40 MARKS.**	**40**
3.	**EXPERIENTIAL LEARNING:** Students will be evaluated for their creativity and practical implementation of the problem. Case study-based teaching learning (10), Program specific requirements (10), Video based seminar/presentation/demonstration (20**) Phase 2 will be done in the exhibition mode (Demo/Prototype/any outcome). ADDING UPTO 40 MARKS**.	**40**
	MAXIMUM MARKS FOR THE CIE THEORY	**100**

RUBRIC FOR SEMESTER END EXAMINATION (THEORY)		
Q. NO.	**CONTENTS**	**MARKS**
	PART A	
1	Objective type questions covering entire syllabus	20
	PART B (Maximum of TWO Sub-divisions only)	
2	Unit 1 : (Compulsory)	16
3 & 4	Unit 2 : Question 3 or 4	16
5 & 6	Unit 3 : Question 5 or 6	16
7 & 8	Unit 4 : Question 7 or 8	16
9 & 10	Unit 5: Question 9 or 10	16
	TOTAL	**100**

Semester: III						
MATERIAL SCIENCE FOR ENGINEERS **Category: Basket Courses - Group A** **Stream: (Common to all Programs)** **(Theory)**						
Course Code	**:**	**ME232TB**		**CIE**	**:**	**100 Marks**
Credits: L:T:P	**:**	**3:0:0**		**SEE**	**:**	**100 Marks**
Total Hours	**:**	**40L**		**SEE Duration**	**:**	**3.0 Hours**

Unit-I	**06 Hrs**
The Fundamentals of Materials The electronic structure of atoms, types of atomic and molecular bonds: ionic bond, covalent bond, metallic bond, secondary bonds, mixed bonding, hybridization. Energy bands in metals, insulators, and semiconductors. Basic crystallography. Defects and dislocations. Types of materials: polymers, metals and alloys, ceramics, semiconductors, composites.	
Unit – II	**10 Hrs**
Material behaviour Thermal properties Thermal conductivity, thermoelectric effects, heat capacity, thermal expansion coefficient, thermal shock, thermocouple. Electrical Properties: dielectric behaviours and temperature dependence of the dielectric constant, insulating materials, ferroelectricity, piezoelectricity, super conductor. Optical properties: luminescence, optical fibers, Mechanical Properties: Stress-strain diagram, elastic deformation, plastic deformation, hardness, viscoelastic deformation, impact energy, fracture toughness, fatigue.	
Unit –III	**10 Hrs**
Materials and their Applications Semiconductors, dielectrics, optoelectronics, structural materials, ferrous alloys, nonferrous alloys, cement, concrete, ceramic, and glasses. Polymers: thermosets and thermoplastics, composites: fibrereinforced, aggregated composites, electronic packaging materials, biomaterials, processing of structural materials.	
Unit –IV	**07 Hrs**
Heat Treatment Post processing heat treatment of electronic devices: thermal oxidation, diffusion, rapid thermal processing. Heat treatment of ferrous materials: annealing, spheroidizing, normalizing, hardening, tempering. formation of austenite, construction of Time Temperature Transformation (TTT) curves. Special heat treatment processes: carburizing, nitriding, cyaniding, flame, and induction hardening. Defects in heat treatment.	
Unit –V	**07 Hrs**
Nanomaterials Synthesis of nanomaterials Ball milling, sol-gel, vapour deposition growth, pulse laser, magnetron sputtering, lithography. Nano porous materials: zeolites, mesoporous materials, carbon nanotubes, graphene, nano FRPs, nano fabrics, bioresorbable and bio-erodable materials, nano ceramic, nano glasses, nano biomaterials, nano implant associated materials. Characterisation of nano structures, spectroscopic techniques, automatic force microscopy.	

Course Outcomes: After completing the course, the students will be able to: -	
CO1	Understand behaviour of various materials such as metals, composites and special materials
CO2	Analyse materials, composition, and their phase transformation
CO3	Investigate solidification process during casting and materials degradation
CO4	Recognize different types of Non-destructive testing methods to find subsurface defects in the materials.

Reference Books	
1	Material Science and Engineering, William D Callister, 6th Edition, 1997, John Wiley and Sons, ISBN: 9812-53-052-5
2	Introduction to Physical Metallurgy, Sydney H Avner, 1994, Mc. Graw Hill Book Company, ISBN: 0-07-Y85018-6
3	Material Science and Engineering, William F Smith, 4th Edition, 2008, Mc. Graw Hill Book Company, ISBN: 0-07-066717-9
4	A.S. Edelstein and R.C. Cammarata, Nanomaterials: Synthesis, Properties and Applications, CRC Press 1996, ISBN:978-0849322749

RUBRIC FOR THE CONTINUOUS INTERNAL EVALUATION (THEORY)		
#	**COMPONENTS**	**MARKS**
1.	**QUIZZES:** Quizzes will be conducted in online/offline mode. TWO QUIZZES will be conducted & Each Quiz will be evaluated for 10 Marks. **THE SUM OF TWO QUIZZES WILL BE THE FINAL QUIZ MARKS.**	**20**
2.	**TESTS:** Students will be evaluated in test, descriptive questions with different complexity levels (Revised Bloom's Taxonomy Levels: Remembering, Understanding, Applying, Analyzing, Evaluating, and Creating). TWO tests will be conducted. Each test will be evaluated for 50 Marks, adding upto 100 Marks. **FINAL TEST MARKS WILL BE REDUCED TO 40 MARKS.**	**40**
3.	**EXPERIENTIAL LEARNING:** Students will be evaluated for their creativity and practical implementation of the problem. Case study-based teaching learning (10), Program specific requirements (10), Video based seminar/presentation/demonstration (20**) Phase 2 will be done in the exhibition mode (Demo/Prototype/any outcome). ADDING UPTO 40 MARKS**.	**40**
	MAXIMUM MARKS FOR THE CIE THEORY	**100**

Semester: III						
BIO SAFETY STANDARDS AND ETHICS **Category: Basket Courses - Group A** **Stream: (Common to all Programs)** **(Theory)**						
Course Code	**:**	**BT232TC**		**CIE**	**:**	**100 Marks**
Credits: L:T:P	**:**	**3:0:0**		**SEE**	**:**	**100 Marks**
Total Hours	**:**	**42L**		**SEE Duration**	**:**	**3.0 Hours**

Unit-I	**09 Hrs**
Biohazards, Bio Safety Levels and Cabinets: Introduction to Biohazards, Biological Safety levels, Bio safety Cabinets, Study of various types of Bio safety cabinets. Various parameters for design of Biosafety cabinets (Materials used for fabrication, sensors, filters, pumps, compressors)	
Unit – II	**08 Hrs**
Biosafety Guidelines: Biosafety guidelines of Government of India, GMOs & LMOs, Roles of Institutional Biosafety Committee, RCGM (Review committee o Genetic manipulation), GEAC (Genetic Engg Approval Committee) for GMO applications in food and agriculture. Overview of National Regulations and relevant International Agreements including Cartagena Protocol.	
Unit –III	**10 Hrs**
Food Safety Standards: FSSAI (Food Safety and Standards Authority of India), Functions, License, types of FSSAI Licences and compliance rules. **Food Hygiene:** General principles of food microbiology and overview of foodborne pathogens, sources of microorganisms in the food chain (raw materials, water, air, equipment, etc.) Quality of foods, Microbial food spoilage and Foodborne diseases, Overview of beneficial microorganisms and their role in food processing and human nutrition, Food Analysis and Testing, General principles of food safety management systems, Hazard Analysis Critical Control Point (HACCP).	
Unit –IV	**09 Hrs**
Food Preservations, Processing, and Packaging: Food Processing Operations, Principles, Good Manufacturing Practices HACCP, Good production, and processing practices (GMP, GAP, GHP, GLP, BAP, etc) Overview of food preservation methods and their underlying principles including novel and emerging methods/principles Overview of food packaging methods and principles including novel packaging materials.	
Unit –V	**09 Hrs**
Food safety and Ethics: Food Hazards, Food Additives, Food Allergens Drugs, Hormones, and Antibiotics in Animals. Factors That Contribute to Foodborne Illness, Consumer Lifestyles and Demand, Food Production and Economics, History of Food Safety, The Role of Food Preservation in Food Safety. **Ethics:** Clinical ethics, Health Policy, Research ethics, ethics on Animals. Biosafety and Bioethics.	

Course Outcomes: After completing the course, the students will be able to	
CO1	Comprehensive knowledge of Biohazards and bio safety levels
CO2	Understanding the biosafety guidelines and their importance to the society
CO3	Knowledge with respect to the Food standards, Hygiene, food processing and packing
CO4	Appreciate the food safety, Ethics, biosafety, and bio ethics

Reference Books	
1	IPR Biosafety and Bioethics, Deepa Goel, Shomini Parashar, 1st Edition, Pearson; 2013, ISBN: 978-8131774700.
2	The Food Safety, Cynthia A Roberts, Oryx Press, 1st Edition, 2001, ISBN: 1–57356–305–6.
3	Food Safety Management Systems, Hal King, Springer Cham, 2020, ISBN: 978-3-030-44734-2.
4	Bioethics: The Basics, Routledge, Alastair V. Campbell, 2nd Edition, 2017, ISBN: 978-0415790314.

RUBRIC FOR THE CONTINUOUS INTERNAL EVALUATION (THEORY)		
#	**COMPONENTS**	**MARKS**
1.	**QUIZZES:** Quizzes will be conducted in online/offline mode. TWO QUIZZES will be conducted & Each Quiz will be evaluated for 10 Marks. **THE SUM OF TWO QUIZZES WILL BE THE FINAL QUIZ MARKS.**	**20**
2.	**TESTS:** Students will be evaluated in test, descriptive questions with different complexity levels (Revised Bloom's Taxonomy Levels: Remembering, Understanding, Applying, Analyzing, Evaluating, and Creating). TWO tests will be conducted. Each test will be evaluated for 50 Marks, adding upto 100 Marks. **FINAL TEST MARKS WILL BE REDUCED TO 40 MARKS.**	**40**
3.	**EXPERIENTIAL LEARNING:** Students will be evaluated for their creativity and practical implementation of the problem. Case study-based teaching learning (10), Program specific requirements (10), Video based seminar/presentation/demonstration (20**) Phase 2 will be done in the exhibition mode (Demo/Prototype/any outcome). ADDING UPTO 40 MARKS**.	**40**
	MAXIMUM MARKS FOR THE CIE THEORY	**100**

Semester: III						
SURVEYING **Category: Professional Core Course** **Stream: Theory & Practice**						
Course Code	**:**	**CV233AI**		**CIE**	**:**	**100+50 Marks**
Credits: L:T:P	**:**	**3:0:1**		**SEE**	**:**	**100+50 Marks**
Total Hours	**:**	**40L+26P**		**SEE Duration**	**:**	**3.0Hours + 3.0Hours**

Unit-I	**8 Hrs**
Fundamentals of Maps: Maps - types; scales-types; measuring distance; finding direction and use of symbols. Map projection - Latitude, Longitude and time, Topographical survey – Toposheets and Principles of topo sheet numbering, Analysis of landforms using maps. **History of Surveying**: Definition of Surveying, Uses of Surveying, Basic principles of surveying, Classification of Surveys. Introduction to Chain surveying, Compass surveying, Plane table surveying and Theodolite surveying. Booking of chain survey work - Field book entries. Calculation of land area using data collected through chain survey.	
Unit – II	**8 Hrs**
Leveling: Principles and basic definitions, Fundamental axes and parts of a dumpy level, types of adjustments and objectives, temporary adjustments of a dumpy level, Types of leveling – Simple leveling, Profile leveling, fly leveling and cross sectioning. Booking of levels 1. Rise and fall method 2. Height of instrument method – comparison, Arithmetic checks. Numerical problems.	
Unit –III	**8 Hrs**
Contour Survey: Contours and their characteristics, Methods of contouring – direct and indirect methods (Grid and Cross section method), Uses of contours. **Total Station:** Introduction - Parts of a Total Station – Accessories – Advantages - Limitations and Applications, Complete procedure for total station survey, data transfer, preparation of maps.	
Unit –IV	**8 Hrs**
Modern surveying: GPS, DGPS, Drone surveying and LiDAR. **Photogrammetry:** Principles of Photogrammetry, Types – Terrestrial and Aerial Photogrammetry, Advantages over ground survey methods - geometry of vertical photographs, scales of vertical photographs. Flight planning.	
Unit –V	**8 Hrs**
Remote Sensing and GIS: Introduction, Principles, Types and Applications of Remote Sensing. Introduction to GIS, functions and advantages, sources of data for GIS. Geographical Information System, Key Components of GIS, Functions of GIS, Data Management and Transformation. Data input methods, data analysis. Overlay operations, Network analysis and Spatial analysis.	
PART B (Laboratory)	
I.Chain Surveying 1. To conduct a chain survey of flat area with details including field book entry, perpendicular and oblique offsets. Survey book entry and prepare a plan by converting to an appropriate scale.	
II. Levelling 2. To determine difference in elevation between two points using differential levelling technique, using height of the instrument method and rise and fall methods. With at least one point above the line of sight. 3. To perform profile levelling and to draw the longitudinal section and cross section to determine the depth of cut and height of filling for a given formation level.	
III. Total station 4. To determine the elevation, distance and gradient between two inaccessible points using total station. 5. Traversing using total station: Data collection, data transfer, area calculation and map preparation. 6. Contour surveying using total station: Data collection, data transfer, area calculation and map preparation.	

IV. Curves 7. To set out simple curve using Rankine's deflection angles method. (Only the directions of forward tangent and backboard tangent is provided and deflection angle needs to be measured in the field) 8. To set out compound curve using Rankine's deflection angles method. (Only the directions of forward tangent and backboard tangent is provided and deflection angle needs to be measured in the field)
V. GIS (Using open source software QGIS) 09. Geo-referencing the hard copy maps. 10. To generate thematic maps using GIS Software. (Including rectifying and mosaicing)
VI. Differential Global Positioning System (DGPS) - Demonstration 11. RTK (Real Time Kinematics) survey for location data gathering and establishing ground control point using DGPS.

Course Outcomes: After completing the course, the students will be able to: -	
CO 1	Describe fundamental concepts of Surveying, Levelling, Total station and application of Remote Sensing, GIS and DGPS.
CO 2	Discuss components of all types of surveying.
CO 3	Apply the concepts of measurements in engineering problems.
CO 4	Demonstrate the applications of Remote Sensing, GIS and DGPS for solving engineering problems.

Reference Books	
1.	Punmia B.C, "Surveying" Vol.I and Vol.II, Laxmi Publications, (P) Ltd, New Delhi 2010. ISBN 81-7008-853-4
2.	Chandra A.M, "Plane surveying", Newage International (P) Ltd., 2009. ISBN 81-224-1902-X
3.	Remote Sensing and GIS by B Bhatia, Oxford University Press, New Delhi.
4.	Duggal S.K, "Surveying", Vol.I & II, Tata Mc Graw Hill Publishing Co., 2009, ISBN 978-0-07-015137-6: ISBN 0-07-015137-7.
5.	Arora K.R, "Surveying", Vol.I & II, Standard Book House, 2009. ISBN 81-89401-23-8
6.	Lillesand and Kiefer, "Principles of Remote sensing and Image Interpretation", (5th Edition) John Wiley Publishers, New Delhi, 2007.

