MIT
Quest for Excellence

Maharashtra Institute of Technology

Chhatrapati Sambhajinagar

An Autonomous Institute Affiliated to

Dr. Babasaheb Ambedkar Marathwada University,

Chhatrapati Sambhajinagar, Maharashtra (India)

Second Year B. Tech Syllabus

(Agricultural Engineering)

(NEP 2020 Based Curriculum)

WEF AY 2024-25

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Abbreviations used in this document

AEC	Ability Enhancement Course
AED	**Agricultural Engineering Department**
CIE	Continuous Internal Evaluation
ELC	Experiential Learning Course
ESE	End-Semester Examination
HSSM	Humanities Social Science & Management
Hrs	Hours
ISE	In-Semester Examination
L	Lecture (Theory)
MDM	Multidisciplinary Minor
MIT	**Maharashtra Institute of Technology**
NEP	National Education Policy 2020
OEC	Open Elective Course
OJT	On-Job Training
P	Practical
PCC	Program Core Course
S3	Semester -III
S4	Semester -IV
T	Tutorial
TA	Teacher Assessment
UG	Under Graduate
VEC	Value Education Course
VSEC	Vocational and Skill Enhancement Course
WEF	With Effect From
Wk	Week

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Second Year B. Tech (Agricultural Engineering) Syllabus Structure

WEF 2024-25 (NEP 2020 Based Curriculum)

Semester-III

Sr. No.	Course Category	Course Code	Course Title	L	T	P	Contact Hrs./Wk	Credits	ISE -I	ISE -II	CIE	TA	ESE / Oral	Total
Orientation Program (2 Days)														
1	PCC	AED201	Farm Machinery and Equipment	3	-	-	3	3	15	15	10	10	50	100
2	PCC	AED202	Strength of Materials	2	-	-	2	2	15	15	10	10	50	100
3	PCC	AED203	Fluid Mechanics and Open Channel Hydraulics	2	-	-	2	2	15	15	10	10	50	100
4	MDM	AED211	Environment Impact Assessment	2	-	-	2	2	15	15	10	10	50	100
5	OEC	OEC241A TO OEC241F	Open Elective Course -1	3	-	-	3	3	15	15	10	10	50	100
6	HSSM	HSM201/ HSM202	Engineering Economics and Management / Innovation and Entrepreneurship	2	-	-	2	2	-	10	-	15	-	25
7	VEC	VEC201 / VEC202	Universal Human Values/ Environmental Studies	1	-	2	3	2	-	10	-	15	-	25
8	ELC	ELC221	Community Engagement Project	-	-	4	4	2	-	-	-	25	-	25
9	OEC[$]	SEM222	Seminar	-	-	2	2	1	-	-	-	25	-	25
10	PCC	AED223	Strength of Materials Lab	-	-	2	2	1	-	-	-	25	25	50
11	PCC	AED224	Fluid Mechanics and Open Channel Hydraulics Lab	-	-	2	2	1	-	-	-	25	25	50
S3				**15**	**-**	**12**	**27**	**21**	**75**	**95**	**50**	**180**	**300**	**700**

Open Elective-1 Course Basket:

Course Code	Course Title	Name of Department offering the Course	$ Seminar (SEM222)
OEC241A	Introduction to Sociology	Basic Sciences & Humanities	Seminar to be prepared and presented on the topics related to course opted as **Open Elective -1.**
OEC241B	Technology for Rural Development	Civil Engineering	
OEC241C	Professional Ethics and Corporate Social Responsibility	Civil Engineering	
OEC241D	Constitution of India	Electrical Engineering	
OEC241E	Electrical, Fire and Vehicle Safety	Electrical Engineering	
OEC241F	Emotional Intelligence	Mechanical engineering	

As per the NEP 2020 guidelines, **Honor Degree** courses are offered by Department (**Major Discipline**), whereas the Minor Degree courses (referred as **Double Minor**) are offered by **another** department. **Honor Degree or Double Minor Degree is Optional**. The students those who fulfills the eligibility norms can enroll for it. The course curriculum and guidelines are given in a **separate Information Booklet, available at the Department**.

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Semester-IV

Sr. No.	Course Category	Course Code	Course Title	L	T	P	Contact Hrs./Wk	Credits	ISE -I	ISE -II	CIE	TA	ESE / Oral	Total
1	PCC	AED251	Soil and Water Conservation Engineering	3	-	-	3	3	15	15	10	10	50	100
2	PCC	AED252	Post Harvest Engineering	2	-	-	2	2	15	15	10	10	50	100
3	PCC	AED253	Irrigation and Drainage Engineering	2	-	-	2	2	15	15	10	10	50	100
4	MDM	AED261	Climate Change in Agriculture	2	-	-	2	2	15	15	10	10	50	100
5	OEC	OEC291A – OEC291H	Open Elective Course -2	2	-	-	2	2	15	15	10	10	50	100
6	HSSM	HSM201/ HSM202	Engineering Economics and Management / Innovation and Entrepreneurship	2	-	-	2	2	-	10	-	15	-	25
7	VEC	VEC201 / VEC202	Universal Human Values/ Environmental Studies	1	-	2	3	2	-	10	-	15	-	25
8	VSEC	VSE271	Professional English	1	-	2	3	2	-	10	-	15	-	25
9	AEC	AEC272	Personality and Leadership Development Skills	-	-	4	4	2	-	-	-	25	-	25
10	PCC	AED273	Post Harvest Engineering Lab	-	-	2	2	1	-	-	-	25	25	50
11	PCC	AED274	Irrigation and Drainage Engineering Lab	-	-	2	2	1	-	-	-	25	25	50
S4				**15**	**-**	**12**	**27**	**21**	**75**	**105**	**50**	**170**	**300**	**700**

Open Elective-2 Course Basket:

Course Code	Course Title	Name of Department offering the Course
OEC291A	Smart Agriculture Practices	Agricultural Engineering
OEC291B	Solid Waste Management	Civil Engineering
OEC291C	Data Communication	Computer Science and Engineering
OEC291D	E-Waste Management	Electronics and Computer Engineering
OEC291E	Programmable Logic Controller	Electrical Engineering
OEC291F	Information and Knowledge Management	Emerging Science and Technology
OEC291G	Renewable Energy Resources	Mechanical Engineering
OEC291H	Plastic Recycling	Plastic and Polymer Engineering

Students may opt for Exit after successful completion of Second Year provided s/he earns 8 additional credits through coursework (VSEC) and/or Internship/OJT during the summer vacation. S/he will be awarded a 2-Year UG Diploma in Agricultural Engineering. Details are available at the Department.

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Semester-III
Detail Course Curriculum

Second Year B. Tech Syllabus
(Agricultural Engineering)

(NEP 2020 Based Curriculum)

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Faculty of Science & Technology Syllabus of Second Year B. Tech (Agricultural Engineering) (Semester III)	
Course Category: PCC Course Code: AED201 Course: Farm Machinery and Equipment Teaching Scheme: Theory- 3 Hrs./week	**Credits: 3-0-0** In Semester Examination-I: 15 Marks In Semester Examination-II: 15Marks Teacher Assessment: 10 Marks Continuous Internal Evaluation: 10 Marks End Semester Examination: 50 Marks End Semester Examination (Duration): 2 Hrs.
Prerequisite	A Degree holder in Agricultural Engineering must know the agricultural operations, Control, maintenance and repair of different machines used in the agricultural sector.
Objectives	1. To know the conventional & modern agricultural operations. 2. To impart student know-how about different farm machinery used in farms. 3. To know the Material of construction, working principles, adjustments, capacities and efficiencies of different farm machines. 4. To be able to calculate the cost of operation of different agricultural machines.
Unit-I	**Introduction to farm mechanization** – Scope, Merits, Limitations, Status of mechanization in the country and state - Classification of farm machines based on operation, power source, in relation to power unit etc. Power units/sources for farm machinery/implements, hitching systems and controls on farm machinery. **(06 Hrs)**
Unit-II	**Seedbed preparation operations and its classification** - Concepts of deep tillage, rotary tillage and minimum tillage - Introduction to machines/implements used for primary and secondary tillage operations, Methods of ploughing, Indigenous plough, Mouldboard plough, and disc plough: functional components, type, constructional details, accessories and attachments. Horizontal suction, vertical suction of MB plough and Disc geometry of disc plough. Chisel plough and sub-soiler: functional components, type, constructional details, accessories and attachment. **(07 Hrs)**
Unit-III	**Secondary tillage implements-** Forces acting on tillage implements, Draft measurement of tillage implements and calculation of power requirement for the tillage implements. Study of the cultivator, harrows, rotary tillers, levelling and paddling implements. Calculation of field capacity and field efficiency. **(06 Hrs)**
Unit-IV	**Introduction to sowing, planting and transplanting equipment** - Introduction to seed drills, no-till drills, and strip-till drills. Introduction to planters- bed planters and other planting equipment, rice transplanters, types of furrow openers, metering systems in drills and planters, Calibration of seed-drills/ planters and adjustments. **(08 Hrs)**