RUBRICFOR THE CONTINUOUS INTERNAL EVALUATION (THEORY)		
#	**COMPONENTS**	**MARKS**
1.	**QUIZZES:** Quizzes will be conducted in online/offline mode. **TWO QUIZZES** will be conducted & Each Quiz will be evaluated for 10 Marks. Each quiz is evaluated for 10 marks adding up to 20 MARKS	**20**
2.	**TESTS:** Students will be evaluated in test, descriptive questions with different complexity levels (Revised Bloom's Taxonomy Levels: Remembering, Understanding, Applying, Analyzing, Evaluating, and Creating). **TWO tests will be conducted**. Each test will be evaluated for **50Marks**, adding upto 100 Marks. **FINAL TEST MARKS WILL BE REDUCED TO 40 MARKS.**	**40**
3.	**EXPERIENTIAL LEARNING:** Students will be evaluated for their creativity and practical implementation of the problem. Case study based teaching learning (10), Program specific requirements (10), Video based seminar/presentation/demonstration (10) Designing &	**40**

	Modeling (10) **Phase 2 will be done in the exhibition mode (Demo/Prototype/any outcome). ADDING UPTO 40 MARKS**.	
4.	**LAB:** Conduction of laboratory exercises, lab report, observation, and analysis (20 Marks), lab test (10 Marks) and Innovative Experiment/ Concept Design and Implementation (20 Marks) adding up to 50 Marks. THE FINAL MARKS WILL BE 50 MARKS	**50**
	MAXIMUM MARKS FOR THE CIE THEORY AND LABORATORY	**150**

RUBRIC FOR SEMESTER END EXAMINATION (THEORY)		
Q.NO.	**CONTENTS**	**MARKS**
	PART A	
1	Objective type of questions covering entire syllabus	20
	PART B (Maximum of THREE Sub-divisions only)	
2	Unit 1 : (Compulsory)	16
3 & 4	Unit 2 : Question 3 or 4	16
5 & 6	Unit 3 : Question 5 or 6	16
7 & 8	Unit 4 : Question 7 or 8	16
9 & 10	Unit 5: Question 9 or 10	16
	TOTAL	**100**

RUBRIC FOR SEMESTER END EXAMINATION (LAB)		
Q.NO.	**CONTENTS**	**MARKS**
1	Write Up	20
2	Conduction of the Experiments	20
3	Viva	10
	TOTAL	**50**

Semester: III						
CONCRETE TECHNOLOGY **Category: Professional Core Course** **Stream: Theory & Practice**						
Course Code	**:**	**CV234AI**		**CIE**	**:**	**100+50 Marks**
Credits: L:T:P	**:**	**3:0:1**		**SEE**	**:**	**100+50 Marks**
Total Hours	**:**	**40L+26P**		**SEE Duration**	**:**	**3.0Hours + 3.0Hours**

Unit-I	**10 Hrs**
Cement: Manufacturing of cement (dry and wet process), Hydraulic Cement, Bogue's compounds, Types of cement, Hydration, product of hydration and its importance, importance of water cement ratio, Transition zone, brief description of field and laboratory testing of cement, water and its quality, Gel-space ratio (Numerical problems)	
Unit – II	**8 Hrs**
Concrete: Manufacturing Concrete: Mixing, Transporting, Placing, Compaction and Curing, Importance of Curing and Methods of Curing, Segregation, Bleeding. Workability: Factors affecting workability, Measurement by various tests, Recommendations of IS: 456-2000 - Sampling procedure, Acceptance criteria, Rheology- Importance, Bingham Parameters.	
Unit –III	**8 Hrs**
Admixtures: Chemical admixtures. Action of plasticizers, Water reducers, super plasticizers, accelerators, retarders, air entraining admixtures. Mineral admixtures: GGBS, Fly-ash, metakaolin, silica fume. **Durability:** Significance of Durability in concrete – Cracking, chemical attack, Alkali aggregate reaction, Permeability, water absorption.	
Unit –IV	**8 Hrs**
Strength: Compressive Strength Factors affecting, Abrams' law, Importance of Strength development with age, Maturity concept (Numerical Problems), accelerated curing, Relation between compressive and tensile strength, Flexural strength, Methods of finding the strength, Modulus of Elasticity and Acceptance Criteria. **NDT:** Importance of Non-destructive tests, Rebound hammer test, Ultra-sonic pulse velocity test, Penetration and pull-out test, Profometer, Semi Destructive tests	
Unit –V	**8 Hrs**
Concrete mix Design: Significance and objectives of concrete mix proportioning, General Considerations, Mix proportioning using IS 10262: 2019 method (Numerical problems on conventional concrete, concrete with Fly-ash and GGBS, High-strength Concrete), Quality control, Frequency of testing	
PART B (Laboratory)	
1. Bulking of sand 2. water Absorption of fine and coarse aggregates 3. Specific gravity of cement 4. Consistency of cement, Initial and final setting of cement 5. Compressive strength of cement 6. Soundness test on cement 7. Mix Design and workability tests on concrete (Slump, Compaction Factor and Vee-bee Consistometer tests) 8. Tests on Hardened Concrete (Compressive, Split tensile and Flexural strength) 9. Flow Test on cement mortar 10. Demonstration of Non Destructive tests (Rebound Hammer, UPV and Profometer)	

Course Outcomes: After completing the course, the students will be able to: -	
CO 1	Comprehend the influence of ingredient properties on cement and concrete
CO 2	Explain the requirement of engineering properties of concrete for structural and non-structural uses
CO 3	Apply fundamental principles, procedures and various specifications for proportioning of concrete mixes
CO 4	Estimate the strength of concrete and to identify causes of deterioration of concrete

Reference Books	
1.	Concrete technology, Shanthakumar. A. R, Apr 2018, Oxford University Press, New Delhi, ISBN13: 978-0199458523
2.	Concrete Technology: Theory and Practice, M. S. Shetty A. K. Jain, 8th Edition, 2018, S Chand Publishing, ISBN-13: 978-9352533800
3.	Concrete: Microstructure, Properties, and Materials, P. Kumar Mehta, Paulo J.M. Monteiro, 4th Edition, Jul 2017, McGraw Hill Education; ISBN-13: 978-9339204761.
4.	Properties of concrete, Neville. A.M, 5th Edition, 2012, Pearson Education, Inc, and Dorling Kindersley Publishing Inc., ISBN-13: 978-8131791073
5.	Concrete Technology: Theory and Practice, M.L. Gambhir, 5th Edition, 2017, McGraw Hill Education, ISBN-13: 978-1259062551
6.	IS 10262: 2019, Concrete Mix proportioning guidelines IS 456:2000 Plain and Reinforced Concrete

RUBRICFOR THE CONTINUOUS INTERNAL EVALUATION (THEORY)		
#	**COMPONENTS**	**MARKS**
1.	**QUIZZES:** Quizzes will be conducted in online/offline mode. **TWO QUIZZES** will be conducted & Each Quiz will be evaluated for 10 Marks. Each quiz is evaluated for 10 marks adding up to 20 MARKS	**20**
2.	**TESTS:** Students will be evaluated in test, descriptive questions with different complexity levels (Revised Bloom's Taxonomy Levels: Remembering, Understanding, Applying, Analyzing, Evaluating, and Creating). **TWO tests will be conducted**. Each test will be evaluated for **50Marks**, adding upto 100 Marks. **FINAL TEST MARKS WILL BE REDUCED TO 40 MARKS.**	**40**
3.	**EXPERIENTIAL LEARNING:** Students will be evaluated for their creativity and practical implementation of the problem. Case study based teaching learning (10), Program specific requirements (10), Video based seminar/presentation/demonstration (10) Designing & Modeling (10) **Phase 2 will be done in the exhibition mode (Demo/Prototype/any outcome). ADDING UPTO 40 MARKS**.	**40**
4.	**LAB:** Conduction of laboratory exercises, lab report, observation, and analysis (20 Marks), lab test (10 Marks) and Innovative Experiment/ Concept Design and Implementation (20 Marks) adding up to 50 Marks. THE FINAL MARKS WILL BE 50 MARKS	**50**
	MAXIMUM MARKS FOR THE CIE THEORY AND LABORATORY	**150**

RUBRIC FOR SEMESTER END EXAMINATION (THEORY)		
Q.NO.	**CONTENTS**	**MARKS**
	PART A	
1	Objective type of questions covering entire syllabus	20
	PART B (Maximum of THREE Sub-divisions only)	
2	Unit 1 : (Compulsory)	16
3 & 4	Unit 2 : Question 3 or 4	16
5 & 6	Unit 3 : Question 5 or 6	16
7 & 8	Unit 4 : Question 7 or 8	16
9 & 10	Unit 5: Question 9 or 10	16
	TOTAL	**100**

RUBRIC FOR SEMESTER END EXAMINATION (LAB)		
Q.NO.	**CONTENTS**	**MARKS**
1	Write Up	20
2	Conduction of the Experiments	20
3	Viva	10
	TOTAL	**50**

Semester: III						
MECHANICS OF MATERIALS **Category: Professional Core Course** **Stream: Theory & Practice**						
Course Code	**:**	**CV235AI**		**CIE**	**:**	**100+50 Marks**
Credits: L:T:P	**:**	**3:0:1**		**SEE**	**:**	**100+50 Marks**
Total Hours	**:**	**42Hrs + 28Hrs**		**SEE Duration**	**:**	**3Hours + 3Hours**

Unit-I	**9 Hrs**
Simple stresses and strain: Hooke's law, Stress Strain behavior of mild steel and concrete; Analysisof bars of uniform and varying(stepped) cross sections; Analysis of Simple and Composite bars of equal and unequal lengths; Expression of Elastic constants and interrelationship, Thermal stress in simple and compound bars, Volumetric strain. - Numerical problems.	
Unit – II	**9 Hrs**
Bending moment and shear force in beams: Introduction, Types of beams, Loads and Reactions, Shear forces and bending moments, Rate of loading, Sign conventions, Relationship between shear force and bending moments, Shear force and bending moment diagrams subjected to concentrated loads, uniform distributed load, uniform varying load, couple and their combinations. Numerical problems	
Unit –III	**8 Hrs**
Bending stress in beams: Introduction, Assumptions in simple bending theory, Expression for Bernoulli's equation, Modulus of rupture, Section modulus, Flexural rigidity, Bending stress distribution in beams of various sections and Numerical problems. **Shear stresses in beams:** Expression for horizontal shear stress in beam, Shear stress diagram for simple rectangular, I section and T-sections only and Numerical problems	
Unit –IV	**8 Hrs**
Deflection of determinate Beams: Introduction, Definitions of slope, Deflection, Elastic curve, Expression for equation of flexure, Sign convention, Double integration method, Slope and deflection using Macaulay's method for prismatic beams and overhanging beams subjected to point loads, UDL and couple and Numerical problems..	
Unit –V	**8 Hrs**
Analysis of columns and struts: Introduction, Euler's theory on columns, Effective length, Slenderness ratio, Short and long columns, Radius of gyration, Buckling load, Expression for Euler's Buckling load for different end conditions, Limitations of Euler's theory, Rankine's formula. Numerical problems.	
Formula book related to expressions will be provided in CIE and SEE	
PART B (Laboratory)	
Importance of MoM Laboratory: Types of loads, operating conditions, Load bearing capacity, ultimate stress, allowable stress, factor of safety, types of failure. 1. Specific Gravity of Coarse aggregate and fine aggregate 2. Fineness modulus of Coarse aggregate and Fine aggregate 3. Compressive strength tests on building blocks (brick, solid blocks and hollow blocks) 4. Tension test on Mild steel and HYSD bars 5. Compression test on HYSD bars and Cast iron 6. Bending Test on Wood 7. Shear test on Mild steel 8. Torsion test 9. Flexure test on tiles 10. Compression Test on paver blocks	

Course Outcomes: After completing the course, the students will be able to: -	
CO 1	Illustrate the behaviour of various materials used for structural elements
CO 2	Apply the basic concepts of mechanics in determining the response of structural members subjected to forces/ moments/ deformations.
CO 3	Analyse the structural members for internal forces and stresses under different loading conditions
CO 4	Evaluate the various properties of construction materials and structural elements.

Reference Books	
1.	A Textbook of Strength of Materials: Mechanics of Solids, R.K. Bansal, 2018, Laxmi Publications, 6th Edition, ISBN-13: 978-8131808146.
2.	Theory of Structures, S. Ramamrutham, 9th Edition ,2014, Dhanpat Rai Publishing Company Private Limited, New Delhi; ISBN-13: 978-9384378103.
3.	Basic Structural Analysis, Reddy C.S., 3rd Edition, 1 July 2017, Tata McGraw Hill Publication Company Ltd., New Delhi, ISBN-13: 978-0070702769.
4.	Mechanics of Materials, R.C.Hibbler, SI Edition, April2018, Pearson Publications, ISBN-13:978-9332584037
5.	Elements of Strength of Materials, Timoshenko and Young, Affiliated East-West Press,2011, 5thEdition, ISBN:9788176710190.
6.	Mechanics of Materials, F.P.Beerand R.Johnston, McGraw-Hill Publishers, 2007, 7th Edition, ISBN 978-0073398235.

RUBRIC FOR THE CONTINUOUS INTERNAL EVALUATION (THEORY)		
#	**COMPONENTS**	**MARKS**
1.	**QUIZZES:** Quizzes will be conducted in online/offline mode. **TWO QUIZZES** will be conducted & Each Quiz will be evaluated for 10 Marks. Each quiz is evaluated for 10 marks adding up to 20 MARKS	**20**
2.	**TESTS:** Students will be evaluated in test, descriptive questions with different complexity levels (Revised Bloom's Taxonomy Levels: Remembering, Understanding, Applying, Analyzing, Evaluating, and Creating). **TWO tests will be conducted**. Each test will be evaluated for **50Marks**, adding upto 100 Marks. **FINAL TEST MARKS WILL BE REDUCED TO 40 MARKS.**	**40**
3.	**EXPERIENTIAL LEARNING:** Students will be evaluated for their creativity and practical implementation of the problem. Case study based teaching learning (10), Program specific requirements (10), Video based seminar/presentation/demonstration (10) Designing & Modeling (10) **Phase 2 will be done in the exhibition mode (Demo/Prototype/any outcome). ADDING UPTO 40 MARKS**.	**40**
4.	**LAB:** Conduction of laboratory exercises, lab report, observation, and analysis (20 Marks), lab test (10 Marks) and Innovative Experiment/ Concept Design and Implementation (20 Marks) adding up to 50 Marks. THE FINAL MARKS WILL BE 50 MARKS	**50**
	MAXIMUM MARKS FOR THE CIE THEORY AND LABORATORY	**150**

RUBRIC FOR SEMESTER END EXAMINATION (THEORY)		
Q.NO.	CONTENTS	MARKS
	PART A	
1	Objective type of questions covering entire syllabus	20
	PART B (Maximum of THREE Sub-divisions only)	
2	Unit 1 : (Compulsory)	16
3 & 4	Unit 2 : Question 3 or 4	16
5 & 6	Unit 3 : Question 5 or 6	16
7 & 8	Unit 4 : Question 7 or 8	16
9 & 10	Unit 5: Question 9 or 10	16
	TOTAL	100

RUBRIC FOR SEMESTER END EXAMINATION (LAB)		
Q.NO.	**CONTENTS**	**MARKS**
1	Write Up	20
2	Conduction of the Experiments	20
3	Viva	10
	TOTAL	**50**

Semester: III						
NATIONAL SERVICE SCHEME(NSS) (Practical)						
Course Code	**:**	**HS237LA**		**CIE**	**:**	**50 Marks**
Credits: L: T: P	**:**	**0:0:2**		**SEE**	**:**	**50 Marks**
Total Hours	**:**	**13P**		**SEE Duration**	**:**	**02 Hrs**

Prerequisites:

1. Students should have service-oriented mindset and social concern.
2. Students should have dedication to work at any remote place, any time with available resources and proper time management for the other works.
3. Students should be ready to sacrifice some of the timely will and wishes to achieve service-oriented targets on time.

Content	**13 Hrs**

Students must take up any one activity on below mentioned topics and must prepare contents for awareness and technical contents for implementation of the projects and has to present strategies for implementation of the same. Compulsorily must attend one camp.

CIE will be evaluated based on their presentation, approach, and implementation strategies. (Any one of the below mentioned activity)

1. Helping local schools to achieve good result and enhance their enrolment in Higher/technical/ vocational education.
2. Preparing an actionable business proposal for enhancing the village/ farmer income and approach for implementation.
3. Developing Sustainable Water management system for rural/ urban areas and implementation approaches.
4. Setting of the information imparting club for women leading to contribution in social and economic issues.
5. Spreading public awareness/ government schemes under rural outreach program. (Minimum 5 programs)
6. Contribution to any national level initiative of Government of India. For eg. Digital India, Skill India, Swachh Bharat, Atmanirbhar Bharath, Make in India, Mudra scheme, Skill development programs etc...
7. Social connect and responsibilities
8. Plantation and adoption of plants. Know your plants
9. Organic farming, Indian Agriculture (Past, Present and Future) Connectivity for marketing
10. Waste management – Public, Private and Govt organization, 5 R's
11. Water conservation techniques – Role of different stakeholders - Implementation
12. Govt. School Rejuvenation and assistance to achieve good infrastructure.
13. Organize National integration and social harmony events/ workshops / seminars. (Minimum 2 programs) and ONE NSS-CAMP.

Course Outcomes: After completing the course, the students will be able to: -	
CO1	Understand the importance of his/her responsibilities towards society.
CO2	Analyze the environmental and societal problems/ issues and will be able to design solutions for thesame.
CO3	Evaluate the existing system and to propose practical solutions for the same for sustainabledevelopment.

ASSESSMENT AND EVALUATION PATTERN		
WEIGHTAGE	**50%**	**50%**
	CIE	**SEE**
Presentation 1- Selection of topic- (phase 1) Justification for Importance, need of the hour with surveyed data.	**10**	*****
EXPERIENTIAL LEARNING Presentation 2 (phase 2) Content development, strategies for implementation methodologies.	**10**	*****
Case Study-based Teaching-Learning	**10**	Implementation strategies of the project with report
Sector wise study & consolidation	**10**	
Video based seminar (4-5 minutes per student)	**10**	
TOTAL MARKS FOR THE COURSE	**50 MARKS**	**50 MARKS**

Semester: III						
NATIONAL CADET CORPS(NCC) (Practical)						
Course Code	**:**	**HS237LB**		**CIE**	**:**	**50 Marks**
Credits: L:T:P	**:**	**0:0:2**		**SEE**	**:**	**50 Marks**
Total Hours	**:**	**15P**		**SEE Duration**	**:**	**02 Hrs**
Unit-I						**07 Hrs**
Drill: Foot Drill- Drill ki Aam Hidayaten, Word ki Command, Savdhan, Vishram, Aram Se, Murdna, KadvarSizing, Teen Line Banana, Khuli Line, Nikat Line, Khade Khade Salute Karna						
Unit – II						**03 Hrs**
Weapon Training (WT): Introduction & Characteristics of 7.62 Self Loading rifle, Identification of rifle parts						
Unit –III						**03 Hrs**
Adventure activities: Trekking and obstacle course						
Unit –IV						**02 Hrs**
Social Service and Community Development (SSCD): Students will participate in various activities throughoutthe semester e.g., Blood donation Camp, Swachhata Abhiyan, Constitution Day, All National Festival						

Course Outcomes: After completing the course, the students will be able to: -	
CO1	Understand that drill as the foundation for discipline and to command a group for common goal.
CO2	Understand the importance of a weapon its detailed safety precautions necessary for prevention of accidents and identifying the parts of weapon.
CO3	Understand that trekking will connect human with nature and cross the obstacles to experience army way of life.
CO4	Understand the various social issues and their impact on social life, Develop the sense of self-less social service for better social & community life.

Reference Books	
1.	NCC Cadet Hand Book by R K Gupta, Ramesh Publishing House, New Delhi, Book code:R- 1991, ISBN: 978-93-87918-57-3, HSN Code: 49011010
2.	nccindia.ac.in

ASSESSMENT AND EVALUATION PATTERN		
WEIGHTAGE	**50%**	**50%**
	CIE	**SEE**
Presentation 1- Selection of topic- (phase 1) Justification for Importance, need of the hour with surveyed data.	**10**	*****
EXPERIENTIAL LEARNING Presentation 2 (phase 2) Content development, strategies for implementation methodologies.	**10**	*****
Case Study-based Teaching-Learning	**10**	Implementation strategies of the project with report
Sector wise study & consolidation	**10**	
Video based seminar (4-5 minutes per student)	**10**	
TOTAL MARKS FOR THE COURSE	**50 MARKS**	**50 MARKS**

Semester: III						
PHYSICAL EDUCATION (SPORTS & ATHLETICS) (Practical)						
Course Code	**:**	**HS237LC**		**CIE**	**:**	**50 Marks**
Credits: L:T:P	**:**	**0:0:2**		**SEE**	**:**	**50 Marks**
Total Hours	**:**	**30P**		**SEE Duration**	**:**	**2.5 Hrs**
Content						**30 Hrs**

Topics for Viva:

1. On rules and regulations pertaining to the games / sports
2. On dimensions of the court, size / weight of the ball and standards pertaining to that sports / game
3. Popular players and legends at state level / National level/ International level
4. Recent events happened and winner / runners in that sport / game
5. General awareness about sport / game, sports happenings in the college campus

Course Outcomes: After completing the course, the students will be able to: -	
CO1	Understand the basic principles and practices of Physical Education and Sports.
CO2	Instruct the Physical Activities and Sports practices for Healthy Living.
CO3	To develop professionalism among students to conduct, organize & Officiate Physical Education andSports events at schools and community level.

Reference Books	
1.	Health, Exercise and Fitness, Muller, J. P. (2000), Delhi: Sports.
2.	Play Field Manual, Anaika ,2005, Friends Publication New Delhi.
3.	IAAF Manual.
4.	Track and Field Marking and Athletics Officiating Manual, M.J Vishwanath,2002, Silver Star Publication, Shimoga.
5.	Steve Oldenburg (2015) Complete Conditioning for Volleyball, Human Kinestics.
Note: Skills of Sports and Games (Game Specific books) may be referred	

ASSESSMENT AND EVALUATION PATTERN		
WEIGHTAGE	**50%**	**50%**
	CIE	**SEE**
Presentation 1- Selection of topic- (phase 1) Justification for Importance, need of the hour with surveyed data.	**10**	*****
EXPERIENTIAL LEARNING Presentation 2 (phase 2) Content development, strategies for implementation methodologies.	**10**	*****
Case Study-based Teaching-Learning	**10**	Implementation strategies of the project with report
Sector wise study & consolidation	**10**	
Video based seminar (4-5 minutes per student)	**10**	
TOTAL MARKS FOR THE COURSE	**50 MARKS**	**50 MARKS**

Semester: III						
MUSIC (Practical)						
Course Code	**:**	**HS237LD**		**CIE**	**:**	**50 Marks**
Credits: L: T: P	**:**	**0:0:2**		**SEE**	**:**	**50 Marks**
Total Hours	**:**	**13P**		**SEE Duration**	**:**	**02 Hrs**
Content						**13 Hrs**

1. Introduction to different genres of music
2. Evolution of genres in India: Inspiration from the world
3. Ragas, time and their moods in Indian Classical Music
4. Identification of ragas and application into contemporary songs
5. Adding your touch to a composition
6. Maths and Music: A demonstration
7. Harmonies in music
8. Chords: Basics and application into any song
9. Music Production-I
10. Music Production-II

Students have to form groups of 2-4 and present a musical performance/ a musical task which shall be given by the experts. The experts shall judge the groups and award marks for the same.

CIE will be evaluated based on their presentation, approach, and implementation strategies. Students need to submit their certificates of any event they participated or bagged prizes in. This shall also be considered for CIE evaluation.

Course Outcomes: After completing the course, the students will be able to: -	
CO1	Understand basics of Music and improve their skills.
CO2	Appreciate the impacts on health and well-being.
CO3	Perform and present music in a presentable manner.
CO4	Develop skills like team building and collaboration.

Reference Books	
1.	Music Cognition: The Basics by Henkjan Honing.
2.	Basic Rudiments Answer Book - Ultimate Music Theory: Basic Music Theory Answer Book by Glory St Germain.
3.	Elements Of Hindustani Classical Music by Shruti Jauhari.
4.	Music in North India: Experiencing Music, Expressing Culture (Global Music Series) by George E. Ruckert.

ASSESSMENT AND EVALUATION PATTERN		
WEIGHTAGE	**50%**	**50%**
	CIE	**SEE**
Presentation 1- Selection of topic- (phase 1) Justification for Importance, need of the hour with surveyed data.	**10**	*****
EXPERIENTIAL LEARNING Presentation 2 (phase 2) Content development, strategies for implementation methodologies.	**10**	*****
Case Study-based Teaching-Learning	**10**	Implementation strategies of the project with report
Sector wise study & consolidation	**10**	
Video based seminar (4-5 minutes per student)	**10**	
TOTAL MARKS FOR THE COURSE	**50 MARKS**	**50 MARKS**

Semester: III						
DANCE (Practical)						
Course Code	**:**	**HS237LE**		**CIE**	**:**	**50 Marks**
Credits: L: T: P	**:**	**0:0:2**		**SEE**	**:**	**50 Marks**
Total Hours	**:**	**13P**		**SEE Duration**	**:**	**02 Hrs**
Contents						**13 Hrs**

1. Introduction to Dance
2. Preparing the body for dancing by learning different ways to warm up.
3. Basics of different dance forms i.e., classical, eastern, and western.
4. Assessing the interest of students and dividing them into different styles based on interaction.
5. Advancing more into the styles of interest.
6. Understanding of music i.e., beats, rhythm, and other components.
7. Expert sessions in the respective dance forms.
8. Activities such as cypher, showcase to gauge learning.
9. Components of performance through demonstration.
10. Introduction to choreographies and routines.
11. Learning to choreograph.
12. Choreograph and perform either solo or in groups.

Course Outcomes: After completing the course, the students will be able to: -	
CO1	Understand the fundamentals of dancing.
CO2	Adapt to impromptu dancing.
CO3	Ability to pick choreography and understand musicality.
CO4	To be able to do choreographies and perform in front of a live audience.

Reference Books	
1.	Dance Composition: A practical guide to creative success in dance making, Jacqueline M. Smith

ASSESSMENT AND EVALUATION PATTERN		
WEIGHTAGE	**50%**	**50%**
	CIE	**SEE**
Presentation 1- Selection of topic- (phase 1) Justification for Importance, need of the hour with surveyed data.	**10**	*****
EXPERIENTIAL LEARNING Presentation 2 (phase 2) Content development, strategies for implementation methodologies.	**10**	*****
Case Study-based Teaching-Learning	**10**	Implementation strategies of the project with report
Sector wise study & consolidation	**10**	
Video based seminar (4-5 minutes per student)	**10**	
TOTAL MARKS FOR THE COURSE	**50 MARKS**	**50 MARKS**

Semester: III						
THEATER (LIGHT CAMERA & ACTION) **(Practical)**						
Course Code	**:**	**HS237LF**		**CIE**	**:**	**50 Marks**
Credits: L:T:P	**:**	**0:0:1**		**SEE**	**:**	**50 Marks**
Total Hours	**:**	**13P**		**SEE Duration**	**:**	**02 Hrs**
Contents						**13 Hrs**

1. Break the ICE
2. Introduction to freedom Talk to each and every single person for a period of 5 complete minutes. Thisis aimed at to make everyone in the room comfortable with each other. This helps everyone get over socialanxiety, Shyness and Nervousness.
3. Ura
4. Rhythm Voice Projection, Voice Modulation, Weeping & Coughing Voice projection is the strength of speaking or singing whereby the voice is used powerfully and clearly. It is a technique employed to command respect and attention, as when a teacher talks to a class, or simply to be heard clearly, as used by an actor in a theatre.
5. It's Leviosa, Not Leviosaaa!
6. Speech work: Diction, Intonation, Emphasis, Pauses, Pitch and Volume Tempo Dialogues delivery. The art of dialogue delivery plays a vital role in in ensuring the efficacy of communication especially from thedramatic aspect of it, this unit discusses some tips to help the young actors improve their dialogue deliveryskills:
7. Elementary, My dear Watson.
8. Responsibilities of an actor tools of an actor character analysis Observations aspects, Stage presence, concentration, conviction, confidence, energy and directionality.
9. Show time
10. Pick a genre: COMEDY, THRILLER, HORROR, and TRAGEDY: Showcase a performance. Stylized acting with reference to historical and mythological plays. Mime: conventional, occupational and pantomime Mono acting: different types of characters

Course Outcomes: After completing the course, the students will be able to: -	
CO1	Develop a range of Theatrical Skills and apply them to create a performance.
CO2	Work collaboratively to generate, develop, and communicate ideas.
CO3	Develop as creative, effective, independent, and reflective students who are able to make informed choices in process and performance.
CO4	Develop an awareness and understanding of the roles and processes undertaken in contemporary professional theatre practice.

Reference Books	
1.	The Empty Space by Peter Brook.
2.	The Viewpoints Book: A Practical Guide to Viewpoints and Composition by Anne Bogart and Tina Landau.

ASSESSMENT AND EVALUATION PATTERN		
WEIGHTAGE	**50%**	**50%**
	CIE	**SEE**
Presentation 1- Selection of topic- (phase 1) Justification for Importance, need of the hour with surveyed data.	**10**	*****
EXPERIENTIAL LEARNING Presentation 2 (phase 2) Content development, strategies for implementation methodologies.	**10**	*****
Case Study-based Teaching-Learning	**10**	Implementation strategies of the project with report
Sector wise study & consolidation	**10**	
Video based seminar (4-5 minutes per student)	**10**	
TOTAL MARKS FOR THE COURSE	**50 MARKS**	**50 MARKS**

Semester: III						
ART WORK & PAINTING (Practical)						
Course Code	**:**	**HS237LG**		**CIE**	**:**	**50 Marks**
Credits: L: T: P	**:**	**0:0:2**		**SEE**	**:**	**50 Marks**
Total Hours	**:**	**13P**		**SEE Duration**	**:**	**02 Hrs**
Contents						**13 Hrs**

1. Use points, line and curves to create various shapes and forms
2. Use of shapes and forms to create various objects and structures
3. Recognizing distinctions in objects when viewed from various perspectives and grasping basic notions of perspective
4. Students will be introduced to the significance of color in art, as well as the principles of color theory and application.
5. Applied the concepts of unity, harmony, balance, rhythm, emphasis and proportion, abstraction and stylizationto create a composition.
6. Learn how to use which materials and for what types of art and textures.
7. Use of the above concepts to create art through the medium of collage, mosaic, painting, mural, batik, tie and dye.
8. Real world application of the above concepts in the form of book cover design and illustration, cartoon, poster, advertisements, magazine, computer graphics and animation
9. Familiarization with the many art forms and techniques of expression found throughout India.

AND

ONE EDUCATIONAL VISIT TO AN ART MUSEUM / INSTITUTE / GALLERY

Students must turn in assignments for each of the above said topics on a weekly basis and have to compulsorilytake part in the museum visit. CIE will be evaluated based on a still life piece, a composition using any one of the media of composition and a presentation on Indian art styles and creation of a piece pertaining to the presentedart style.

Course Outcomes: After completing the course, the students will be able to: -	
CO1	Use lines, shapes, and colors to depict the various sentiments and moods of life and nature.
CO2	Use one's creativity to develop forms and color schemes, as well as the ability to portray them effectively in drawing and painting on paper.
CO3	Develop the ability to properly use drawing and painting materials (surfaces, tools and equipment, and so on).
CO4	Improve their observation abilities by studying everyday items as well as numerous geometrical and non-geometrical (i.e., organic) shapes found in life and nature and to hone their drawing and painting talents in response to these insights.

Reference Books	
1.	Catching the Big Fish: Meditation, Consciousness, and Creativity, David Lynch
2.	Art & Fear: Observations on the Perils (and Rewards) of Artmaking, David Bayles & Ted Orland

ASSESSMENT AND EVALUATION PATTERN		
WEIGHTAGE	**50%**	**50%**
	CIE	**SEE**
Presentation 1- Selection of topic- (phase 1) Justification for Importance, need of the hour with surveyed data.	**10**	*****
EXPERIENTIAL LEARNING Presentation 2 (phase 2) Content development, strategies for implementation methodologies.	**10**	*****
Case Study-based Teaching-Learning	**10**	Implementation strategies of the projectwith report
Sector wise study & consolidation	**10**	
Video based seminar (4-5 minutes per student)	**10**	
TOTAL MARKS FOR THE COURSE	**50 MARKS**	**50 MARKS**

Semester: IV						
PHOTOGRAPHY & FILM MAKING (Practical)						
Course Code	**:**	**HS237LH**		**CIE**	**:**	**50 Marks**
Credits: L: T: P	**:**	**0:0:2**		**SEE**	**:**	**50 Marks**
Total Hours	**:**	**13P**		**SEE Duration**	**:**	**02 Hrs**

Contents **13 Hrs**

1. Introduction to photography.
2. Understanding the terminologies of DSLR.
3. Elements of photography.
4. Introduction to script writing, storyboarding.
5. Understanding the visualization and designing a set.
6. Basics of film acting
7. Video editing using software
8. Introduction to cinematography.
9. Understanding about lighting and camera angles.
10. Shooting a short film.

Students must form groups of 2-4 and present a short film which shall be given by the experts. The experts shall judge the groups and award marks for the same.

CIE will be evaluated based on their presentation, approach and implementation strategies. Students need tosubmit their certificates of any event they participated or bagged prizes in. This shall also be considered for CIE evaluation.

Course Outcomes: After completing the course, the students will be able to: -	
CO1	Understand basics of photography and videography and improve their skills.
CO2	Appreciate the skills acquired from photography.
CO3	Perform and present photos and films in a presentable manner.
CO4	Develop skills like team building and collaboration.

Reference Books	
1.	Read This If You Want to Take Great Photographs – Henry Carroll
2.	The Digital Photography Book: Part 1 – Scott Kelby

ASSESSMENT AND EVALUATION PATTERN		
WEIGHTAGE	**50%**	**50%**
	CIE	**SEE**
Presentation 1- Selection of topic- (phase 1) Justification for Importance, need of the hour with surveyed data.	**10**	*****
EXPERIENTIAL LEARNING Presentation 2 (phase 2) Content development, strategies for implementation methodologies.	**10**	*****
Case Study-based Teaching-Learning	**10**	Implementation strategies of the project with report
Sector wise study & consolidation	**10**	
Video based seminar (4-5 minutes per student)	**10**	
TOTAL MARKS FOR THE COURSE	**50 MARKS**	**50 MARKS**

Semester: III						
BRIDGE COURSE: C PROGRAMMING (Mandatory Audit Course) (Common to all Programs)						
Course Code	**:**	**CS139AT**		**CIE**	**:**	**50 Marks**
Credits: L:T:P	**:**	**2:0:0(Audit)**		**SEE**	**:**	**--**
Total Hours	**:**	**30L**		**SEE Duration**	**:**	**--**

Unit-I	**6 Hrs**
Introduction to Programming Definition of a computer. Components of computer system, Programming Languages. Design and implementation of efficient programs. Program Design Tools: Algorithms, Flowcharts and Pseudo codes. Types of Errors.	
Unit – II	**6 Hrs**
Introduction to C Introduction, structure of a C program, Writing the first program, Files used in a C program. Compiling and executing C Programs using comments, C Tokens, Character set in C, Keywords, Identifiers, Basic Data Types in C, Variables, Constants, I/O statements in C. Operators in C, Type conversion and type casting, scope of variables.	
Unit –III	**6 Hrs**
Decision Control and Looping Statements Introduction to decision control, conditional branching statements, iterative statements, Nested loops, Break and continue statements, goto statements **Arrays** Introduction, Declaration of Arrays, Accessing elements of an array, Storing values in arrays, Operations on Arrays- Traversing, Inserting and Deletion of element in an array. Two dimensional arrays- Operations on two dimensional arrays.	
Unit –IV	**6 Hrs**
Strings Introduction, Operations on strings- finding length of a string, converting characters of a string into uppercase and lowercase, Concatenating two strings, appending a string to another string, comparing two string, reversing a string. String and character Built in functions. **Functions** Introduction, Using functions, Function declaration/function prototype, Function definition, Function call, Return statement.	
Unit-V	**6 Hrs**
Functions Passing parameters to a function, Built-in functions. Passing arrays to functions. Recursion. **Structures and Pointers** Introduction: Structure Declaration, Typedef declaration, initialization of structures, accessing members of a structures, Introduction to pointers, declaring pointer variables.	