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Unit-V	**Introduction to plant protection equipment** – sprayers and dusters, Classification of sprayers, Types of nozzles – components and function, Calculations for calibration of sprayers and chemical application rates. Introduction to interculture equipment - Use of weeders – manual and powered. Study of functional requirements of weeders and main components. Familiarization of fertilizer application equipment. **(06 Hrs)**
Unit-VI	**Harvesting and threshing-** Principles and types of cutting mechanisms, construction and adjustments of shear and impact-type cutting mechanisms. Crop harvesting machinery: mowers, windrowers, reapers, reaper binders and forage harvesters. Forage chopping and handling equipment. Maize harvesting and shelling equipment, Root crop harvesting equipment– potato and groundnut digger. Cotton picking and Sugarcane harvester. Threshing mechanics and various types of threshers. Power thresher, straw combines and grain combines. Cost analysis of farm machinery. **(06 Hrs)**

References

Sr. No.	Title	Author	Publication	Edition
1.	Elements of Agricultural Engineering	Dr. Jagdishwar Sahay	Standard Publishers	5th
2.	Principles of Agricultural Engineering, Vol-I	A. M. Michel & T.P. Ojha	Jain Brothers	10th
3.	Principles of Farm Machinery	C. P. Nakra	CBS Publication	3rd
4.	Farm Machines & Equipment	D. N. Sharma &S. Mukesh	Dhanpat Rai Publishing	3rd

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Faculty of Science & Technology Syllabus of Second Year B. Tech (Agricultural Engineering) (Semester III)	
Course Category: PCC Course Code: AED202 Course: Strength of Materials Teaching Scheme: Theory: 2 Hrs./week	**Credits: 2-0-0** In Semester Examination-I: 15 Marks In Semester Examination-II: 15Marks Teacher Assessment: 10 Marks Continuous Internal Evaluation: 10 Marks End Semester Examination: 50 Marks End Semester Examination (Duration): 02 Hrs.
Prerequisite	The purpose of the subject of Strength of Materials is to make the students aware of the limiting values of stresses, safe carrying stresses, and various mechanical properties of Materials.
Objectives	1. To learn about the concept of stress, strain, and deformation of solids and the state of stress. 2. To learn the bending moment, shear force, and the corresponding stress distribution for different types of beams. 3. To know the concepts of strain energy, principal stress, and principal planes.
Unit-I	**Simple Stresses and Strains:** Mechanical properties of materials, Simple stress and strain, Stress-Strain Curve for Steel, Ductile Material, Brittle Material, Hooke's Law, Shearing Stresses, Bearing stresses, Composite sections, Statically Indeterminate Members, temperature stresses, lateral strains and linear strains, elastic constants, biaxial and triaxial deformations. **05 Hrs)**
Unit-II	**Shear Force and Bending Moment:** Concept, Types of Supports, beam and loads, shear force and bending moments, Shear force and bending moment diagrams for statically determinate beams subjected to various loading conditions like UDL, UVL, bracket loads, point loads and moments, etc. SF and BM for sections with varying Young's modulus and moment of Inertia. **(05 Hrs)**
Unit-III	**Theory of simple bending:** Pure bending, assumptions made in the theory of simple bending, neutral axis, a moment of resistance, section modulus, Flexural formula, and Filched Beam. **(04 Hrs)**
Unit-IV	**Shear Stress Distribution:** Shear stress equation, Distribution of shear stress over rectangular, circular, and triangular sections, complementary shear, Direct and bending stresses: Direct Bending stress in a column. Core of section for rectangular, hallow rectangular, circular, and hallow circular section. **(04 Hrs)**

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Unit-V	**Theory of Torsion:** Torsional Formula, Assumptions made in the theory of torsion, Polar modulus, torsional stresses, Power Transmission, torsional stress on a composite shaft for various conditions. **(04 Hrs)**
Unit-VI	**Principal stresses and strains:** Concept, stress on an oblique plane, Method of finding stresses on an inclined section of body Analytical and Graphical method (Mohr's circle diagram). **(04 Hrs)**

References

Sr. No.	Title	Author	Publication	Edition
1.	Strength of Materials	S. Ramamrutham	Dhanpatrai and Sons	14th
2.	Strength of Materials	R.K. Bansal	Laxmi Publications	4th
3.	Mechanics of Materials	R. C. Hibbler	Pearson Education	4th
4.	Mechanics of Structure, vol-I	Junnarkar	Charotar	4th

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Faculty of Science & Technology Syllabus of Second Year B. Tech (Agricultural Engineering) (Semester III)	
Course Category: PCC Course Code: AED203 Course: Fluid Mechanics and Open Channel Hydraulics Teaching Scheme: Theory: 02 Hrs./week	**Credits: 2-0-0** In Semester Examination-I: 15 Marks In Semester Examination-II: 15Marks Teacher Assessment: 10 Marks Continuous Internal Evaluation: 10 Marks End Semester Examination: 50 Marks End Semester Examination (Duration): 02 Hrs.
Prerequisite	• Basic understanding of calculus and differential equations. • Familiarity with physics principles, especially fluid properties and mechanics. • Knowledge of basic engineering mechanics and mathematics.
Objectives	1. Understand and apply principles of fluid mechanics to analyze and predict fluid flow behaviors. 2. Develop skills to design and evaluate hydraulic structures, ensuring efficiency and safety in water management. 3. Apply theoretical knowledge to solve real-world engineering problems related to open channel hydraulics and fluid dynamics.
Unit-I	**Properties of fluids:** ideal and real fluid, units; Pressure and its measurement, Pascal's law, pressure forces on plane and curved surfaces, the centre of pressure, pressure diagram, Buoyancy, Archimedes principle, metacentre and metacentric height. **(05 Hrs)**
Unit-II	**Kinematics of fluid flow:** Lagrangian and Eulerian description of fluid motion, continuity equation, path lines, streak lines and streamlines, stream function, velocity potential and flow net. Types of fluid flow, translation, rotation, circulation and vorticity, vortex motion. **(05 Hrs)**
Unit-III	**Dynamics of fluid flow:** Bernoulli's theorem, venturi meter, orifice meter and pitot tube, siphon; Flow through orifices (measurement of discharge, measurement of time), flow through mouthpieces, Flow over notches, flow over weirs, end contraction of rectangular weirs, ventilation of weirs, various types of nappe. **(04 Hrs)**
Unit-IV	**laminar and turbulent flow in pipes:** general equation for head loss Darcy equation, minor and major hydraulic losses through pipes and fittings, flow through network of pipes, Chezy's formula for loss of head in pipes, flow through simple and compound pipes, transmission of power through pipes. **(04 Hrs)**
Unit-V	**Open channel design and hydraulics:** Chezy's formula, best hydraulic section, velocity and pressure profiles in open channels, hydraulic jump; Discharge measurement in open channels: current meter. **(04 Hrs)**

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Unit-VI	**Dimensional analysis and similitude:** Rayleigh's method and Buckingham's `pi' theorem, types of similarities, dimensionless numbers. **(04 Hrs)**

	Sr. No.	Title	Author	Publication	Edition
References	1.	A Textbook of Fluid Mechanics	Bansal R K. 2019.	Laxmi Publications, New Delhi	10th
	2.	Hydraulics, Fluid Mechanics & Hydraulic Machines.	Ramanathan S.	Dhanpat Rai & Sons, Delhi	16th
	3.	Hydraulics, Fluid Mechanics and Hydraulic Machines.	Khurmi R S and Khurmi N.	S. Chand & Co. Ltd., New Delhi.	24th
	4.	Hydraulics & Fluid Mechanics, including hydraulic machines.	Modi P N and Seth S M. 2017	Standard Book House, Delhi	24th

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Faculty of Science & Technology Syllabus of Second Year B.Tech. (Agricultural Engineering) (Semester III)	
Course Category: MDM Course Code: AED211 Course: Environment Impact Assessment Teaching Scheme: Theory: 2 Hrs./week	**Credits: 2-0-0** In Semester Examination-I: 15 Marks In Semester Examination-II: 15Marks Teacher Assessment: 10 Marks Continuous Internal Evaluation: 10 Marks End Semester Examination: 50 Marks End Semester Examination (Duration): 2 Hrs.

Prerequisite	Environmental science and concept of ecology.
Objectives	1. Students would overview the concepts, methods, issues, and various forms and stages of EIA process. 2. Students will be able to examine the development of EIA in India and highlight the diversity of approach and impact of the EIA process.
Unit-I	**Introduction and Evolution of EIA:** Introduction to Environmental Impact Assessment, Origin of EIA, Stages in EIA, thorough discussion of steps in EIA. **Establishments of Procedure:** Legislative Option, Project Screening for EIA, Public Participation in EIA process. **(02 Hrs)**
Unit-II	**Impact Assessment:** Background information, IA methods, environmental impact assessment methodology, documentation and selection process, environmental indices and indicators for describing the affected environment, and Life cycle assessment. **(04 Hrs)**
Unit-III	**Air and Noise Environment:** Prediction and assessment of impact for air and noise environment, Basic information of air quality, identification of type and quantity of air pollutant, existing air quality and air quality standards, impact prediction and assessment, mitigation. Basic information of noise, existing noise levels and standards, prediction of noise levels and assessment of impact, mitigations. **(05 Hrs)**
Unit-IV	**Water and Soil Environment:** Prediction and assessment of impact for water and soil environment, Basic information of water quality (Surface water and groundwater), water quality standards, identification of impact, prediction of impact and assessment, mitigations. Background information of soil environment, soil, and groundwater standards, prediction and assessment of impact for groundwater and soil, mitigations. **(05 Hrs)**
Unit-V	**Decision Methods for Evaluating Alternative:** Public participation in environmental decision-making, Regulatory requirements, environmental impact assessment process, objectives of public participation, and verbal communication in EIA studies. **(05 Hrs)**

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Unit-VI	**Environmental Impact Assessment Report:** Rapid and Comprehensive EIA, general structure of EIA document, Environmental management plan; post environmental monitoring. Latest EIA notification by Ministry of Environment and Forest (Govt. of India): Provisions in the EIA notification, Procedure for public hearing, post environmental monitoring, and obtaining Environmental clearance for construction projects. **(05 Hrs)**

References

Sr. No.	Title	Author	Publication	Edition
1.	Environmental Impact Assessment	Canter R.L.	Mc Graw Hill International	1st
2.	Environmental Impact Assessment Theory and Practice	Peter Watten (Eds.)	Unwin Hyman	2nd
3.	Environmental Impact Assessment	R.R. Barthwal	New Age International	1St
4.	Environmental Impact Analysis Handbook	John G. Rau and David C. Wooten	McGraw Hill Book Company	1St

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Faculty of Science & Technology
Syllabus of Second Year B.Tech. (All Branches) (Semester III)
Open Elective-1 offered by the Department of Basic Sciences and Humanities

Course Category: OEC Course Code: OEC241A Course: Introduction to Sociology Teaching Scheme: Theory: 03 Hrs./week	**Credits: 3-0-0** In-Semester Examination -I: 15 Marks In-Semester Examination -II: 15Marks Teacher Assessment: 10 Marks Continuous Internal Evaluation: 10 Marks End Semester Examination: 50 Marks End Semester Examination (Duration):02 Hrs.

Prerequisite	Communication Skills, critical thinking skills.
Objectives	The objective of this course is to let the students: 1. Describe foundational sociological theories and concepts. 2. Apply sociological perspectives to analyze social phenomena relevant to engineering contexts. 3. Evaluate the impact of social factors on engineering practices and outcomes. 4. Analyze ethical issues related to engineering in society. 5. Develop critical thinking skills for assessing social implications of engineering projects. 6. Communicate effectively about sociological issues within engineering communities.
Unit-I	**Introduction to Sociology:** Definition and subject matter of sociology, Sociology as a science and its nature, Sociology as a means to establish social harmony, Scope of sociology and early thinkers, perspectives in sociology, functionalist perspective, conflict perspective, interactionist, sociology and other social sciences, society, evolution of societies, agrarian society, hunter-gatherer society, feudal society, information society, tribal society, industrial societies, postindustrial society. **(07 Hrs)**
Unit-II	**Socialization and Culture:** Definition and importance of socialization in shaping individual identity and behaviour, Primary socialization: Family, peers. Secondary socialization: School, media, religion, and other social institutions, workplace, Cultural Norms, Values, and Symbols. **(06 Hrs)**
Unit-III	**Social Structure and Inequality:** Social stratification and mobility, Race, class, gender, and intersectionality, social institutions (family, education, economy, politics), Social institutions, need of an institution, characteristics of institution, kinds of institutions, functions of institutions, primary institutions, difference between institution & community: social stratification, gender stratification. **(06 Hrs)**
Unit-IV	**Social Change and Globalization:** Social change, theories of change types of theories of change, evolutionary, functionalist, conflict, factors of social change, resistance to change, Globalization and its consequences, social movements and activism. **(06 Hrs)**

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Unit-V	**Sociological Research Methods:** Ethical Considerations in Sociological Research, Informed consent, confidentiality and anonymity, avoiding harm to participants, Research ethics review processes, Qualitative and Quantitative Research Methods, Ethnography, Participant observation, Interviews, Focus groups, Case studies, Surveys, Experiments, Content analysis, Secondary data analysis. **(07 Hrs)**
Unit-VI	**Engineering for Social Equity:** Sociology of technology, Engineering ethics and social responsibility, Sociotechnical systems and their impacts, Introduction to the concept of the Bottom of the Pyramid (BoP) and its significance in global engineering. Ethical considerations in designing products and services for BoP markets. Innovative design approaches for affordability, accessibility, and sustainability in BoP contexts. Strategies for designing inclusive and equitable sociotechnical systems that prioritize human well-being and social justice. Sociological dimensions of emerging technologies (e.g., AI, biotechnology, renewable energy). **(07 Hrs)**

References

Sr. No.	Title	Author	Publication	Edition
1.	Sociology and Economics for Engineers	Premvir Kapoor	Khanna Book Publishing (2018)	1st
2.	Principles of Sociology - I	Dr. S.R Myneni	Allahabad law agency	2nd

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Faculty of Science & Technology
Syllabus of Second Year B.Tech. (All Branches) (Semester III)
Open Elective-1 offered by the Department of Civil Engineering

Course Category: OEC Course Code: OEC241B Course: Technology for Rural Development Teaching Scheme: Theory: 03 Hrs./week	**Credits: 3-0-0** In-Semester Examination -I: 15 Marks In-Semester Examination -II: 15Marks Teacher Assessment: 10 Marks Continuous Internal Evaluation: 10 Marks End Semester Examination: 50 Marks End Semester Examination (Duration): 02 Hrs.

Prerequisite	No special requisites required
Objectives	1. To understand the role of technology in the development of rural areas. 2. To explore various technologies suitable for rural applications. 3. To promote sustainable and inclusive development through technological interventions.
Unit-I	**Introduction to Rural Development:** Definition and scope of rural development; Characteristics of rural areas in India Importance of rural development in national growth; Government policies and programs for rural development. **(06 Hrs)**
Unit-II	**Agricultural Technologies:** Advanced agricultural practices; Mechanization in agriculture; Irrigation technologies Soil health and fertility management; post-harvest technologies. **(06 Hrs)**
Unit-III	**Renewable Energy Technologies:** Solar energy: solar PV and thermal systems; Wind energy: small-scale wind turbines Biomass energy: biogas and biofuels; Micro-hydropower systems; Implementation and case studies in rural areas. **(07 Hrs)**
Unit-IV	**Water and Sanitation Technologies:** Safe drinking water technologies; Low-cost sanitation solutions; Water conservation techniques; Wastewater management; Community-based approaches to water and sanitation. **(06 Hrs)**
Unit-V	**Advanced Irrigation Technologies:** Automation in irrigation systems, Use of sensors and remote sensing in irrigation, Irrigation scheduling and management, Water-saving technologies and practices, Use of GIS in irrigation. **(07 Hrs)**
Unit-VI	**Rural empowerment:** Causes of Rural Backwardness, Need for Rural technology Development and its Constraints, Rural Education with emphasis on Adult and Community Education, Development of Rural Women and Children- Status and Development Strategies. **(07 Hrs)**