Course Outcomes: After completing the course, the students will be able to:-	
CO 1	Analyse problems and design solution using program design tools.
CO 2	Evaluate the appropriate method/data structure required in C programming to develop solutions by investigating the problem.
CO 3	Design a sustainable solution using C programming with societal and environmental concern by engaging in lifelong learning for emerging technology
CO 4	Demonstrate programming skills to solve inter-disciplinary problems using modern tools effectively by exhibiting team work through oral presentation and written reports.

Reference Books	
1.	Programming in C, Reema Thareja, 2018, Oxford University Press. ISBN: 9780199492282.
2.	The C Programming Language, Kernighan B.W and Dennis M. Ritchie, 2015, 2nd Edition, Prentice Hall, ISBN (13): 9780131103627.
3.	Turbo C: The Complete Reference, H. Schildt, 2000, 4th Edition, Mcgraw Hill Education, ISBN-13: 9780070411838.
4.	Algorithmic Problem Solving, Roland Backhouse, 2011, Wiley, ISBN: 978-0-470-68453-5

PRACTICE PROGRAMS

Implement the following programs using cc/gcc compiler

1. Familiarization with programming environment: Concept of creating, naming and saving the program file in gedit/vi editor, Concept of compilation and execution, Concept of debugging in GDB environment.
2. Implementation and execution of simple programs to understand working of
   - Formatted input and output functions- printf() and scanf().
   - Escape sequences in C.
   - Using formula in a C program for specific computation: For example: computing area of circle, converting Celsius to Fahrenheit, area of a triangle, converting distance in centimeters to inches, etc.
   - Preprocessor directives (#include, #define).
3. Execution of erroneous C programs to understand debugging and correcting the errors like:
   - Syntax / compiler errors.
   - Run-time errors.
   - Linker errors.
   - Logical errors.
   - Semantical errors.
4. Implementation and execution of simple programs to understand working of operators like:
   - Unary.
   - Arithmetic.

- Logical.
- Relational.
- Conditional.
- Bitwise.

5. Develop a C program to compute the roots of the equation ax2 + bx + c = 0.
6. Develop a C program that reads N integer numbers and arrange them in ascending or descending order using selection sort and bubble sort technique.
7. Develop a C program for Matrix multiplication.
8. Develop a C program to search an element using Binary search and linear search techniques.
9. Using functions develop a C program to perform the following tasks by parameter passing to read a string from the user and print appropriate message for palindrome or not palindrome.
10. Develop a C program to compute average marks of 'n' students (Name, Roll_No, Test Marks) and search a particular record based on 'Roll_No'.
11. Develop a C program using pointers to function to find given two strings are equal or not.
12. Develop a C program using recursion, to determine GCD , LCM of two numbers and to perform binary to decimal conversion.

RUBRIC FOR THE CONTINUOUS INTERNAL EVALUATION (THEORY)		
#	**COMPONENTS**	**MARKS**
1.	**QUIZZES:** Quizzes will be conducted in online/offline mode. TWO QUIZZES will be conducted & Each Quiz will be evaluated for 05 Marks. **THE SUM OF TWO QUIZZES WILL BE THE FINAL QUIZ MARKS.**	10
2.	**TESTS:** Students will be evaluated in test, descriptive questions with different complexity levels (Revised Bloom's Taxonomy Levels: Remembering, Understanding, Applying, Analyzing, Evaluating, and Creating). **TWO** tests will be conducted. Each test will be evaluated for 25 Marks, adding upto 50 Marks. **FINAL TEST MARKS WILL BE REDUCED TO 20 MARKS.**	20
3.	**EXPERIENTIAL LEARNING:** Students will be evaluated for their creativity and practical implementation of the problem. **Phase I (10) & Phase II (10) ADDING UPTO 20 MARKS.**	20
	MAXIMUM MARKS FOR THE CIE THEORY	**50**

Semester: IV						
PROBABILITY THEORY AND LINEAR PROGRAMMING (Theory) (AS, CH, CV, EE, EI, ET, ME)						
Course Code	**:**	MA241AT		**CIE**	**:**	**100 Marks**
Credits: L: T:P	**:**	2:1:0		**SEE**	**:**	**100 Marks**
Total Hours	**:**	30L+26T		**SEE Duration**	**:**	**3.00 Hours**

Unit-I	**06 Hrs**
Random Variables: Random variables-discrete and continuous, probability mass function, probability density function, cumulative distribution function, mean and variance. Two or more random variables - Joint probability mass function, joint probability density function, conditional distribution and independence, Covariance and Correlation. Implementation using MATLAB.	
Unit – II	**06 Hrs**
Probability Distributions: Discrete distributions - Binomial, Poisson and Geometric. Continuous distributions – Exponential, Uniform, Normal and Weibull. Implementation using MATLAB.	
Unit –III	**06 Hrs**
Sampling Distributions and Estimation: Population and sample, Sampling distributions - Simple random sampling (with replacement and without replacement). Standard error, Sampling distributions of means (known), Sampling distributions of proportions, Sampling distribution of differences and sums. Estimation-point estimation, interval estimation. Implementation using MATLAB.	
Unit –IV	**06 Hrs**
Inferential Statistics: Principles of Statistical Inference, Test of hypothesis - Null and alternative hypothesis, Procedure for statistical testing, Type I and Type II errors, level of significance, Tests involving the normal distribution, one – tailed and two – tailed tests, P – value, Special tests for large and small samples (F, Chi – square, Z, t – test). Implementation using MATLAB.	
Unit –V	**06 Hrs**
Linear Programming: Mathematical formulation of linear programming problem. Solving linear programming problem using Graphical, Simplex and Big M methods. Implementation using MATLAB.	

Course Outcomes: After completing the course, the students will be able to	
CO1:	Illustrate the fundamental concepts of random variables, distributions, sampling, inferential statistics and optimization.
CO2:	Compute the solution by applying the acquired knowledge of random variables, distributions, sampling, inferential statistics and optimization to the problems of engineering applications.
CO3:	Evaluate the solution of the problems using appropriate probability and optimization techniques to the real-world problems arising in many practical situations.

CO4:	Interpret the overall knowledge of random variables, probability distributions, sampling theory, inferential statistics and optimization gained to engage in life – long learning.

Reference Books	
1	Probability & Statistics for Engineers & Scientists, Ronald E. Walpole & Raymond H. Myers, 9th Edition, 2016, Pearson Education, ISBN-13: 978-0134115856.
2	Applied Statistics and Probability for Engineers, Douglas C. Montgomery and George C. Runger, 6th Edition, 2014, John Wiley & Sons, ISBN:13 9781118539712, ISBN (BRV):9781118645062.
3	Introduction to Probability and Statistics for Engineers and Scientists, Sheldon Ross, 5th Edition, 2014, Academic Press, ISBN: 13-978-0123948113.
4	Higher Engineering Mathematics, B.S. Grewal, 44th Edition, 2015, Khanna Publishers, ISBN: 81-7409-195-5.

RUBRIC FOR THE CONTINUOUS INTERNAL EVALUATION (THEORY)		
#	**COMPONENTS**	**MARKS**
1.	**QUIZZES:** Quizzes will be conducted in online/offline mode. TWO QUIZZES will be conducted & Each Quiz will be evaluated for 10 Marks. **THE SUM OF TWO QUIZZES WILL BE THE FINAL QUIZ MARKS.**	**20**
2.	**TESTS:** Students will be evaluated in test, descriptive questions with different complexity levels (Revised Bloom's Taxonomy Levels: Remembering, Understanding, Applying, Analyzing, Evaluating, and Creating). THREE tests will be conducted **(Two regular tests & One optional Improvement test).** Each test will be evaluated for 50 Marks, adding upto **100** Marks. **FINAL TEST MARKS WILL BE REDUCED TO 40 MARKS.**	**40**
3.	**EXPERIENTIAL LEARNING:** Students will be evaluated for their creativity and practical implementation of the problem. Case study-based teaching learning (05), Program specific requirements (05), Video based seminar/presentation/demonstration (10), MATLAB (20). **ADDING UPTO 40 MARKS**.	**40**
	MAXIMUM MARKS FOR THE CIE THEORY	**100**

RUBRIC FOR SEMESTER END EXAMINATION (THEORY)		
Q. NO.	**CONTENTS**	**MARKS**
	PART A	
1	Objective type questions covering entire syllabus	20
	PART B (Maximum of TWO Sub-divisions only)	
2	Unit 1: (Compulsory)	16
3 & 4	Unit 2: Question 3 or 4	16
5 & 6	Unit 3: Question 5 or 6	16
7 & 8	Unit 4: Question 7 or 8	16
9 & 10	Unit 5: Question 9 or 10	16
	TOTAL	**100**

Semester: IV						
ENVIRONMENT & SUSTAINABILITY **Category: Basket Courses - Group A** **Stream: (Common to all Programs)** **(Theory)**						
Course Code	**:**	**CV242TA**		**CIE**	**:**	**100 Marks**
Credits: L:T:P	**:**	**3:0:0**		**SEE**	**:**	**100 Marks**
Total Hours	**:**	**42L**		**SEE Duration**	**:**	**3.0 Hours**

Unit-I	**10 Hrs**
ENVIRONMENT AND BIODIVERSITY Definition, scope and importance of environment – need for public awareness. Eco-system and Energy flow– ecological succession. Types of biodiversity: genetic, species and ecosystem diversity– values of biodiversity, threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts – endangered and endemic species of India – conservation of biodiversity. **ENVIRONMENTAL POLLUTION** Causes, Effects and Preventive measures of Water, Soil, Air and Noise Pollutions. Solid, Hazardous and E-Waste management. Occupational Health and Safety Management system (OHASMS). Environmental protection, Environmental protection acts.	
Unit – II	**8 Hrs**
RENEWABLE SOURCES OF ENERGY Energy management and conservation, New Energy Sources: Need of new sources. Different types of new energy sources. Energy Cycles, carbon cycle, emission and sequestration, Green Engineering: Sustainable urbanization-Socioeconomical and technological change. Applications of - Hydrogen energy, Ocean energy resources, Tidal energy conversion. Concept, origin and power plants of geothermal energy.	
Unit –III	**8 Hrs**
SUSTAINABILITY AND MANAGEMENT Introduction to Environmental Economics, Environmental Audit, Development, GDP, Sustainability - concept, needs and challenges-economic, social and aspects of sustainability - from unsustainability to sustainability-millennium development goals and protocols. Linear vs. cyclical resource management systems, need for systems thinking and design of cyclical systems, circular economy, industrial ecology, green technology. Specifically apply these concepts to: Water Resources, Energy Resources, Food Resources, Land & Forests, Waste management.	
Unit –IV	**8 Hrs**
Sustainable Development Goals - targets, indicators and intervention areas Climate change - Global, Regional and local environmental issues and possible solutions. Concept of Carbon Credit, Carbon Footprint. Environmental management in industry. **SUSTAINABILITY PRACTICES** Zero waste and R concept, Circular economy, ISO 14000 Series, Material Life cycle assessment. Environmental Impact Assessment. Sustainable habitat: Green buildings, Green materials, Energy efficiency, Sustainable transports.	
Unit –V	**8 Hrs**
Corporate Social Responsibility (CSR) - Meaning & Definition of CSR, History & evolution of CSR. Concept of Charity, Corporate philanthropy, Corporate Citizenship, CSR-an overlapping concept. Concept of sustainability & Stakeholder Management. Relation between CSR and Corporate governance; environmental aspect of CSR; Chronological evolution of CSR in India. Sustainability Reporting: Flavor of GRI, Dow Jones Sustainability Index, CEPI. Investor interest in Sustainability.	

Course Outcomes: After completing the course, the students will be able to: -	
CO 1	Understand the basic elements of Environment and its Biodiversity.
CO 2	Explain the various types of pollution and requirement for sustainable strategy for present scenario.
CO 3	Evaluate the different concepts of sustainability and its significance for welfare of all life forms.
CO 4	Recognize the role of Corporate social responsibility in conserving the Environment.

Reference Books	
2.	Anubha Kaushik and C. P. Kaushik's "Perspectives in Environmental Studies", 6th Edition, New Age International Publishers ,2018.
2.	Benny Joseph, 'Environmental Science and Engineering', Tata McGraw-Hill, New Delhi, 2016.
3.	Gilbert M.Masters, 'Introduction to Environmental Engineering and Science', 2nd edition, Pearson Education, 2004.
4.	Allen, D. T. and Shonnard, D. R., Sustainability Engineering: Concepts, Design and Case Studies, Prentice Hall.
5.	Bradley. A.S; Adebayo, A.O., Maria, P. Engineering Applications in sustainable design and development, Cengage learning.
6.	Environment Impact Assessment Guidelines, Notification of Government of India, 2006.
7.	Mackenthun, K.M., Basic Concepts in Environmental Management, Lewis Publication, London, 1998.
8.	R. Rajagopalan, Environmental Studies: From Crisis to Cure. Oxford University Press, 2011, 358 pages. ISBN: 9780198072089.
9.	Daniel D. Chiras, Environmental Science. Jones & Bartlett Publishers, 01-Feb-2012, 669 pages. ISBN: 9781449645311.
10.	Corporate Social Responsibility Part I, Part II, Part III by David Crowther and Guler Aras.

RUBRIC FOR THE CONTINUOUS INTERNAL EVALUATION (THEORY)		
#	**COMPONENTS**	**MARKS**
1.	**QUIZZES:** Quizzes will be conducted in online/offline mode. TWO QUIZZES will be conducted & Each Quiz will be evaluated for 10 Marks. **THE SUM OF TWO QUIZZES WILL BE THE FINAL QUIZ MARKS.**	**20**
2.	**TESTS:** Students will be evaluated in test, descriptive questions with different complexity levels (Revised Bloom's Taxonomy Levels: Remembering, Understanding, Applying, Analyzing, Evaluating, and Creating). TWO tests will be conducted. Each test will be evaluated for 50 Marks, adding upto 100 Marks. **FINAL TEST MARKS WILL BE REDUCED TO 40 MARKS.**	**40**
3.	**EXPERIENTIAL LEARNING:** Students will be evaluated for their creativity and practical implementation of the problem. Case study-based teaching learning (10), Program specific requirements (10), Video based seminar/presentation/demonstration (20**) Phase 2 will be done in the exhibition mode (Demo/Prototype/any outcome). ADDING UPTO 40 MARKS**.	**40**
	MAXIMUM MARKS FOR THE CIE THEORY	**100**

RUBRIC FOR SEMESTER END EXAMINATION (THEORY)		
Q. NO.	**CONTENTS**	**MARKS**
	PART A	
1	Objective type questions covering entire syllabus	20
	PART B (Maximum of TWO Sub-divisions only)	
2	Unit 1 : (Compulsory)	16
3 & 4	Unit 2 : Question 3 or 4	16
5 & 6	Unit 3 : Question 5 or 6	16
7 & 8	Unit 4 : Question 7 or 8	16
9 & 10	Unit 5: Question 9 or 10	16
	TOTAL	**100**

Semester: IV						
MATERIAL SCIENCE FOR ENGINEERS **Category: Basket Courses - Group A** **Stream: (Common to all Programs)** **(Theory)**						
Course Code	**:**	**ME242TB**		**CIE**	**:**	**100 Marks**
Credits: L:T:P	**:**	**3:0:0**		**SEE**	**:**	**100 Marks**
Total Hours	**:**	**40L**		**SEE Duration**	**:**	**3.0 Hours**

Unit-I	**06 Hrs**
The Fundamentals of Materials The electronic structure of atoms, types of atomic and molecular bonds: ionic bond, covalent bond, metallic bond, secondary bonds, mixed bonding, hybridization. Energy bands in metals, insulators, and semiconductors. Basic crystallography. Defects and dislocations. Types of materials: polymers, metals and alloys, ceramics, semiconductors, composites.	
Unit – II	**10 Hrs**
Material behaviour Thermal properties Thermal conductivity, thermoelectric effects, heat capacity, thermal expansion coefficient, thermal shock, thermocouple. Electrical Properties: dielectric behaviours and temperature dependence of the dielectric constant, insulating materials, ferroelectricity, piezoelectricity, super conductor. Optical properties: luminescence, optical fibers, Mechanical Properties: Stress-strain diagram, elastic deformation, plastic deformation, hardness, viscoelastic deformation, impact energy, fracture toughness, fatigue.	
Unit –III	**10 Hrs**
Materials and their Applications Semiconductors, dielectrics, optoelectronics, structural materials, ferrous alloys, nonferrous alloys, cement, concrete, ceramic, and glasses. Polymers: thermosets and thermoplastics, composites: fibrereinforced, aggregated composites, electronic packaging materials, biomaterials, processing of structural materials.	
Unit –IV	**07 Hrs**
Heat Treatment Post processing heat treatment of electronic devices: thermal oxidation, diffusion, rapid thermal processing. Heat treatment of ferrous materials: annealing, spheroidizing, normalizing, hardening, tempering. formation of austenite, construction of Time Temperature Transformation (TTT) curves. Special heat treatment processes: carburizing, nitriding, cyaniding, flame, and induction hardening. Defects in heat treatment.	
Unit –V	**07 Hrs**
Nanomaterials Synthesis of nanomaterials Ball milling, sol-gel, vapour deposition growth, pulse laser, magnetron sputtering, lithography. Nano porous materials: zeolites, mesoporous materials, carbon nanotubes, graphene, nano FRPs, nano fabrics, bioresorbable and bio-erodable materials, nano ceramic, nano glasses, nano biomaterials, nano implant associated materials. Characterisation of nano structures, spectroscopic techniques, automatic force microscopy.	