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	Sr. No.	Title	Author	Publication	Edition
References	1	Rural Development: Principles, Policies, and Management	Singh, Katar	SAGE	1st
	2	Renewable Energy Engineering and Technology Principles and Practice	V. V. N. Kishore	TERI Press	1st
	3	Rural Water Supply and Sanitation	Sharma J. K.	Adrent Publications and Distributors	5th
	4	Irrigation Technology: Theory and Practice	S. B. Bhakar and Y. P. Rao	Agrotech Publishing Academy	2008
	5	Empowering Rural India: Experiments And Experiences	D. Sunder Raj, P. Siva Ram, R. Venkata Ravi	Kaniska Publishers Distributers	2006

Faculty of Science & Technology
Syllabus of Second Year B.Tech. (All Branches) (Semester III)
Open Elective-1 offered by the Department of Civil Engineering

Course Category: OEC Course Code: OEC241C Course: Professional Ethics and Corporate Social Responsibility Teaching Scheme: Theory: 03 Hrs./week	**Credits: 3-0-0** In-Semester Examination -I: 15 Marks In-Semester Examination -II: 15Marks Teacher Assessment: 10 Marks Continuous Internal Evaluation: 10 Marks End Semester Examination: 50 Marks End Semester Examination (Duration): 02 Hrs.

Prerequisite	No general prerequisites required
Objectives	1. To develop an understanding of professional ethics in different organizational contexts. 2. To identify, analyze, and resolve ethical issues in business decision-making. 3. To develop various corporate social Responsibilities and practices ine professional life
Unit-I	**Professional Ethics and Business:** The Nature of Business Ethics; Ethical Issues in Business; Moral Responsibility and Blame; Utilitarianism: Weighing Social Costs and Benefits; Rights and Duties of Business. **(06 Hrs)**
Unit-II	**Professional Ethics in the Marketplace:** Perfect Competition; Monopoly Competition; Oligopolistic Competition; Oligopolies and Public Policy Professional Ethics and the Environment: Dimensions of Pollution and Resource Depletion; Ethics of Pollution Control; Ethics of Conserving Depletable Resources. **(07 Hrs)**
Unit-III	**Professional Ethics of Consumer Protection:** Markets and Consumer Protection; Contract View of Business Firm's Duties to Consumers; Due Care Theory; Advertising Ethics; Consumer Privacy. **(06 Hrs)**
Unit-IV	**Introduction to Corporate Social Responsibility:** Concept, Scope & Relevance and Importance of CSR in Contemporary Society. CSR and Indian Corporations- Legal Provisions and Specification on CSR, A Score Card, Future of CSR. **(07 Hrs)**
Unit-V	**Exploring the Dualities of Business Sustainability:** Potential Business Benefits-Triple bottom line, Human resources, Risk management, Supplier relations; Criticisms and concerns of business; Motives; Misdirection. **(06 Hrs)**
Unit-VI	**Role of Business in Sustainable Development:** Sustainable Development, Role of Business in Sustainable Development, Sustainability Terminologies, Corporate Sustainability, Corporate Sustainability and Corporate Social Responsibility, Government

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	Role in improving Sustainability Reporting KYOSEI, Triple Bottom Line (TBL), Sustainability Reporting, Benefits of Sustainability Reporting, Global Reporting Initiative (GRI), Sustainability Reporting Framework Global Reporting Initiative (GRI) – Sustainability Reporting Guidelines UN Global Compact – Ten Principles, 2000, Sustainability Indices, Sustainability Reporting Framework in India, Challenges in Mainstreaming Sustainability Reporting. **(07 Hrs)**

References

Sr. No.	Title	Author	Publication	Edition
1	Business Ethics: Texts and Cases from the Indian Perspective	Ananda Das Gupta	Springer	1st
2	Business Ethics: Concepts and Cases	Manuel G. Velasquez.	Pearson	8th
3	Corporate Social Responsibility in India	Bidyut Chakrabarty	Routledge	1st

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Faculty of Science & Technology
Syllabus of Second Year B.Tech. (All Branches) (Semester III)
Open Elective-1 offered by the Department of Electrical Engineering

Course Category: OEC Course Code: OEC241D Course: Constitution of India Teaching Scheme: Theory: 03 Hrs./week	**Credits: 3-0-0** In-Semester Examination -I: 15 Marks In-Semester Examination -II: 15Marks Teacher Assessment: 10 Marks Continuous Internal Evaluation: 10 Marks End Semester Examination: 50 Marks End Semester Examination (Duration): 02 Hrs.

Prerequisite	No general prerequisites required
Objectives	1. To acquaint the students with legacies of constitutional development in India and help those to understand the most diversified legal document of India and philosophy behind it. 2. To make students aware of the theoretical and functional aspects of the Indian Parliamentary System. 3. To channel students' thinking towards a basic understanding of the constitutional principles and statutory institutions.
Unit-I	**Introduction to Constitution:** Meaning and Concept of Indian Constitution; Nature of Constitution; Brief Idea of Indian Constitution [Parts, Articles and Schedule]. **(06 Hrs)**
Unit-II	**Silent Features of Indian Constitution:** Written and Enacted Constitution; The longest and most detailed Constitution of the World; Rigidity and Flexible Constitution; Parliamentary system of Government; Federal system with unitary bias; Adult Franchise; Single Citizenship; Sovereign, Democratic, Republic; Secularism; Directive Principles of State Policy; Independent Judiciary; Fundamental Rights; Fundamental Duties. **(07 Hrs)**
Unit-III	**Fundamental Rights:** - Concept of State (Art. -12); Right to Equality (Art. -14 to 18); Right to Freedom (Art. -19 to 22); Right against Exploitation (Art. -23 & 24); Right to Religion (Art. -25 to 28); Right of Minorities (Art. -29 & 30); Constitutional Remedies (Art.-32). Fundamental Duties (Art.-51 A). **(06 Hrs)**
Unit-IV	**Directive Principles of State Policy (DPSPs):** Meaning and Significance of Directive Principles; Classification/ Principles of D.P.S.P.; Relationship between F.Rs. and D.P.S.P. **(07 Hrs)**
Unit-V	**Executives** Union Government the President, Council of Ministers and Prime Minister. State Government The Governor, Council of Ministers and Chief Minister. **(06 Hrs)**

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Unit-VI	**Election Commission:** Election Commission: Role and Functioning; Chief Election Commissioner and Election Commissioners; State Election Commission: Role and Functioning; Institute and Bodies for the welfare of SC/ST/OBC and women. **(07 Hrs)**

References

Sr. No.	Title	Author	Publication	Edition
1	Constitution of India, Bare Act.	Govt. of India.	Govt. of India.	49th
2	Our Constitution (An Introduction of Indians Constitution and Constitutional Law	Subhash C. Kashyap	National Book Trust,	5th
3	Introduction to the Constitution of India	Basu D.D.	Lexis Nexis	21st
4	Indian Prime Minister	Sharma L.N.	Macmillan Company of India,	-
5	Union Executive	Jain H.M.	Chaitanya Publishing House,	1st
6	Framing of Indian Constitution	Dr. S.N. Busi	New Age International Publisher	1st

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Faculty of Science & Technology Syllabus of Second Year B.Tech. (All Branches) (Semester III) Open Elective-1 offered by the Department of Electrical Engineering	
Course Category: OEC Course Code: OEC241E Course: Electrical, Fire and Vehicle Safety Teaching Scheme: Theory: 03 Hrs./week	**Credits: 3-0-0** In-Semester Examination -I: 15 Marks In-Semester Examination -II: 15Marks Teacher Assessment: 10 Marks Continuous Internal Evaluation: 10 Marks End Semester Examination: 50 Marks End Semester Examination (Duration): 02 Hrs.