Course Outcomes: After completing the course, the students will be able to: -	
CO1	Understand behaviour of various materials such as metals, composites and special materials
CO2	Analyse materials, composition, and their phase transformation
CO3	Investigate solidification process during casting and materials degradation
CO4	Recognize different types of Non-destructive testing methods to find subsurface defects in the materials.

Reference Books	
1	Material Science and Engineering, William D Callister, 6th Edition, 1997, John Wiley and Sons, ISBN: 9812-53-052-5
2	Introduction to Physical Metallurgy, Sydney H Avner, 1994, Mc. Graw Hill Book Company, ISBN: 0-07-Y85018-6
3	Material Science and Engineering, William F Smith, 4th Edition, 2008, Mc. Graw Hill Book Company, ISBN: 0-07-066717-9
4	A.S. Edelstein and R.C. Cammarata, Nanomaterials: Synthesis, Properties and Applications, CRC Press 1996, ISBN:978-0849322749

RUBRIC FOR THE CONTINUOUS INTERNAL EVALUATION (THEORY)		
#	**COMPONENTS**	**MARKS**
1.	**QUIZZES:** Quizzes will be conducted in online/offline mode. TWO QUIZZES will be conducted & Each Quiz will be evaluated for 10 Marks. **THE SUM OF TWO QUIZZES WILL BE THE FINAL QUIZ MARKS.**	**20**
2.	**TESTS:** Students will be evaluated in test, descriptive questions with different complexity levels (Revised Bloom's Taxonomy Levels: Remembering, Understanding, Applying, Analyzing, Evaluating, and Creating). TWO tests will be conducted. Each test will be evaluated for 50 Marks, adding upto 100 Marks. **FINAL TEST MARKS WILL BE REDUCED TO 40 MARKS.**	**40**
3.	**EXPERIENTIAL LEARNING:** Students will be evaluated for their creativity and practical implementation of the problem. Case study-based teaching learning (10), Program specific requirements (10), Video based seminar/presentation/demonstration (20**) Phase 2 will be done in the exhibition mode (Demo/Prototype/any outcome). ADDING UPTO 40 MARKS**.	**40**
	MAXIMUM MARKS FOR THE CIE THEORY	**100**

Semester: IV						
BIO SAFETY STANDARDS AND ETHICS **Category: Basket Courses - Group A** **Stream: (Common to all Programs)** **(Theory)**						
Course Code	**:**	**BT242TC**		**CIE**	**:**	**100 Marks**
Credits: L:T:P	**:**	**3:0:0**		**SEE**	**:**	**100 Marks**
Total Hours	**:**	**42L**		**SEE Duration**	**:**	**3.0 Hours**

Unit-I	**09 Hrs**
Biohazards, Bio Safety Levels and Cabinets: Introduction to Biohazards, Biological Safety levels, Bio safety Cabinets, Study of various types of Bio safety cabinets. Various parameters for design of Biosafety cabinets (Materials used for fabrication, sensors, filters, pumps, compressors)	
Unit – II	**08 Hrs**
Biosafety Guidelines: Biosafety guidelines of Government of India, GMOs & LMOs, Roles of Institutional Biosafety Committee, RCGM (Review committee o Genetic manipulation), GEAC (Genetic Engg Approval Committee) for GMO applications in food and agriculture. Overview of National Regulations and relevant International Agreements including Cartagena Protocol.	
Unit –III	**10 Hrs**
Food Safety Standards: FSSAI (Food Safety and Standards Authority of India), Functions, License, types of FSSAI Licences and compliance rules. **Food Hygiene:** General principles of food microbiology and overview of foodborne pathogens, sources of microorganisms in the food chain (raw materials, water, air, equipment, etc.) Quality of foods, Microbial food spoilage and Foodborne diseases, Overview of beneficial microorganisms and their role in food processing and human nutrition, Food Analysis and Testing, General principles of food safety management systems, Hazard Analysis Critical Control Point (HACCP).	
Unit –IV	**09 Hrs**
Food Preservations, Processing, and Packaging: Food Processing Operations, Principles, Good Manufacturing Practices HACCP, Good production, and processing practices (GMP, GAP, GHP, GLP, BAP, etc) Overview of food preservation methods and their underlying principles including novel and emerging methods/principles Overview of food packaging methods and principles including novel packaging materials.	
Unit –V	**09 Hrs**
Food safety and Ethics: Food Hazards, Food Additives, Food Allergens Drugs, Hormones, and Antibiotics in Animals. Factors That Contribute to Foodborne Illness, Consumer Lifestyles and Demand, Food Production and Economics, History of Food Safety, The Role of Food Preservation in Food Safety. **Ethics:** Clinical ethics, Health Policy, Research ethics, ethics on Animals. Biosafety and Bioethics.	

Course Outcomes: After completing the course, the students will be able to	
CO1	Comprehensive knowledge of Biohazards and bio safety levels
CO2	Understanding the biosafety guidelines and their importance to the society
CO3	Knowledge with respect to the Food standards, Hygiene, food processing and packing
CO4	Appreciate the food safety, Ethics, biosafety, and bio ethics

Reference Books	
1	IPR Biosafety and Bioethics, Deepa Goel, Shomini Parashar, 1st Edition, Pearson; 2013, ISBN: 978-8131774700.
2	The Food Safety, Cynthia A Roberts, Oryx Press, 1st Edition, 2001, ISBN: 1–57356–305–6.
3	Food Safety Management Systems, Hal King, Springer Cham, 2020, ISBN: 978-3-030-44734-2.
4	Bioethics: The Basics, Routledge, Alastair V. Campbell, 2nd Edition, 2017, ISBN: 978-0415790314.

RUBRIC FOR THE CONTINUOUS INTERNAL EVALUATION (THEORY)		
#	**COMPONENTS**	**MARKS**
1.	**QUIZZES:** Quizzes will be conducted in online/offline mode. TWO QUIZZES will be conducted & Each Quiz will be evaluated for 10 Marks. **THE SUM OF TWO QUIZZES WILL BE THE FINAL QUIZ MARKS.**	**20**
2.	**TESTS:** Students will be evaluated in test, descriptive questions with different complexity levels (Revised Bloom's Taxonomy Levels: Remembering, Understanding, Applying, Analyzing, Evaluating, and Creating). THREE tests will be conducted. Each test will be evaluated for 50 Marks, adding upto 150 Marks. **FINAL TEST MARKS WILL BE REDUCED TO 40 MARKS.**	**40**
3.	**EXPERIENTIAL LEARNING:** Students will be evaluated for their creativity and practical implementation of the problem. Case study-based teaching learning (10), Program specific requirements (10), Video based seminar/presentation/demonstration (20**) ADDING UPTO 40 MARKS**.	**40**
	MAXIMUM MARKS FOR THE CIE THEORY	**100**

Semester: IV						
MECHANICS OF FLUIDS **Category: Professional Core Course** **Stream: Theory & Practice**						
Course Code	**:**	**CV343AI**		**CIE**	**:**	**100+50 Marks**
Credits: L:T:P	**:**	**3:0:1**		**SEE**	**:**	**100+50 Marks**
Total Hours	**:**	**42L+28P**		**SEE Duration**	**:**	**3.0Hours + 3.0Hours**

Unit-I	**9 Hrs**
Introduction: Definition of Properties and its usage for characterization of Fluid, Numerical Problems. **Fluid Pressure and its measurement:** Fluid pressure at a point, Pascal's law, Variation of pressure in a fluid, Atmospheric Absolute, Gauge, and Vacuum pressures, Measurement of pressure using Simple and Differential manometers, Numerical Problems.	
Unit – II	**8 Hrs**
Kinematics of Fluid Flow: Classification of flows: Steady and Unsteady, Uniform and Non-uniform, Laminar and Turbulent, Rotational and Irrotational flow. **Dynamics of Fluid Flow:** Laws of Mass, Energy and Momentum, Continuity equation (One Dimensional), Euler's equation, Bernoulli's equation, Modified Bernoulli's equation - limitations and its application - Orifice Meter & Venturimeter, Numerical Problems.	
Unit –III	**8 Hrs**
Flow through pipes: Head losses - Major loss & Minor loss, Darcy - Weisbach Equation, Hydraulic Gradient line, Total Energy Line, Series and Parallel Network of pipes, Numerical Problems. **Notches and Weirs:** Definition of Notch and Weir, Flow through V-notch, Rectangular weir, Cippoletti weir, Corrections for Velocity of Approach, End Contractions, Numerical Problems.	
Unit –IV	**8 Hrs**
Flow through Open Channel: Calculation of Velocity using Chezy's and Manning's experiments, Hydraulic Efficient Channels: Rectangular and Trapezoidal channel, Numerical Problems. Specific Energy, Critical Depth, Froude's Number, Specific Energy Diagram, Subcritical and Supercritical flows, Alternative Depths, Hydraulic Jump, Numerical Problems.	
Unit –V	**9 Hrs**
Impact of Jet on Vanes: Impact of jet on vanes, Force exerted by the jet on a straight & curved vane (Stationary & Moving). Velocity triangles, Numerical Problems.	
PART B (Laboratory)	
1. Calibration of 90° V-notch. 2. Calibration of Rectangular notch. 3. Calibration of Cippoletti notch. 4. Calibration of Ogee weir. 5. Calibration of Venturimeter. 6. Calibration of orificemeter 7. Verification of Bernoulli's principle. 8. Determination of friction factor for a given pipe. 9. Impact of jet on vanes. 10. Minor Losses in pipes (Bends in pipe, Sudden Expansion in pipe, Sudden Contraction in pipe).	

Course Outcomes: After completing the course, the students will be able to: -	
CO 1	Describe the different properties of fluids, for the flow characterization and measurements.
CO 2	Explain the behavior of the fluids under static and dynamic conditions.
CO 3	Apply continuity equation and energy equation in solving problems on flow through conduits.
CO 4	Compute hydrostatic and hydrodynamic forces, flow profiles in channel transitions and analyze hydraulic transients.

Reference Books	
1.	Hydraulics and Fluid Mechanics including Hydraulic Machines, P.N. Modi and S.M Seth, 21st Edition 2017, Standard Book House, ISBN 978-81-89401-26-9.
2.	A text book of Fluid Mechanics and Hydraulics Machines, Dr. R.K.Bansal, 10th Edition, 2018, Laxmi Publication (P) LTD, ISBN-10: 8131808157
3.	Fluid Mechanics, 8th Edition 2016, Frank M White TATA McGraw Hill, New Delhi, ISBN-10: 9385965492, ISBN-13: 978-9385965494
4.	Flow in open Channels, K. Subramanya, 5th Edition ,20 April 2019, Tata McGraw Hill, McGraw-Hill; ISBN-10: 9353166292
5.	Fluid Mechanics with Engineering Applications, Daugherthy, R.L., Franzini, J.B., Finnemore, E.J., 1997, McGraw Hill, New York, ISBN-10: 9780070219144.
6.	Fluid Mechanics, Streeter, V. L.,Wylie, E. Benjamin: 9th Edition, 2017, Tata McGraw Hill Publications., ISBN-10: 0070701407

RUBRICFOR THE CONTINUOUS INTERNAL EVALUATION (THEORY)		
#	**COMPONENTS**	**MARKS**
1.	**QUIZZES:** Quizzes will be conducted in online/offline mode. **TWO QUIZZES** will be conducted & Each Quiz will be evaluated for 10 Marks. Each quiz is evaluated for 10 marks adding up to 20 MARKS	**20**
2.	**TESTS:** Students will be evaluated in test, descriptive questions with different complexity levels (Revised Bloom's Taxonomy Levels: Remembering, Understanding, Applying, Analyzing, Evaluating, and Creating). **TWO tests will be conducted**. Each test will be evaluated for **50Marks**, adding upto 100 Marks. **FINAL TEST MARKS WILL BE REDUCED TO 40 MARKS.**	**40**
3.	**EXPERIENTIAL LEARNING:** Students will be evaluated for their creativity and practical implementation of the problem. Case study based teaching learning (10), Program specific requirements (10), Video based seminar/presentation/demonstration (10) Designing & Modeling (10) **Phase 2 will be done in the exhibition mode (Demo/Prototype/any outcome). ADDING UPTO 40 MARKS**.	**40**
4.	**LAB:** Conduction of laboratory exercises, lab report, observation, and analysis (20 Marks), lab test (10 Marks) and Innovative Experiment/ Concept Design and Implementation (20 Marks) adding up to 50 Marks. THE FINAL MARKS WILL BE 50 MARKS	**50**
	MAXIMUM MARKS FOR THE CIE THEORY	**150**

RUBRIC FOR SEMESTER END EXAMINATION (THEORY)		
Q.NO.	**CONTENTS**	**MARKS**
	PART A	
1	Objective type of questions covering entire syllabus	20
	PART B (Maximum of THREE Sub-divisions only)	
2	Unit 1 : (Compulsory)	16
3 & 4	Unit 2 : Question 3 or 4	16
5 & 6	Unit 3 : Question 5 or 6	16
7 & 8	Unit 4 : Question 7 or 8	16
9 & 10	Unit 5: Question 9 or 10	16
	TOTAL	**100**

RUBRIC FOR SEMESTER END EXAMINATION (LAB)		
Q.NO.	**CONTENTS**	**MARKS**
1	Write Up	20
2	Conduction of the Experiments	20
3	Viva	10
	TOTAL	**50**

Semester: IV						
BUILDING PLANNING AND DRAWING **Category: Professional Core Course** **Stream: Theory & Practice**						
Course Code	**:**	**CV244AI**		**CIE**	**:**	**100+50 Marks**
Credits: L:T:P	**:**	**3:0:1**		**SEE**	**:**	**100+50 Marks**
Total Hours	**:**	**40L+28P**		**SEE Duration**	**:**	**3.0Hours + 3.0Hours**

Unit-I	**8 Hrs**
Building systems: Foundations, Masonry, Walls, Floors, Stairs, Lintels and arches, Roofs, doors, windows, Ventilators – Classification and functional requirements.	
Unit – II	**8 Hrs**
Building Construction: Formwork and scaffolding, underpinning, Plastering, Pointing and painting, Weather proofing - concepts, Pre-cast construction – Classification and functional requirements,	
Unit –III	**8 Hrs**
Building services: Water distribution and drainage systems, principles, plans, materials, connections and services of connections, Air-conditioning, Acoustics, Fire protection and Harzards, Electrical drawing – Classification and functional requirements.,	
Unit –IV	**8 Hrs**
Building Planning: Principles of Building Planning, Classification of buildings and Building by laws as per National building Code (NBC). Introduction to Green buildings and rating systems	
Unit –V	**8 Hrs**
Construction equipment and safety: Introduction, Factors for selecting equipment, various earth moving equipment's, Hoisting equipment's, Conveyors and rollers, Trenching machines, Fire safety-Introduction, Requirements and Procedures.	
PART B (Laboratory)	
Introduction to Building drawing – universal signs and symbols, line types, scale, building elements; Building floor plans, elevations and sections, vocabulary based on building drawing; **Using Auto-CAD 2D/ 3D /REVIT/ SKETCHUP 3D:** **Prepare working drawing of components of building like** Substructure - types of foundation, footing layouts, marking drawings; **Development of Plan, Elevation, section and Schedule of Openings for the following.** Single Storey building, Two Storey building. (With or without line diagram) Plumbing, sanitary layouts, electrical layouts.	

Course Outcomes: After completing the course, the students will be able to: -	
CO 1	Understand the fundamental of building materials, Planning, construction & factors of deterioration.
CO 2	Elaborate and visualize the common Civil engineering structural components.
CO 3	Familiarize with the critical aspects of various services in building
CO 4	Understand the essence of a civil engineer in the concept of building planning & drawings.

Reference Books	
1.	Balagopal T S, Prabhu K, Vincent P and Vijayan C, Building Drawing and Detailing, Spades Publishers (1987).
2.	Shah M G, Kale C M and Patki S Y, Building drawing with an integrated approach to built environment – 4th Edition, Tata McGraw Hill (2002).
3.	Building Construction, S.G. Rangwala, 33rd Edition, 2016, Charotar Publishing House Pvt. Ltd.; ISBN-10: 9385039040
4.	Building Construction B.C. Punmia , Ashok Kumar Jain , Arun Kumar Jain, 11th Edition, 2016, Laxmi Publications; ISBN-10: 9788131804285
5.	Building Planning and Drawing , S. S. Bhavikatti, 30 June 2014, I K International Publishing House Pvt. Ltd, ISBN-13: 978-9382332565
6.	Building Construction, Sushil Kumar 20th Edition, 2017, Standard publisher dist. ISBN-10: 9788180141683
7.	National Building Code of India 2016 (NBC 2016)

RUBRIC FOR THE CONTINUOUS INTERNAL EVALUATION (THEORY)		
#	**COMPONENTS**	**MARKS**
1.	**QUIZZES:** Quizzes will be conducted in online/offline mode. **TWO QUIZZES** will be conducted & Each Quiz will be evaluated for 10 Marks. Each quiz is evaluated for 10 marks adding up to 20 MARKS	**20**
2.	**TESTS:** Students will be evaluated in test, descriptive questions with different complexity levels (Revised Bloom's Taxonomy Levels: Remembering, Understanding, Applying, Analyzing, Evaluating, and Creating). **TWO tests will be conducted**. Each test will be evaluated for **50Marks**, adding upto 100 Marks. **FINAL TEST MARKS WILL BE REDUCED TO 40 MARKS.**	**40**
3.	**EXPERIENTIAL LEARNING:** Students will be evaluated for their creativity and practical implementation of the problem. Case study based teaching learning (10), Program specific requirements (10), Video based seminar/presentation/demonstration (10) Designing & Modeling (10) **Phase 2 will be done in the exhibition mode (Demo/Prototype/any outcome). ADDING UPTO 40 MARKS**.	**40**
4.	**LAB:** Conduction of laboratory exercises, lab report, observation, and analysis (20 Marks), lab test (10 Marks) and Innovative Experiment/ Concept Design and Implementation (20 Marks) adding up to 50 Marks. THE FINAL MARKS WILL BE 50 MARKS	**50**
	MAXIMUM MARKS FOR THE CIE THEORY	**150**

RUBRIC FOR SEMESTER END EXAMINATION (THEORY)		
Q.NO.	**CONTENTS**	**MARKS**
	PART A	
1	Objective type of questions covering entire syllabus	20
	PART B (Maximum of THREE Sub-divisions only)	
2	Unit 1 : (Compulsory)	16
3 & 4	Unit 2 : Question 3 or 4	16
5 & 6	Unit 3 : Question 5 or 6	16
7 & 8	Unit 4 : Question 7 or 8	16
9 & 10	Unit 5: Question 9 or 10	16
	TOTAL	**100**

RUBRIC FOR SEMESTER END EXAMINATION (LAB)		
Q.NO.	**CONTENTS**	**MARKS**
1	Write Up	20
2	Conduction of the Experiments	20
3	Viva	10
	TOTAL	**50**

Semester: IV						
STRUCTURAL ANALYSIS **Category: Professional Core Course** **Stream: Theory**						
Course Code	**:**	**CV345AT**		**CIE**	**:**	**100 Marks**
Credits: L:T:P	**:**	**3:0:0**		**SEE**	**:**	**100 Marks**
Total Hours	**:**	**42L**		**SEE Duration**	**:**	**3.0 Hours**

Unit-I	**8 Hrs**
Review of SFD, BMD. **Deflection of Beams:** Conjugate beam Method – Simply supported beams, Cantilever Beam, and Over hanging beams.	
Unit – II	**8 Hrs**
Energy Theorems: Introduction: Strain energy in linear elastic system, expression of strain energy due to axial load, bending moment and shear force – Principle of virtual work, unit load method, Castigliano's theorems-Deflection of simple beams..	
Unit –III	**8 Hrs**
Redundant Trusses: Introduction, Analysis of statically indeterminate structures using strain energy method, Analysis of trusses (Redundant up to second degree), Lack of fit in member & temperature stress in redundant truss.	
Unit –IV	**9 Hrs**
Slope Deflection Method: Introduction; Derivation of Slope-Deflection equations for beams. Analysis of Continuous beam by Slope –Deflection Equations. (No portal frames) **Moment – Distribution Method:** Introduction, Stiffness factor, Distribution Factor, Distribution moment and Carry-over moment; Analysis of Continuous beams with and without settlement of supports. Single bay, Single storey, Orthogonal Portal frames with and without sway.	
Unit –V	**9 Hrs**
Arches: Introduction**,** Three Hinged Parabolic and circular Arches with supports at Same levels and different levels**,** Determination of Normal thrust, Radial Shear and bending moment - Problems. **Cables and Suspension - Bridges**: Analysis of Cables at Same levels and different levels with point load and UDL– Numerical problems.	

Course Outcomes: After completing the course, the students will be able to: -	
CO 1	Classify different forms of structures and illustrate their basic properties.
CO 2	Apply the concepts of structural analysis to evaluate the response of structural elements.
CO 3	Analyze the different forms of structural elements by suitable methods of analysis.
CO 4	Study the behavior of structures for determinate, indeterminate, arch and cables.

Reference Books	
1.	Basic Structural Analysis, Reddy C.S., 3rd Edition, 1 July 2017, Tata McGraw Hill Publication Company Ltd., New Delhi, ISBN 13: 978-0070702769.
2.	Theory of Structures, S. Ramamrutham, 9th Edition ,2014, DhanpatRai Publishing Company Private Limited, New Delhi; ISBN-13: 978-9384378103.
3.	Basic Structural Analysis, K.U. Muthu , Azmi Ibrahim , M. Vijayanand , Maganti Janardhana, 3rd Edition, 2017, I K International Publishing House Pvt. Ltd, ISBN-13 : 978-9385909573
4.	Structural Analysis, R C Hibbler, 8th Edition, 25 February 2011, Pearson Publications; Pearson Prentice Hall, ISBN-13: 978-0132570534.
5.	Elementary Structural Analysis, Norris C.H., Wilbur J.B., 3rd Edition, 2016, McGraw Hill Internationa1 Book, ISBN 13: 9352604717

RUBRIC FOR THE CONTINUOUS INTERNAL EVALUATION (THEORY)		
#	**COMPONENTS**	**MARKS**
1.	**QUIZZES:** Quizzes will be conducted in online/offline mode. TWO QUIZZES will be conducted & Each Quiz will be evaluated for 10 Marks. **THE SUM OF TWO QUIZZES WILL BE THE FINAL QUIZ MARKS.**	**20**
2.	**TESTS:** Students will be evaluated in test, descriptive questions with different complexity levels (Revised Bloom's Taxonomy Levels: Remembering, Understanding, Applying, Analyzing, Evaluating, and Creating). TWO tests will be conducted. Each test will be evaluated for 50 Marks, adding upto 100 Marks. **FINAL TEST MARKS WILL BE REDUCED TO 40 MARKS.**	**40**
3.	**EXPERIENTIAL LEARNING:** Students will be evaluated for their creativity and practical implementation of the problem. Case study-based teaching learning (10), Program specific requirements (10), Video based seminar/presentation/demonstration (20**) Phase 2 will be done in the exhibition mode (Demo/Prototype/any outcome). ADDING UPTO 40 MARKS**.	**40**
	MAXIMUM MARKS FOR THE CIE THEORY	**100**

RUBRIC FOR SEMESTER END EXAMINATION (THEORY)		
Q. NO.	**CONTENTS**	**MARKS**
	PART A	
1	Objective type questions covering entire syllabus	20
	PART B (Maximum of TWO Sub-divisions only)	
2	Unit 1 : (Compulsory)	16
3 & 4	Unit 2 : Question 3 or 4	16
5 & 6	Unit 3 : Question 5 or 6	16
7 & 8	Unit 4 : Question 7 or 8	16
9 & 10	Unit 5: Question 9 or 10	16
	TOTAL	**100**

Semester: IV						
ECOLOGY AND ENVIRONMENT **Category: Professional Core Elective (NPTEL/MOOC)** **Stream:** **(MOOC Course)**						
Course Code	**:**	**CV246TA**		**CIE**	**:**	**50 Marks**
Credits: L:T:P	**:**	**2:0:0**		**SEE**	**:**	**50 Marks**
Total Hours	**:**	**30L**		**SEE Duration**	**:**	**3.0 Hours**

Content	30 Hrs
Week 1. Sustainability, Dams, Adayar River, Urbanisation in Western Ghats and Biodiesel, Use And Throw Plastic, Nano Materials Information Technologhy Week 2. Definition of Health Risk, Transport Of Pollutants in the Environment, Assesment of Risk, Remediation and Liability, Life Cycle Analysis Week 3. Energy & Environment Week 4. Energy & Environment Week 5. Drinking Water Supply : Need and Challenges, Water Quality Standards And Philosophy of Water Treatment, Water Treatment : Point Of Use Filters, Wastewater Management in Developing Urban Environments: Indian Scenario, Wastewater Recycling: A Sustainable Option For Water Management Week 6. Sustainable Water Management In Urban Areas, Ground Water Contamination, Groundwater - Sanitation Nexus Week 7. Chasing Sustainability - The Challenge, Devoloping Frame Works Of Action: Ethics , Social And sanitation, Promoting Policies For Eco-Productive Cities in the global House Week 8. The need to study ecology, Ecosystem functions and services, Ecological footprint, Energy and Material flow in ecosystems and ecological efficiency, Energy flow, productivity and Biodiversity, Biodiversity, population and ecological principles	

Semester: IV						
REMOTE SENSING AND GIS **Category: Professional Core Elective (NPTEL/MOOC)** **Stream:** **(MOOC Course)**						
Course Code	**:**	**CV246TB**		**CIE**	**:**	**50 Marks**
Credits: L:T:P	**:**	**2:0:0**		**SEE**	**:**	**50 Marks**
Total Hours	**:**	**30L**		**SEE Duration**	**:**	**3.0 Hours**

Content	30 Hrs
Week 1: Remote Sensing Data and Corrections Week 2: Satellite Image Corrections Week 3: Digital Image Processing-I Week 4 : Digital Image Processing-II Week 5 : Thermal and Microwave Week 6 : Imaging Spectroscopy-I Week 7 : Imaging Spectroscopy-II & GIS-I Week 8: GIS-II and Application	

Semester: IV						
RIVER ENGINEERING **Category: Professional Core Elective (NPTEL/MOOC)** **Stream:** **(MOOC Course)**						
Course Code	**:**	**CV246TC**		**CIE**	**:**	**50 Marks**
Credits: L:T:P	**:**	**2:0:0**		**SEE**	**:**	**50 Marks**
Total Hours	**:**	**30L**		**SEE Duration**	**:**	**3.0Hours**

Content	30 Hrs
Week 1: Sediment Properties Week 2: Hydrodynamic principle Week 3: Hydrodynamic principle- II Week 4 : Sediment Transport Week 5 : Physical Modeling: Introduction to Scour Week 6 : Bridge Scour and River Training Work Week 7 : Riverbank Stabilization Week 8: River Equilibrium	

Semester: IV						
PROJECT PLANNING & CONTROL **Category: Professional Core Elective (NPTEL/MOOC)** **Stream:** **(MOOC Course)**						
Course Code	**:**	**CV246TD**		**CIE**	**:**	**50 Marks**
Credits: L:T:P	**:**	**2:0:0**		**SEE**	**:**	**50 Marks**
Total Hours	**:**	**30L**		**SEE Duration**	**:**	**3.0 Hours**

Content	30 Hrs
Week 1. Introduction, Course Context, Construction Project Management Week 2. Time Management, Work Breakdown Structure (WBS), Gantt Charts Week 3. Duration Estimation, Network Representation & Analysis -1 Week 4. Network Representation & Analysis -2; Two-Span Bridge: Scheduling, Network Analysis and Appl Week 5. Time-Cost Trade-off (Crashing) Week 6. Resource Scheduling Week 7. Precedence Diagramming Method (PDM), Project Monitoring & Control Week 8. Project Monitoring & Control (Earned Value Concepts), Uncertainty in Project Schedules (PERT)	

Semester: IV						
SUSTAINABLE ENGINEERING CONCEPTS AND LIFE CYCLE ANALYSIS **Category: Professional Core Elective (NPTEL/MOOC)** **Stream: MOOC Course**						
Course Code	**:**	**CV246TE**		**CIE**	**:**	**50 Marks**
Credits: L:T:P	**:**	**2:0:0**		**SEE**	**:**	**50 Marks**
Total Hours	**:**	**30L**		**SEE Duration**	**:**	**3.0 Hours**

Content	30 Hrs
Week 1- Life Cycle Assessment – Introduction, LCA and Sustainability, LCA and Environmental Systems, LCA and Water, Food and Energy Week 2 - RISK Assessment and LCA Frameworks, RISK Assessment – Toxicology, RISK Assessment Methods, RISK Assessment Methods (Contd.), Environmental Risk Assessment Week 3 - Environmental Data Collection and LCA Methodology Week 4 - A Detailed Methodology, LCA Benefits and Drawbacks, History of LCA, The ISO Framework Week 5 - Unit Process, Data and LCI Databases, Inventory Data and LCIA, LCA Interpretation Week 6 - ISO 14040, Key Points of a Good LCA and Example LCA, Chemical Release in Environment, Green Sustainable Materials Week 7 - Design for Sustainability Week 8 - Summary and Case Studies	

Semester: IV						
Building Energy Systems and Auditing (MOOC Course)						
Course Code	**:**	**CV246TF**		**CIE**	**:**	**50 Marks**
Credits: L:T:P	**:**	**2:0:0**		**SEE**	**:**	**50 Marks**
Total Hours	**:**	**30L**		**SEE Duration**	**:**	**3.00 Hours**

Content	30 Hrs
Week 1: General Introduction to Building Physics Review of Climate Responsive Design Principles, Heat conduction, convection and radiation principles, Material properties, Daylighting. **Week 2: Building Heat Transfer Mechanism** Heat admittance through building envelope, Psychometric operation, Solar Radiation and consideration for glazing design **Week 3: Building Heat Load Estimation Methods** Thermal load and ventilation. Study on building energy systems that contribute to the energy needs of the built forms, Energy calculation and modelling of building based on thermal transfer values. Concept of cooling degree days **Week 4: Energy Conservation Building Code Considerations** ECBC norms on energy efficient building in India, Building envelope trade-off method. Envelope performance factor. Daylight and lighting consideration **Week 5: Energy Conservation in Residential Building** Eco-Niwas Samhita 2018 guidelines for residential building energy conservation, Residential envelope transmittance values in various climatic conditions in India. Comfort system and controls. **Week 6: Life Cycle Analysis** Discussion on life cycle energy analysis of building. Embodied energy, operational energy. Bureau of Energy Efficiency, Govt. of India (BEE) guidelines and Building Energy Index of different building types. **Week 7: Building Energy Audits** Energy Auditing types and level. Tools for Auditing, Payback of Retrofits, Accepted Home Energy Designations. Factors Affecting Thermal Performance of Insulation. **Week 8: Passive Technologies and Green Energy** Passive low energy technologies and its application in building Earth-air tubes, radiant cooling, Passive downdraft evaporative cooling (PDEC). Green technologies for alternative sources of building operating energy:, PV Cell, wind energy, bio gas, Energy efficient buildings in India: case studies	

Semester: IV						
Interior Design (MOOC Course)						
Course Code	**:**	**CV246TG**		**CIE**	**:**	**50 Marks**
Credits: L:T:P	**:**	**2:0:0**		**SEE**	**:**	**50 Marks**
Total Hours	**:**	**30L**		**SEE Duration**	**:**	**3.00 Hours**