Prerequisite	- Basic understanding of physics and chemistry concepts - Familiarity with engineering principles, including circuit theory - Knowledge of automotive technology, including vehicle components and systems.
Objectives	1. Develop a comprehensive understanding of electrical safety principles and hazards. 2. Analyze the causes and dynamics of fires and implement preventive measures. 3. Examine safety protocols and regulations pertaining to vehicle electrical systems. 4. Acquire practical skills in identifying, mitigating, and responding to safety risks.
Unit-I	**Introduction to Electrical safety and Safety Management:** General Background of Electricity, General Safety Provisions in Indian Electricity Rules, OSHA Standards on Electrical Safety, Basic Electrical Safety Rule as per OSHA, Terms and Definitions, Objectives of Safety and Security Measures, Effect of Electrical Current on the Human Body, Case studies highlighting real-world examples of electrical fires and their consequences. **(07 Hrs)**
Unit-II	**Electrical Shocks and their Prevention:** Primary and Secondary Electric shocks, Occurrence of Electric Shock, Possibility of Getting Electric Shock, Severity of Electric Shock, Medical Analysis of Electric Shock and Its Effects, AC Shocks Versus DC Shocks, Shocks Due to Flashovers, Lightning Strokes on Overhead Transmission Lines, Prevention of Shocks, FIRST AID, Removal of Contact with Live Conductor, Artificial Respiration, Schafer's Prone Pressure Method, Accident Management and Safety Management. **(06 Hrs)**
Unit-III	**Introduction to Electrical Fire and Prevention:** Introduction, Terms and definition, causes of initiation of fires, types of Fires Class A Fires, Class B fires, Class C Fires, Class D fires, Class E Fires, Fire Extinguishing techniques, Fire Hazard Analysis, Prevention of Fires, Fire protection and loss prevention, step after occurrences of fires. **(06 Hrs)**

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Unit-IV	**Fire Extinguisher and Fire Fighting System:** Introduction, types of Fire Extinguisher, Water Fire Extinguisher, Foam Extinguishers, Dry Powder and Carbon dioxide Extinguisher, Maintenance of Fire Extinguishers. Introduction to Fire Fighting System, types and Application, Fire Detection and Alarm System, Water spray system. **(07 Hrs)**
Unit-V	**Introduction to Electric Vehicle and Safety:** Electric Vehicle Architecture, Major Components, Types of Batteries, Lithium-Ion Batteries, Hazards in Electric Vehicle, Electric Motor safety, Power Electronics Circuits Safety, Safety at Charging Station. Case studies illustrating incidents of vehicle fires and lessons learned for prevention. **(07 Hrs)**
Unit-VI	**Review of Indian Electricity Rules and Acts:** Introduction, Scope of IE Act and IE Rules, Classification of Electrical Installation, Electrical Safety general Requirements as per IE Rules. Indian Electricity Act, Rules regarding First AID and Fire Fighting System, safety Requirement of Electric Vehicle as per BIS standards. **(06 Hrs)**

References

Sr. No.	Title	Author	Publication	Edition
1.	Electrical Safety, Fire Safety Engineering & Safety Management	S. Rao	Khanna Publishers	4th
2.	Vehicle Battery Fires, Why They Happen and How they Happened	Gregory J. Barnett	SAE International Publication	1st
3.	Electric Vehicle Technology Explained	James Larminie	John Wiley and sons	1st
4.	Electric Vehicle Technology and Policy in India	Vishal Garg	Applied Science Publishers	1st
5.	Practical Guide to Electrical Safety	R. K. Jain	Nabhi Publication	1st

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Faculty of Science & Technology Syllabus of Second Year B.Tech. (All Branches) (Semester III) Open Elective-1 offered by the Department of Mechanical Engineering	
Course Category: OEC Course Code: OEC241F Course: Emotional Intelligence Teaching Scheme: Theory: 03 Hrs./week	**Credits: 3-0-0** In-Semester Examination -I: 15 Marks In-Semester Examination -II: 15Marks Teacher Assessment: 10 Marks Continuous Internal Evaluation: 10 Marks End Semester Examination: 50 Marks End Semester Examination (Duration): 02 Hrs.
Prerequisite	----
Objectives	1. To introduce the concept, models and components of emotional intelligence. 2. To understand the significance of emotional intelligence in self-development and building effective relationships.
Unit-I	**Introduction to Emotional Intelligence:** Definition, Components of emotional intelligence, Introduction to emotions, Power of emotions, Importance of emotional intelligence in personal life, define EQ, difference between IQ and EQ, Theories of EI, Models of emotions. **(06 Hrs)**
Unit-II	**Understanding Emotions:** The Brain and Emotion, The Relationship of Mood and Emotion, The Role of Emotion in Organizational Health, Types of Emotions, Control of Emotions, Impulse Control, Marshmallow Experiment- Negative and Positive Emotions, Emotion and Health, The Emotional Brain & Amigdala Hijack. **(06 Hrs)**
Unit-III	**Emotional Intelligence Competence:** Self-awareness, self-regulation, - Social Skills – Relationship Management- EI and Motivation. Emotional competence, Developing EI. **(06 Hrs)**
Unit-IV	**Managing Emotions:** EI Assessment Tools, Emotional Intelligence and Psychological Adjustment, Issues in Anxiety, Stress, Depression, Anger, Self Esteem and Self-Management Empathy. Building a successful career using emotional intelligence, Handling stress and pressure in the workplace **(07 Hrs)**
Unit-V	**EI Practice at Workplace:** Emotional Intelligence and Decision Making, EI and Personality, Work Frustrations, EI and Work Performance, EI and Leadership, EI and Job Stress, EI and Information Processing,

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	EI and Communication, EI and Conflict Resolution, Emotional intelligence in job interviews, career advancement and workplace interactions. **(07 Hrs)**
Unit-VI	**Emotional Intelligence and Teamwork:** Applying Emotional Intelligence in Engineering Projects, Team dynamics and emotional intelligence, Case studies and group activities. Emotional Quality Management. **(07 Hrs)**

References

Sr. No.	Title	Author	Publication	Edition
1.	Emotional Intelligence: Why It can Matter More Than IQ	Daniel Goleman	Bantam Books	2012
2.	Emotional Intelligence at Work: A Professional Guide	Daliph Singh	Response Books: New Delhi	2001
3.	Emotional Intelligence in Everyday Life: A Scientific Inquiry	Ciarruchi, J., Forgas, J. and Mayer, John.	Taylor & Francis	2006
4.	Emotional Intelligence 2.0	Travis Bradberry	Talent Smart	2009

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Faculty of Science & Technology Syllabus of Second Year B.Tech. (All Branches) (Semester III / IV)	
Course Category: HSSM Course Code: HSM201 Course: Engineering Economics and Management Teaching Scheme: Theory: 2 Hrs./week	**Credits: 2-0-0** In-Semester Examination-II: 10 Marks Teacher Assessment: 15 Marks

Prerequisite	No general prerequisites required
Objectives	1. To introduce students to the fundamental principles of industrial management. 2. To familiarize students with various aspects of industrial operations. 3. To provide students with knowledge of real-world industrial management challenges.
Unit-I	**Introduction to Engineering Economics:** Introduction to Economics, Importance, and scope of economics in engineering, Economic analysis and its role in project management, Overview of economic principles and concepts relevant to engineering, Micro - and macro-economics, economics of growth and development, Demand and supply analysis. **(05 Hrs)**
Unit-II	**Cash Flow and Time Value of Money:** Interest rates, compounding, and discounting, Present value and future value analysis, Equivalent annual cost analysis. Cash Flow – Diagrams, Categories & Computation, Calculations, Treatment of Salvage Value, Annual Cash Flow Analysis, Analysis, Calculating Rate of Return, Incremental Analysis. **(05 Hrs)**
Unit-III	**Elements of Managerial Economics:** Cost & Cost Control –Techniques, Types of Costs, Lifecycle Costs, Budgets, Break-even Analysis, Capital Budgeting, Application of Linear Programming. Investment Analysis – NPV, ROI, IRR, Payback Period, Depreciation, Time value of money (present and future worth of cash flows). Business Forecasting – Elementary techniques. **(04 Hrs)**
Unit-IV	**Business Organization:** Concept of organization, Elements of Organization, Types of Business organization, Principles of Organization, Organization structure. **(04 Hrs)**
Unit-V	**Management Concept:** Management, Administration, Organization, Managerial skills, Evolution and development of Management Thought, Principles of Management, Functions of Management, Levels of Management. **(04 Hrs)**
Unit-VI	**Human Resource Management:** Introduction, Definitions, and Concept of HRM, Functions and objectives of HRM, Manpower Planning, Recruitment and selection, Training and development, Compensation Management. **(04 Hrs)**