Content	**30 Hrs**
Week 1: Module 1:Interior Design: Definition; Understanding; History of Interior Design; Scope Module 2:Interior Design; Interior Decoration; and Interior Architecture Module 3:Interior Design Projects: Overview on Costing and Career Module 4:Interior Design: Case Studies and Examples Module 5:Summary and Discourse Week 2: Module 1:Principles and Elements of Interior Design: Discussion and Examples; Understanding Composition Module 2:Space Making Elements - wall, column, partition screen, floor, furniture, interior landscaping Module 3:Trends, Concepts and Schemes in Lighting, Colour, Furnishing, Finishes Module 4:Interior Design: Drawings and Representation Techniques Module 5:Summary and Discourse Week 3: Module 1:Interior Design: Understanding varied spaces – Retail; Work; Living; Restorative; Public; Transient, Concepts of Place and Space Module 2:Interior-Design – Finishes, Materials and Specifications: diverse surface treatments, finishes, materials, specifications and application techniques Module 3:Interior-Design – Finishes, Materials and Specifications: Space-Making Crafts; Space-Surface Crafts - traditional, folk and contemporary crafts and their role in creating and enhancing interior spaces Module 4:skills; building (space-making) crafts; building (space-making) elements; tools; techniques; technology; local resources; community participation; establishing inter-relationships Module 5:Summary and Discourse Week 4: Module 1:Interior Design: Materials - Timber Module 2:Interior Design: Materials - Stone Module 3:Interior Design: Materials - Tiles Module 4:Interior Design: Materials - Paints Module 5:Summary and Discourse Week 5: Module 1:Green Interiors: Introduction to Rating Systems; Examples Module 2:Green Interiors: Attributes – IAQ, IEQ, Furniture Module 3:Green Interiors: Physics of Light - Day Light, Artificial Light, Chemistry of Colours Module 4:Green Interiors: Policies and Incentives; Materials and Finishes Module 5:Summary and Discourse Week 6: Module 1:Interior Design Technology: Innovative trends and technologies – Tiny Houses, Origami Module 2:Interior Design Technology: Experimental finishes and materials; Joinery Module 3:Interior Design Technology: Visual Merchandising; Concepts of Modularity, Portability, Foldability, DIY Module 4:Interior Design Technology: New Concepts – Installations, Decor Module 5:Summary and Discourse	

Week 7:
Module 1:Professional Practice: Interior services, functional importance
Module 2:Professional Practice: bylaws, supervision
Module 3:Building Material Costing; BoQ; Market Exposure; Product Catalogues
Module 4:Important Organisations, Institutes, Firms, Designers, Avenues of Pedagogy and Practice
Module 5:Summary and Discourse

Week 8:
Module 1:Trans-Disciplinar y Interventions: Craft-Design Explorations
Module 2:Trans-Disciplinar y Interventions: Craft-Design Explorations
Module 3:Creative and Cultural Industries: Focus on Visual Art and Interior Design
Module 4:Interior Design: Future Roadmap; Opportunities and Challenges
Module 5:Summary and Discourse

SEMESTER: IV						
DESIGN THINKING LAB **Category: PROFESSIONAL CORE COURSE** **(Practicals)**						
Course Code	**:**	**CV247DL**		**CIE**	**:**	**50 Marks**
Credits: L:T:P	**:**	**0:0:2**		**SEE**	**:**	**50 Marks**
Total Hours	**:**	**26P**		**SEE Duration**	**:**	**2.0 Hrs**
						26 Hrs

Guidelines for Design Thinking Lab (DTL):

1. DTL is to be carried out by a team of two-three students.
2. Each student in a team must contribute equally in the tasks mentioned below.
3. Each group must select a theme that will provide solutions to the challenges of societal concern. Normally three to four themes would be identified by the by the department
4. Each group should follow the stages of Empathy, Design, Ideate, prototype and Test for completion of DTL.
5. After every stage of DTL, the committee constituted by the department along with the coordinators would evaluate for CIE. The committee shall consist of respective coordinator & two senior faculty members as examiners. The evaluation will be done for each student separately.
6. The team should prepare a Digital Poster and a report should be submitted after incorporation of any modifications suggested by the evaluation committee.

The Design Thinking lab tasks would involve:

1. Carry out the detailed questionnaire to arrive at the problem of the selected theme. The empathy report shall be prepared based on the response of the stake holders.
2. For the problem identified, the team needs to give solution through thinking out of the box innovatively to complete the ideation stage of DTL
3. Once the idea of the solution is ready, detailed design must be formulated in the Design stage considering the practical feasibility.
4. If the Design of the problem is approved, the team should implement the design and come out with prototype of the system.
5. Conduct thorough testing of all the modules in the prototype developed and carry out integrated testing.
6. Demonstrate the functioning of the prototype along with presentations of the same.
7. Prepare a Digital poster indicating all the stages of DTL separately. A Detailed project report also should be submitted covering the difficulties and challenges faced in each stage of DTL.
8. Methods of testing and validation should be clearly defined both in the Digital poster as well asthe report.
9. The students are required to submit the Poster and the report in the prescribed format provided bythe department.

Course Outcomes: After completing the course, the students will be able to: -	
CO1	Interpret the process of Design Thinking to solve real world problems from the end user view point.
CO2	Apply design thinking tools to make decisions and attain a feasible solution.
CO3	Identify and solve a Capstone project with sustainable goals using Design Thinking.
CO4	Develop a pretotype and optimize it further through demonstrations.

RUBRICS FOR THE CONTINUOUS INTERNAL EVALUATION		
#	**COMPONENTS**	**MARKS**
1.	Empathy, Ideate evaluation	**10**
2.	Design evaluation	**15**
3.	Prototype evaluation, Digital Poster presentation and report submission	**25**
	MAXIMUM MARKS FOR THE CIE	**50**

RUBRICS FOR SEMESTER END EXAMINATION		
#	**COMPONENTS**	**MARKS**
1.	Written presentation of synopsis: Write up	**05**
2.	Presentation/Demonstration of the project	**15**
3.	Demonstration of the project	**20**
4.	Viva	**05**
5.	Report	**05**
	MAXIMUM MARKS FOR THE SEE	**50**

SEMESTER: IV						
UNIVERSAL HUMAN VALUES II **Category: Common to all Programs** **Stream: Theory**						
Course Code	**:**	**HS248AT**		**CIE**	**:**	**50 Marks**
Credits: L:T:P	**:**	**2:0:0**		**SEE**	**:**	**50 Marks**
Total Hours	**:**	**28L**		**SEE Duration**	**:**	**02 Hrs**
Unit-I						**10 Hrs**
Course Introduction - Need, Basic Guidelines, Content and Process for Value Education: Purpose and motivation for the course, recapitulation from Universal Human Values-I, Self-Exploration 'Natural Acceptance' and Experiential Validation Continuous Happiness and Prosperity- Human Aspirations, Right understanding, Relationship and Physical Facility, Understanding Happiness and Prosperity correctly. Practice sessions to discuss natural acceptance in human being as the innate acceptance for living with responsibility. **Understanding Harmony in the Human Being - Harmony in Myself!**: Understanding human being as a co- existence of the sentient 'I' and the material 'Body', Understanding the needs of Self ('I') and 'Body' Understanding the Body as an instrument of Understanding the characteristics and activities of 'I' and harmony in 'I', Understanding the harmony of I with the Body: Sanyam and Health; Practice sessions to discuss the role others have played in making material goods available to me. Identifying from one's own life.						
Unit – II						**10 Hrs**
Understanding Harmony in the Family and Society- Harmony in Human Relationship: Understanding valuesin human-human relationship; meaning of Justice and program for its fulfilment to ensure mutual happiness; Trustand Respect as the foundational values of relationship, Understanding the meaning of Trust. Understanding the harmony in the society (society being an extension of family): Resolution, Prosperity, fearlessness (trust) and co-existence as comprehensive Human Goals, Visualizing a universal harmonious order in society- Undivided Society, Universal Order- from family to world family. Practice sessions to reflect on relationships in family, hostel and institute as extended family, real life examples, teacher-student relationship, goal of education etc. Gratitude as a universal value in relationships. Discuss with scenarios. Elicit examples from students' lives.						
Unit –III						**08 Hrs**
Understanding Harmony in the Nature and Existence - Whole existence as Coexistence: Understanding the harmony in the Nature, Interconnectedness, and mutual fulfilment among the four orders of nature recyclability and self-regulation in nature, Understanding Existence as Co-existence of mutually interacting units in all pervasive space, Holistic perception of harmony at all levels of existence. Practice sessions to discuss human being as cause of imbalance in nature (film "Home" can be used), pollution, depletion of resources and role of technology etc.						

Course Outcomes: After completing the course, the students will be able to: -	
CO1	By the end of the course, students are expected to become more aware of themselves, and their surroundings (family, society, nature); they would become more responsible in life, and in handling problems with sustainable solutions,
CO2	While keeping human relationships and human nature in mind. They would have better critical ability.
CO3	They would also become sensitive to their commitment towards what they have understood (human values, human relationship and human society).
CO4	It is hoped that they would be able to apply what they have learnt to their own self in different day-to-day settings in real life, at least a beginning would be made in this direction.

Reference Books	
1.	Jeevan Vidya: Ek Parichaya, A Nagaraj, Jeevan Vidya Prakashan, Amarkantak, 1999.
2.	Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004
3.	The Story of Stuff (Book).
4.	The Story of My Experiments with Truth - by Mohandas Karamchand Gandhi
5.	Small is Beautiful - E. F Schumacher.
6.	Slow is Beautiful - Cecile Andrews.

RUBRICS FOR THE CONTINUOUS INTERNAL EVALUATION (THEORY)		
#	**COMPONENTS**	**MARKS**
1.	**QUIZZES:** Quizzes will be conducted in online/offline mode. **TWO QUIZZES** will be conducted & Each Quiz will be evaluated for 5 Marks. **THE SUM OF TWO QUIZZES WILL BE THE FINAL QUIZ MARKS.**	**10**
2.	**TESTS:** Students will be evaluated in test, descriptive questions with different complexity levels (Revised Bloom's Taxonomy Levels: Remembering, Understanding, Applying, Analyzing, Evaluating, and Creating). **TWO TESTS** will be conducted. Each test will be evaluated for 25 Marks, adding up to 50 Marks. **FINAL TEST MARKS WILL BE REDUCED TO 20 MARKS.**	**20**
3.	**EXPERIENTIAL LEARNING:** Students will be evaluated for their creativity and practical implementation of the problem. **Phase I (10) & Phase II (10) ADDING UPTO 20 MARKS**.	**20**
	MAXIMUM MARKS FOR THE CIE THEORY	**50**

RUBRICS FOR SEMESTER END EXAMINATION (THEORY)		
Q.NO.	**CONTENTS**	**MARKS**
	PART A	
1	Objective type questions covering entire syllabus	**10**
	PART B (Maximum of THREE Sub-divisions only)	
2	Unit 1: (Compulsory)	**08**
3 & 4	Unit 2: Question 3 or 4	**08**
5 & 6	Unit 3: Question 5 or 6	**08**
7 & 8	Unit 4: Question 7 or 8	**08**
9 &10	Unit 5: Question 9 or 10	**08**
	TOTAL	**50**

Semester: IV						
Bridge Course: MATHEMATICS **Category: Mandatory Audit Course** **Stream: (AS, BT, CH, CV, EC, EE, EI, ET, IM, ME)** **Theory**						
Course Code	**:**	**MAT149AT**		**CIE**	**:**	50 Marks
Credits: L: T: P	**:**	2:0:0		**SEE**	**:**	**NO SEE** (AUDIT COURSE)
Total Hours	**:**	30L				

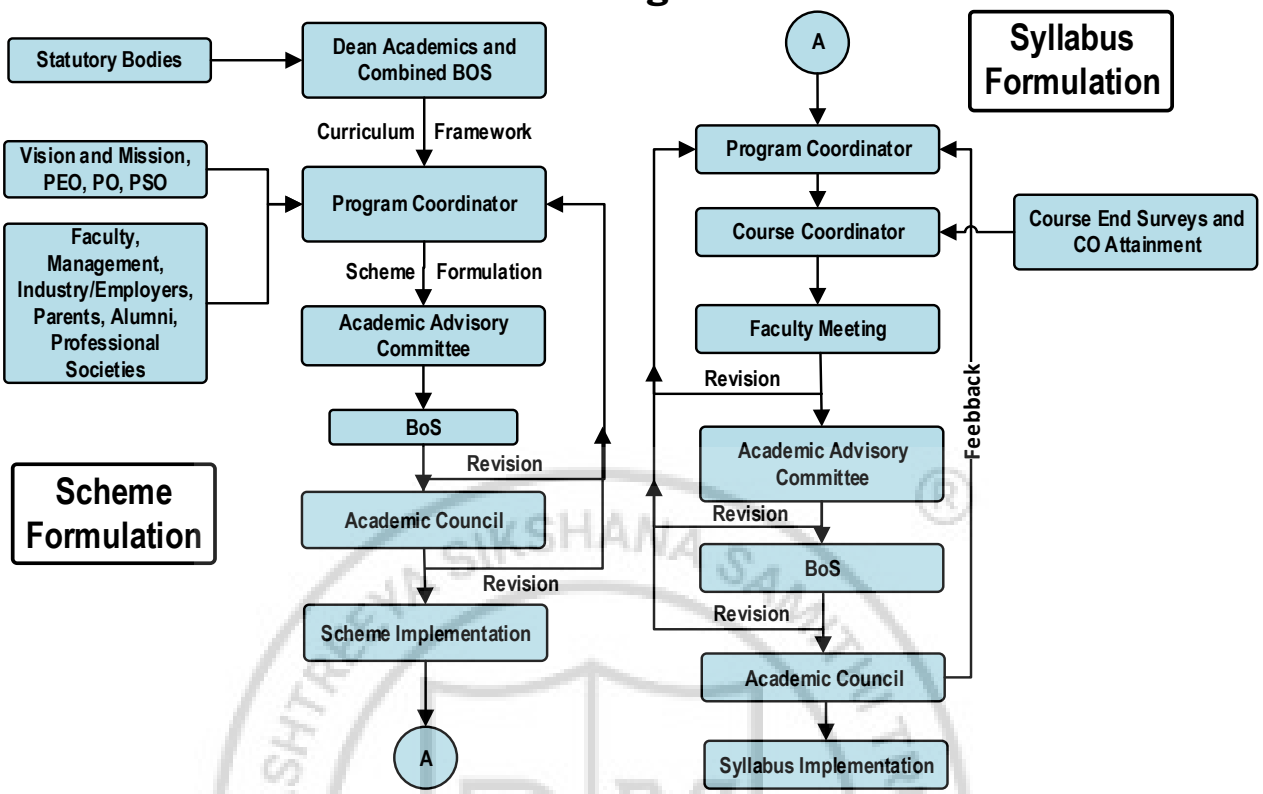
Unit-I	**10 Hrs**
Multivariable Calculus: **Partial Differentiation:** Introduction, simple problems. Total derivative, composite functions. Jacobians – simple problems. **Vector Differentiation:** Introduction, velocity and acceleration, gradient, divergence – solenoidal vector function, curl – irrotational vector function and Laplacian, simple problems.	
Unit – II	**10 Hrs**
Differential Equations: Higher order linear differential equations with constant coefficients, solution of homogeneous equations - Complementary functions. Non-homogeneous equations – Inverse differential operator method of finding particular integral based on input function (force function).	
Unit –III	**10 Hrs**
Numerical Methods: Solution of algebraic and transcendental equations – Intermediate value property, Newton-Raphson method. Solution of first order ordinary differential equations – Taylor series and 4^{th} order Runge-Kutta methods. Numerical integration – Simpson's $1/3^{rd}$, $3/8^{th}$ and Weddle's rules. (All methods without proof)**.**	

Course Outcomes: After completing the course, the students will be able to	
CO1:	Illustrate the fundamental concepts of partial differentiation, vector differentiation, higher order linear differential equations and numerical methods.
CO2:	Derive the solution by applying the acquired knowledge of differential calculus, differential equations, velocity, and acceleration vectors to the problems of engineering applications.
CO3:	Evaluate the solution of the problems using appropriate techniques of differential calculus, vector differentiation, differential equations, and numerical methods.
CO4:	Compile the overall knowledge of differential calculus, vector differentiation, differential equations and numerical methods gained to engage in life – long learning.

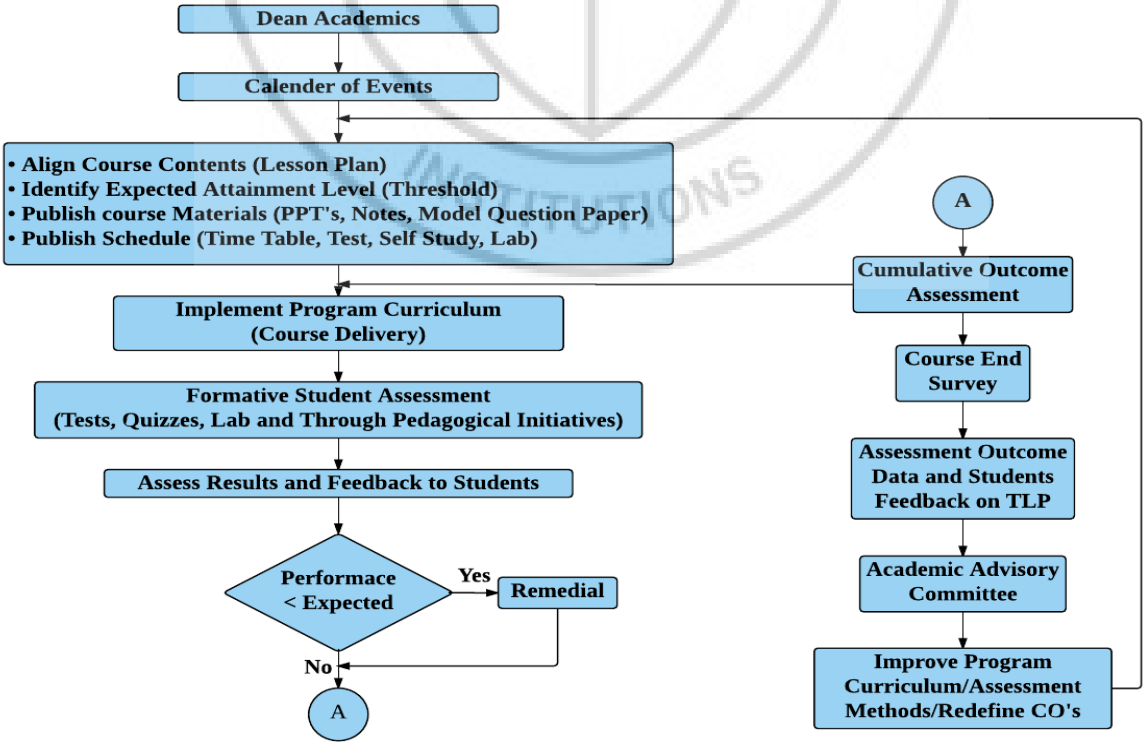
Reference Books	
1	Higher Engineering Mathematics, B.S. Grewal, 44^{th} Edition, 2015, Khanna Publishers, ISBN: 978-81-933284-9-1.
2	Higher Engineering Mathematics, B.V. Ramana, 11^{th} Edition, 2010, Tata McGraw-Hill, ISBN: 978-0-07-063419-0.
3	A Textbook of Engineering Mathematics, N.P. Bali & Manish Goyal, 7^{th} Edition, 2010, Lakshmi Publications, ISBN: 978-81-31808320.
4	Advanced Engineering Mathematics, E. Kreyszig, 10^{th} Edition (Reprint), 2016. John Wiley & Sons, ISBN: 978-0470458365.

RUBRIC FOR THE CONTINUOUS INTERNAL EVALUATION (THEORY)		
#	**COMPONENTS**	**MARKS**
1.	**QUIZZES:** Quizzes will be conducted in online/offline mode. TWO QUIZZES will be conducted & Each Quiz will be evaluated for 10 Marks. **THE SUM OF TWO QUIZZES WILL BE THE FINAL QUIZ MARKS.**	**20**
2.	**TESTS:** Students will be evaluated in test, descriptive questions with different complexity levels (Revised Bloom's Taxonomy Levels: Remembering, Understanding, Applying, Analyzing, Evaluating, and Creating). TWO TESTS will be conducted. Each test will be evaluated for 30 Marks, adding upto 60 Marks. **FINAL TEST MARKS WILL BE AVERAGE OF TWO TESTS.**	**30**
	MAXIMUM MARKS FOR THE CIE THEORY	**50**

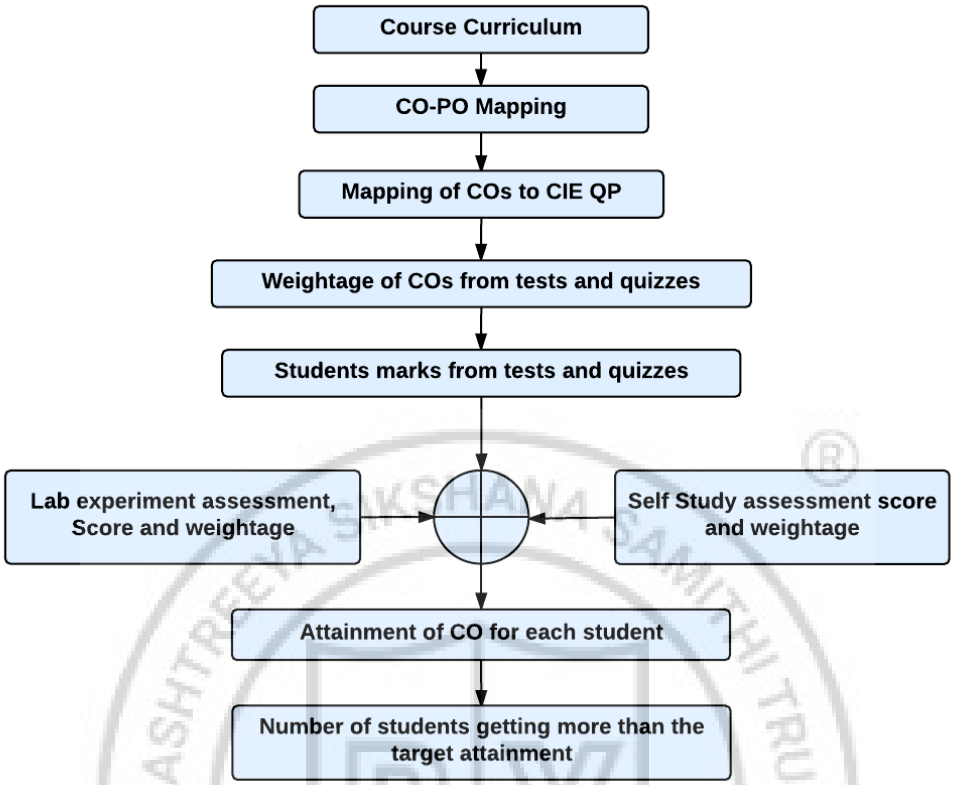
Curriculum Design Process



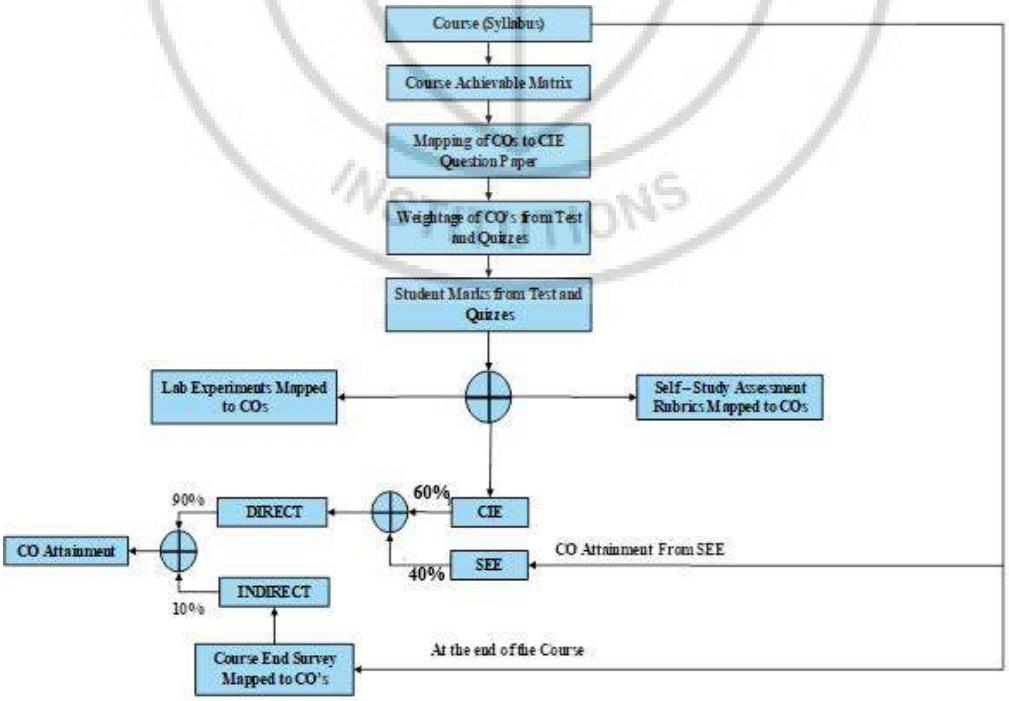
Academic Planning and Implementation



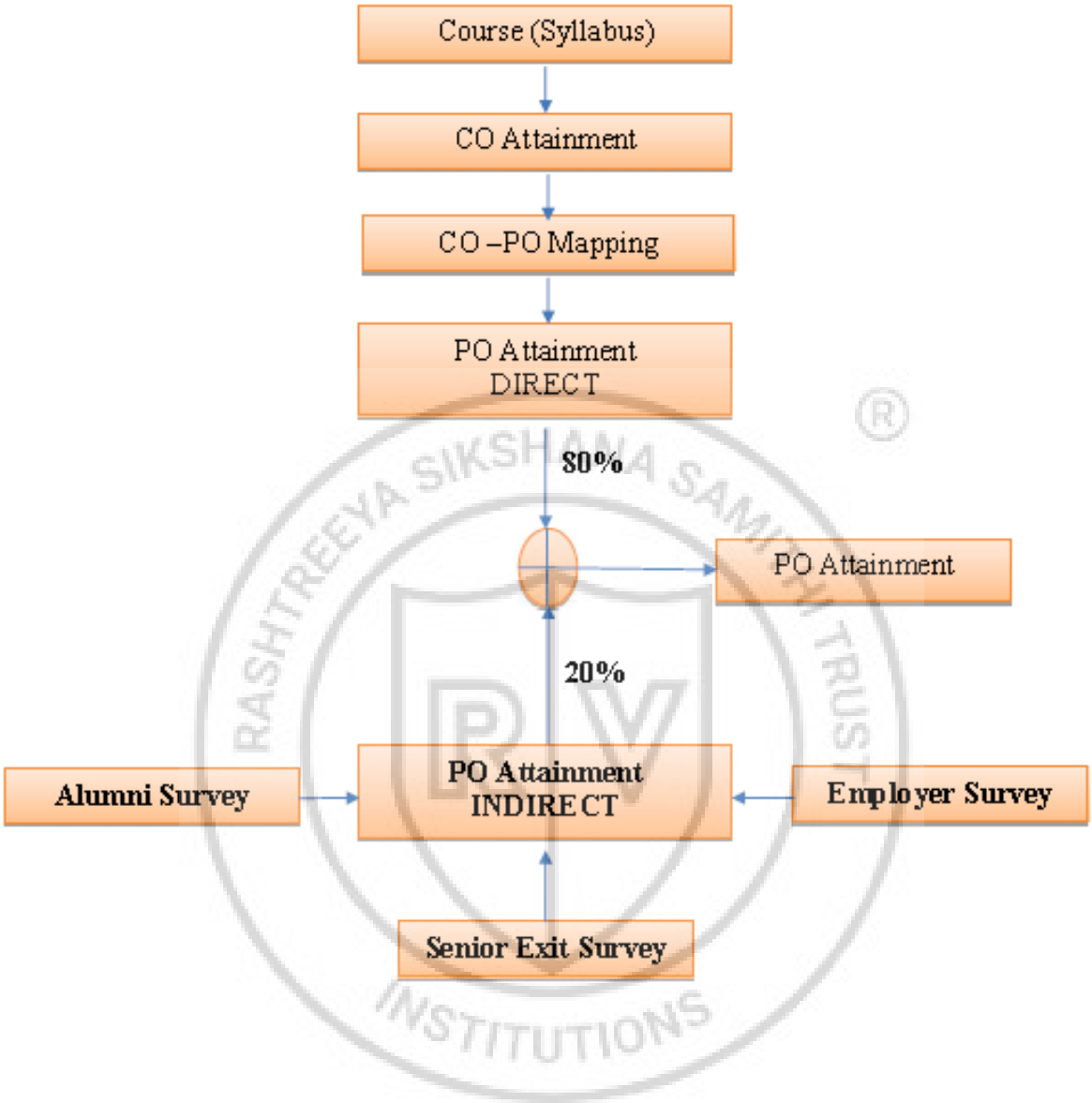
Process For Course Outcome Attainment



Final CO Attainment Process



Program Outcome Attainment Process



KNOWLEDGE & ATTITUDE PROFILE

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

PROGRAM OUTCOMES (POs)

- **PO1:** Engineering Knowledge: Apply knowledge of mathematics, natural science, computing, engineering fundamentals and an engineering specialization as specified in WK1 to WK4 respectively to develop to the solution of complex engineering problems.
- **PO2:** Problem Analysis: Identify, formulate, review research literature and analyze complex engineering problems reaching substantiated conclusions with consideration for sustainable development. (WK1 to WK4)
- **PO3:** Design/Development of Solutions: Design creative solutions for complex engineering problems and design/develop systems/components/processes to meet identified needs with consideration for the public health and safety, whole-life cost, net zero carbon, culture, society and environment as required. (WK5)
- **PO4:** Conduct Investigations of Complex Problems: Conduct investigations of complex engineering problems using research-based knowledge including design of experiments, modelling, analysis & interpretation of data to provide valid conclusions. (WK8).
- **PO5:** Engineering Tool Usage: Create, select and apply appropriate techniques, resources and modern engineering & IT tools, including prediction and modelling recognizing their limitations to solve complex engineering problems. (WK2 and WK6)
- **PO6**: The Engineer and The World: Analyze and evaluate societal and environmental aspects while solving complex engineering problems for its impact on sustainability with reference to economy, health, safety, legal framework, culture and environment. (WK1, WK5, and WK7).
- **PO7:** Ethics: Apply ethical principles and commit to professional ethics, human values, diversity and inclusion; adhere to national & international laws. (WK9)
- **PO8:** Individual and Collaborative Team work: Function effectively as an individual, and as a member or leader in diverse/multi-disciplinary teams.
- **PO9:** Communication: Communicate effectively and inclusively within the community and society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations considering cultural, language, and learning differences
- **PO10:** Project Management and Finance: Apply knowledge and understanding of engineering management principles and economic decision-making and apply these to one's own work, as a member and leader in a team, and to manage projects and in multidisciplinary environments.
- **PO11:** Life-Long Learning: Recognize the need for, and have the preparation and ability for i) independent and life-long learning ii) adaptability to new and emerging technologies and iii) critical thinking in the broadest context of technological change. (WK8)

INNOVATIVE TEAMS OF RVCE

Ashwa Mobility Foundation (AMF): Designs and fabricates Formula-themed race cars and mobility solutions to address urban transportation issues.

Astra Robotics Team: Focuses on designing and building application-specific robots.

Coding Club: Helps students gain coding skills and succeed in competitions like GSoC and ACM-ICPC.

Entrepreneurship Development Cell (E-Cell): Promotes entrepreneurship through workshops, speaker sessions, and mentoring for startups.

Frequency Club Team: Works on software and hardware, emphasizing AI and Machine Learning.

Team Garuda: Develops a supermileage urban concept electric car and E-mobility products.

Team Jatayu: Builds low-cost UAVs with autonomous capabilities for various tasks.

Solar Car Team: Aims to create a solar electric vehicle for sustainable transportation.

Team Antariksh: Focuses on space technology and the development of operational rockets.

Team Chimera: Builds a Formula Electric Car through R&D in E-Mobility.

Helios Racing Team: Designs and tests All-Terrain Vehicles, participating in SAE's BAJA competitions.

Team Hydra: Develops autonomous underwater vehicles for tasks like water purification.

Team Krushi: Creates low-cost farming equipment to assist farmers in cultivation and harvesting.

Team Vyoma: Designs and tests radio-controlled aircraft and UAVs.

Team Dhruva: Engages in astronomy-related activities and collaborates on projects with organizations like ICTS and IIA.

Ham Club: Promotes Amateur Radio and explores technical innovations in communications, especially for disaster response.

Cultural Activity Teams

1. AALAP (Music club)
2. DEBSOC (Debating society)
3. CARV (Dramatics club)
4. FOOTPRINTS (Dance club)
5. QUIZCORP (Quizzing society)
6. ROTARACT (Social welfare club)
7. RAAG (Youth club)
8. EVOKE (Fashion team)
9. f/6.3 (Photography club)
10. CARV ACCESS (Film-making

NSS of RVCE

NCC of RVCE

VISION

Leadership in Quality Technical Education, Interdisciplinary Research & Innovation, with a Focus on Sustainable and Inclusive Technology

MISSION

- To deliver outcome based Quality education, emphasizing on experientiallearning with the state of the art infrastructure.
- To create a conducive environment for interdisciplinary research and innovation.
- To develop professionals through holistic education focusing on individual growth, discipline, integrity, ethics and social sensitivity.
- To nurture industry-institution collaboration leading to competency enhancement and entrepreneurship.
- To focus on technologies that are sustainable and inclusive, benefiting all sections of the society.

QUALITY POLICY

Achieving Excellence in Technical Education, Research and Consulting through an Outcome Based Curriculum focusing on Continuous Improvement and Innovation by Benchmarking against the global Best Practices.

CORE VALUES

Professionalism, Commitment, Integrity, Team Work, Innovation