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	Sr. No.	Title	Author	Publication	Edition
References	1.	Industrial Organization and Engineering Economics	T. R. Banga & S. C. Sharma	Khanna Publishers.	24th
	2.	Industrial Engineering & Management	O. P. Khanna	Dhanpatrai Publications	8th
	3.	Essentials of Management	Harold Koontz (Author), Heinz Weihrich	McGraw-Hill Education	5th
	4.	Human Resource Management: Text and Cases	K Aswathappa, Sadhna Dash	Tata McGraw-Hill	10th
	5.	Marketing Management	G. Shainesh, Philip Kotler	McGraw-Hill Education	8th

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Faculty of Science & Technology Syllabus of Second Year B.Tech. (All Branches) (Semester III / IV)	
Course Category: HSSM Course Code: HSM202 Course: Innovation and Entrepreneurship Teaching Scheme: Theory: 02 Hrs./week	**Credits: 2-0-0** In-Semester Examination-II: 10 Marks Teacher Assessment: 15 Marks

Prerequisite	There is no general prerequisite required
Objectives	1. Develop awareness about entrepreneurs and entrepreneurship. 2. Describe the functions and characteristics of entrepreneurs and entrepreneurship. 3. Discuss the concept of innovation and entrepreneurship. 4. Identify concepts, principles, and strategies with reference to social entrepreneurship and social innovation.
Unit-I	**Introduction to Entrepreneurship:** Introduction, the concept of entrepreneur, entrepreneurship, and social entrepreneurship, the definition of entrepreneurship, four types of entrepreneurships and entrepreneur, the importance of entrepreneurship, and characteristics of entrepreneurship. **(04 Hrs)**
Unit-II	**Innovation & Entrepreneurship:** Definition of Innovation, Fundamentals of Innovation, Types of Innovation - Incremental, Disruptive, and Radical, The Innovation Process: from idea to execution The Innovation-Entrepreneurship Relationship, Entrepreneurial Mindset, Corporate Entrepreneurship, Social Impact Innovation. **(04 Hrs)**
Unit-III	**Creativity and Innovation:** Foundations of Creativity and Innovations, Creative thinking process, Developing a creative mindset, Overcoming creative blocks, Exploring Types of Innovation through Case Studies **(04 Hrs)**
Unit-IV	**Entrepreneurship Development Process:** Introduction, the process of entrepreneurship development, objectives of the entrepreneurship development program, the process of entrepreneurship development, entrepreneurship development, and start-up India, Indian entrepreneurship development challenges. **(05 Hrs)**
Unit-V	**Entrepreneurship as Innovation and Problem-Solving:** Entrepreneurs as problem solvers, innovations, and entrepreneurial ventures – global and Indian role of technology – e-commerce and social media, social entrepreneurship – concept. **(04 Hrs)**

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Unit-VI	**Social Entrepreneurship and Social Innovation:** Understanding Social Entrepreneurship and Social Innovation, The Social Entrepreneurial Mindset and Skills, Identifying Social Needs and Opportunities, Social Enterprise Models, Funding Sources for Social Enterprises and Innovations, Impact Investing, and Social Venture Capital. **(05 Hrs)**

References

Sr. No.	Title	Author	Publication	Edition
1.	Entrepreneurship	Robert Hisrich and Michael Peters	Tata Mc Graw– Hill	11th
2.	Entrepreneurial Development	Vasant Desai	Himalaya Publishing House (1991)	-
3.	Entrepreneurship – Strategies and Resources	Marc J Dollinger	Marsh Publications	4th
4.	The Innovator's Dilemma: When New Technologies Cause Great Firms to Fail.	Christensen, C.M.	Harvard Business Review Press. (2016)	-
5.	Social Entrepreneurship: What Everyone Needs to Know.	Bornstein, D., & Davis, S	Oxford University Press. (2010)	-
6.	Impact Investing: Transforming How We Make Money While Making a Difference	Bugg-Levine, A., & Emerson, J.	Wiley (2011)	-

MOOC Courses Links	• https://onlinecourses.swayam2.ac.in/cec24_mg08/preview • https://onlinecourses.nptel.ac.in/noc20_mg35/preview • https://onlinecourses.nptel.ac.in/noc21_mg63/preview
Weblink	✓ https://ebooks.inflibnet.ac.in/hsp15/chapter/chapter-1/ ✓ https://ocw.mit.edu/collections/entrepreneurship/ ✓ https://www.youtube.com/playlist?list=PLb5SyhPhDyTci1lsuhn2Dj1zxqLyENLW5 ✓ https://www.youtube.com/watch?v=0Hv-sMeNKGQ ✓ https://digitalleadership.com/blog/the-innovation-entrepreneurship-relationship/

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Faculty of Science & Technology Syllabus of Second Year B.Tech. (All Branches) (Semester III / IV)	
Course Category: VEC Course Code: VEC201 Course: Universal Human Values Teaching Scheme: Theory: 01 Hrs./week Practical: 02 Hrs./Week	**Credits: 1-0-1** In-Semester Examination-II: 10 Marks Teacher Assessment: 15 Marks
Prerequisite	No general prerequisites are required.
Objectives	This course aims to enable students, 1. To appreciate the essential complementarity between 'VALUES' and 'SKILLS' to ensure sustained happiness and prosperity, which are the core aspirations of all human beings. 2. To facilitate the development of a holistic perspective among students to lead their personal and professional lives in an ethical way. 3. To highlight plausible implications of such a holistic understanding in terms of ethical human conduct, trustful and mutually fulfilling human behavior, and mutually enriching interaction with nature.
Unit-I	**Introduction to Value Education** • Understanding Value Education • Self-exploration as the Process for Value Education • Continuous Happiness and Prosperity - the Basic Human Aspirations and their Fulfilment • Right Understanding, Relationship and Physical Facility • Happiness and Prosperity - Current Scenario • Method to Fulfil the Basic Human Aspirations **(02 Hrs)**
Unit-II	**Harmony in the Human Being** • Understanding Human being as the Co-existence of the Self and the Body • Distinguishing between the Needs of the Self and the Body • The Body as an Instrument of the Self • Understanding Harmony in the Self • Harmony of the Self with the Body • Programme to Ensure self-regulation and Health **(02 Hrs)**
Unit-III	**Harmony in the Family** • Harmony in the Family - the Basic Unit of Human Interaction "Trust' - the Foundational Value in Relationship • 'Respect' - as the Right Evaluation Values in Human-to-Human Relationship **(02 Hrs)**
Unit-IV	**Harmony in the Society** • Other Feelings, Justice in Human-to-Human Relationship • Understanding Harmony in the Society • Vision for the Universal Human Order **(02 Hrs)**

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Unit-V	**Harmony in the Nature (Existence)** • Understanding Harmony in the Nature • Interconnectedness, self-regulation and Mutual Fulfilment among the Four Orders of Nature • Realizing Existence as Co-existence at All Levels • The Holistic Perception of Harmony in Existence **(02 Hrs)**
Unit-VI	**Implications of the Holistic Understanding - a Look at Professional Ethics** • Basis for Universal Human Values • Definitiveness of (Ethical) Human Conduct • Professional Ethics in the light of Right Understanding • A Basis for Humanistic Education, Humanistic Constitution and Universal Human Order • Holistic Technologies, Production Systems and Management Models Typical Case Studies • Strategies for Transition towards Value-based Life and Profession **(03 Hrs)**
Exercise	**Based on the above syllabus, exercise 02 Hrs/week**

References

Sr. No.	Title	Author	Publication	Edition
1.	Scicncc and Humanism	P.L. Dhar, RR Gaur	Commonwealth Publishers	1st
2.	Jeevan Vidya: Ek Parichaya	Nagaraj	Jeevan Vidya Prakashan, Amarkantak	1999
3.	Human Values	A. N. Tripathy	New Age International Publishers	2003
4.	Fundamentals of Ethics for Scientists & Engineers	E. G. Seebauer & Robert L. Berry	Oxford University Press	1st
5.	Engineering Ethics and Human Values	M. Govindrajan, S. Natrajan & V.S. Senthil Kumar	Eastern Economy Edition, Prentice Hall of India Ltd.	1st
6.	Foundations of Ethics and Management	B. P. Banerjee	Excel Books	2005
7	Indian Ethos and Modern Management	B. L. Bajpai	New Royal Book Co., Lucknow.	2004 Reprinted 2008

E-Resources

1. http://madhyasth-darshan.info/postulations/knowledge/knowledge-of-humane-conduct/
2. https://www.youtube.com/channel/UCQxWr5QB_eZUnwxSwxXEkQw
3. https://youtu.be/OgdNx0X923I
4. https://fdp-si.aicte-india.org/UHV-II%20Practice%20Sessions.php
5. https://fdp-si.aicte-india.org/download.php#1/

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Faculty of Science & Technology Syllabus of Second Year B.Tech. (All Branches) (Semester III / IV)	
Course Category: VEC Course Code: VEC202 Course: Environmental Studies Teaching Scheme: Theory: 01 Hr/week, Practical: 02 Hrs/Week	**Credits: 1-0-1** In-Semester Examination -II: 10 Marks Teacher Assessment: 15 Marks

Prerequisite	Understanding of the Concept of Environment.
Objectives	1. To study the environment and ecosystems. 2. To study different types of natural resources. 3. Knowledge and concept of biodiversity and its conservation. 4. Basic knowledge and concept of causes, effects, and control of different types of environmental pollution. 5. To study population growth and its impact on the environment
Unit-I	**Introduction to environmental studies and natural resources:** Definition, scope and importance and need for public awareness. Natural resources: Forest resources: Use and over-exploitation, deforestation. Timber extraction. Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams benefits and problems. Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources. **(02 Hrs)**
Unit-II	**Food, energy, and land resources: Food resources:** World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity. Energy resources: Growing energy needs, renewable and non-renewable energy sources, and use of alternate energy sources. Land resources: Land as a resource, land degradation, man-induced landslides, soil erosion, and desertification. **(02 Hrs)**
Unit-III	**Ecosystems:** Concept of an ecosystem. Structure and function of an ecosystem. Producers, consumers, and decomposers. Energy flow in the ecosystem. Ecological succession. Food chains, food webs, and ecological pyramids. Introduction, types, characteristic features, structure, and function of the following ecosystems: Forest ecosystem, Grassland ecosystem, Desert ecosystem, and Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries). **(02 Hrs)**
Unit-IV	**Biodiversity and its conservation:** Introduction – Definition: genetic, species, and ecosystem diversity. Biogeographical classification of India. Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts. Endangered and endemic species of India Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity. **(02 Hrs)**

Unit-V	**Environmental Pollution:** Definition, Cause, effects, and control measures of Air pollution, Water pollution, Soil pollution, Marine pollution, Noise pollution, Thermal pollution, nuclear hazards, Role of an individual in the prevention of pollution. **(03 Hrs)**
Unit-VI	**Social issues and the Environment**: From Unsustainable to sustainable development. Urban problems related to energy. Climate change, global warming, acid rain, ozone layer depletion Environment Protection Act. Public awareness. **(02 Hrs)**
List of Exercise	1. Study of a local hilly area to document environmental assets. 2. Study of a forest area as an environmental asset. 3. Study assignment on sustainable development goal, 'No Hunger'. 4. Case study on landslide. 5. Poster making on food chain, food web and ecological pyramids. 6. Study of hotspots of biodiversity in India as a mega diversity nation. 7. Assignment on causes, effects and control measures of urban and industrial wastes. 8. Working out a plan of roof top rainwater harvesting for a house. 9. Case study on resettlement and rehabilitation of people because of developmental activities such as dams, mining, etc. 10. Visit to local polluted site

References

Sr. No.	Title	Author	Publication	Edition
1.	Environmental Biology	Agarwal, K.C.	Nidi Publ. Ltd. Bikaner (2001)	-
2.	The Biodiversity of India	Bharucha Erach	Mapin Publishing Pvt. Ltd., Ahmedabad	1st
3.	Global Biodiversity Assessment	Heywood, V.H & Waston	Cambridge Univ. Press (1995)	-
4.	Environmental Protection and Laws	Jadhav, H & Bhosale, V.M.	Himalaya Pub. House, Delhi	1st
5.	Fundamentals of Ecology	Odum, E.P.	W.B. Saunders Co. USA	1st
6.	Environmental Science	Miller T.G. Jr	Wadsworth Publishing Co.	1st

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Faculty of Science & Technology Syllabus of Second Year B.Tech. (All Branches) (Semester III)	
Course Category: ELC Course Code: ELC221 Course: Community Engagement Project Teaching Scheme: Practical: 04 Hrs/Week	**Credits: 0-0-2** Teacher Assessment: 25 Marks
Course Description	The "Community Engagement Project" course is designed to provide students with field-based learning experiences that integrate their theoretical knowledge of major discipline of engineering with real-life socio-economic issues. Students will engage in projects that address community needs, enhancing their understanding of the role of engineering in society and developing their problem-solving and communication skills.
Objectives	1. To expose students to socio-economic issues and challenges in society. 2. To apply theoretical knowledge to develop practical solutions to real-life problems. 3. To enhance students' communication, teamwork, and project management skills. 4. To foster a sense of social responsibility and ethical awareness among students.
Learning Outcomes	By the end of the course, students will be able to: 1. Identify and analyze socio-economic issues in the community. 2. Apply engineering principles to propose and implement solutions to community problems. 3. Work effectively in teams to achieve project goals. 4. Communicate project findings and solutions effectively in written and oral forms. 5. Reflect on the social impact of their projects and their role as engineers in society.
Implementation guidelines	1. A group of four students, under the guidance of faculty mentors, conduct a Socioeconomic Survey of the nearby area/ habitation. They will interact with people and conduct the survey using a structured questionnaire. 2. The group of students will choose a topic related to their subject area relevant to their major discipline and conduct a Project which includes data collection and analysis and a conclusion/ solution on a selected problem. 3. Students should submit a project report duly signed by the mentor. 4. Assessment should be done by a mentor continuously (Rubrics based)
Assessment Methodology	1. **Field Work and Engagement (40%)** o Quality and effectiveness of community engagement. o Depth of data collection and analysis. o Ability to identify and understand community issues. 2. **Project Implementation (30%)** o Creativity and feasibility of proposed solutions. o Effectiveness of implementation. o Adaptation and problem-solving during implementation. 3. **Reports and Documentation (20%)** o Documentation of data, process, and outcomes.

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	○ Reflection on personal learning and project impact. 4. **Presentation (10%)** ○ Clarity and effectiveness of oral presentation. ○ Ability to communicate project findings and solutions. ○ Engagement with audience and response to questions.

Rubrics for Assessment:

Criteria	Excellent (5)	Good (4)	Satisfactory (3)	Needs Improvement (2)	Inadequate (1)
Field Work and Engagement	Thorough and insightful engagement with the community. Extensive data collection and deep understanding of issues.	Effective engagement with the community. Adequate data collection and good understanding of issues.	Satisfactory engagement with the community. Basic data collection and understanding of issues.	Limited engagement with the community. Incomplete data collection and understanding of issues.	Minimal or no engagement with the community. Poor or no data collection and understanding of issues.
Project Implementation	Innovative and highly feasible solutions. Effective implementation with positive impact.	Creative and feasible solutions. Good implementation with noticeable impact.	Basic but feasible solutions. Satisfactory implementation with some impact.	Limited creativity in solutions. Ineffective implementation with minimal impact.	No feasible solutions. Poor or no implementation with no impact.
Reports and Documentation	Comprehensive and clear reports. Thorough documentation of process and outcomes. Reflective insights.	Clear and detailed reports. Good documentation of process and outcomes. Some reflective insights.	Adequate reports. Basic documentation of process and outcomes. Limited reflective insights.	Incomplete or unclear reports. Inadequate documentation of process and outcomes. Minimal reflective insights.	Poor or no reports. No documentation of process and outcomes. No reflective insights.
Presentation	Highly effective and engaging presentation. Clear communication of findings and solutions.	Effective presentation. Clear communication of findings and solutions.	Satisfactory presentation. Basic communication of findings and solutions.	Unclear or disorganized presentation. Limited communication of findings and solutions.	Poor or no presentation. Unable to communicate findings and solutions.

Suggested Reading Materials and Resources:

1. **Book:** "The Community Engagement Professional in Higher Education" by Lina D. Dostilio
2. **Web Resources:** IEEE Xplore Digital Library for research papers on community engagement projects. Also, refer websites of NGOs and community organizations for case studies and project ideas.

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Faculty of Science & Technology Syllabus of Second Year B.Tech. (All Branches) (Semester III)	
Course Category: Seminar Course Code: SEM222 Course: Seminar Teaching Scheme: Practical: 02 Hrs/Week	**Credits: 0-0-1** Teacher Assessment: 25 Marks
Course Description	The Seminar course is designed to develop students' research, presentation, and communication skills through the preparation and presentation of seminars. The topics for the seminars will be related to the **Open Elective-1 Course chosen** by the students. Under the supervision of faculty, students will engage in independent research, organize their findings, and present them effectively to their peers and faculty members. This course aims to enhance students' ability to communicate complex ideas clearly and confidently, fostering a deeper understanding of their elective subjects.
Assessment Methodology	The assessment for the Seminar course will be based on continuous evaluation of the following components: 1. **Topic Selection and Proposal (20%)** o Relevance and appropriateness of the selected topic. o Clarity and feasibility of the seminar proposal. 2. **Literature Review (20%)** o Depth and thoroughness of the literature review. o Use of credible and relevant sources. 3. **Seminar Outline and Content Development (20%)** o Logical organization and structure of the seminar. o Clarity and coherence of the content. o Integration of theoretical concepts with practical examples. 4. **Presentation Skills (20%)** o Clarity, confidence, and engagement during the presentation. o Effective use of visual aids and multimedia. o Ability to handle questions and engage in discussion. 5. **Seminar Report (20%)** o Quality and thoroughness of the written seminar paper. o Proper formatting, citations, and adherence to guidelines.
	Guidelines for Implementation: 1. **Supervision and Guidance:** o Faculty members will supervise the seminar preparation and presentation process. o Regular meetings will be scheduled for discussing progress and providing feedback. 2. **Topic Selection:** o Students will select topics related to their open elective courses. o Topics must be approved by the supervising faculty. 3. **Literature Review:** o Students will conduct a thorough literature review using credible academic sources. o An annotated bibliography will be prepared as part of the assessment. 4. **Seminar Preparation:** o Students will develop a detailed outline and structure for their seminar.

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	○ Visual aids and multimedia tools will be used to enhance the presentation. 5. **Presentation:** ○ Students will present their seminars to peers and faculty. ○ Each presentation will be followed by a Q&A session. 6. **Final Submission:** ○ A written seminar report summarizing the research and presentation will be submitted. ○ Proper formatting and citation guidelines must be followed.

Rubrics for Assessment:

Criteria	Excellent (5)	Good (4)	Satisfactory (3)	Needs Improvement (2)	Inadequate (1)
Topic Selection and Proposal	Highly relevant and innovative topic. Clear and feasible proposal.	Relevant and clear topic. Feasible proposal with minor improvements needed.	Adequate topic. Proposal is clear but lacks innovation.	Topic relevance is questionable. Proposal lacks clarity and feasibility.	Irrelevant or inappropriate topic. Poor or no proposal.
Literature Review	Comprehensive and insightful review. Uses a wide range of credible sources.	Thorough review with mostly credible sources.	Adequate review with some credible sources. Basic synthesis of information.	Limited review with few credible sources. Weak synthesis and analysis.	Poor or no review with irrelevant or no credible sources. No synthesis or analysis.
Seminar Outline and Content Development	Clear, logical, and well-organized outline. Content is comprehensive and well-developed.	Good outline and organization. Content is clear with minor gaps.	Adequate outline with some organization. Content covers basic points.	Poorly organized outline. Content is incomplete or lacks coherence.	No clear outline. Content is disorganized and lacks substance.
Presentation Skills	Engaging, clear, and confident presentation. Effective use of visual aids. Handles Q&A expertly.	Clear and confident presentation. Good use of visual aids. Handles Q&A adequately.	Adequate presentation with some clarity issues. Basic use of visual aids. Manages Q&A with difficulty.	Unclear or hesitant presentation. Limited use of visual aids. Struggles with Q&A.	Poor or no presentation. Ineffective or no use of visual aids. Unable to handle Q&A.
Seminar Report	Thorough and well-written Report. Proper formatting and citations. Reflects deep understanding.	Good Report with minor errors. Mostly proper formatting and citations. Shows good understanding.	Adequate Report with some errors. Basic formatting and citations. Shows basic understanding.	Poorly written Report with many errors. Inadequate formatting and citations. Limited understanding.	No or very poorly written Report. Incorrect or no formatting and citations. Lacks understanding.

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Faculty of Science & Technology Syllabus of Second Year B.Tech. (Agricultural Engineering) (Semester III)	
Course Category: PCC Course Code: AED223 Course: Strength of Materials Lab Teaching Scheme: Practical: 02 Hrs/Week	**Credits: 0-0-1** Teacher Assessment: 25 Marks End Semester Oral Examination: 25 Marks
Objectives	1. To learn about the concept of stress, strain and deformation of solid and state of stress. 2. To learn the bending moment, shear force and the corresponding stress distribution for different types of beams. 3. To know the concepts of strain energy, principal stress and principal planes.
List of Practical	1. Study of the universal testing machine. 2. Tension test on ductile materials like mild steel and TOR steel. 3. Flexural test on timber beam. 4. Shear test on metals. 5. Compressive Strength Test on Burnt Clay Building Bricks. 6. Water absorption test on burnt bricks. 7. Transverse test on flooring tiles. 8. Abrasion test on flooring tiles. 9. Impact tests on metals-Izod and Charpy. 10. Torsion test on steel. 11. Rockwell Hardness test. 12. Deflection of Beam. 13. Study the Buckling of a column. 14. Study the Defection of Spring **Note: A minimum of 10 practicals Should be performed.**

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Faculty of Science & Technology Syllabus of Second Year B.Tech. (Agricultural Engineering) (Semester III)	
Course Category: PCC Course Code: AED224 Course: Fluid Mechanics and Open Channel Hydraulics Lab Teaching Scheme: Practical: 02 Hrs/Week	**Credits: 0-0-1** Teacher Assessment: 25 Marks End Semester Oral Examination: 25 Marks
Objectives	1. Understanding Fundamental Principles 2. Application of Theoretical Knowledge 3. Development of Experimental Skills
List of Practical	1. Study of manometers and pressure gauges 2. Study of various types of flow such as laminar flow, uniform flow, steady flow, vertex flow, rotational flow 3. Determination of meta-centric height 4. calibration of V-Notch 5. Calibration of rectangular notch 6. Determination of friction in pipes 7. Determination of coefficient of discharge of venturi meter 8. Verification of Bernoulli's theorem 9. Determination of the coefficient of discharge for the mouthpiece 10. Determination of coefficient of discharge for rectangular and triangular notch 11. Measurement of velocity by current meter 12. Determine the Reynolds number 13. Study of open channel flow: velocity distribution in open channels and determination of Manning's coefficient of Rugosity and Chezy's roughness coefficient **Note: A minimum of 10 practicals Should be performed.**

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Semester-IV
Detail Course Curriculum

Second Year B. Tech Syllabus
(Agricultural Engineering)

(NEP 2020 Based Curriculum)

WEF AY 2024-25

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Faculty of Science & Technology Syllabus of Second Year B.Tech. (Agricultural Engineering) (Semester IV)	
Course Category: PCC Course Code: AED 251 Course: Soil and Water Conservation Engineering Teaching Scheme: Theory: 03 Hrs./week	**Credits: 3-0-0** In-Semester Examination-I: 15 Marks In-Semester Examination-II: 15Marks Teacher Assessment: 10 Marks Continuous Internal Evaluation: 10 Marks End Semester Examination: 50 Marks End Semester Examination (Duration):02 Hrs.

Prerequisite	Basic knowledge about watershed hydrology and watershed
Objectives	1. Study of soil erosion problems caused by natural erosive agents. 2. To study various agronomical and mechanical measures for control soil & water conservation
Unit-I	**Soil Erosion** – problems of soil erosion, basic terminologies, causes, types and agents of soil erosion, Factors affecting, water and wind erosion, mechanics of water erosion, classification of water erosion, splash, sheet, rill, gully & stream bank erosion. **(07 Hrs)**
Unit-II	**Soil Loss Estimation** - universal soil loss equation and modified soil loss equation, determination of their various parameter's rainfall erosivity and erodibility, sedimentation in reservoirs and streams, estimation and measurement, sediment delivery ratio, trap efficiency. **(07 Hrs)**
Unit-III	**Gully Erosion** - gullies and their classification, stages of gully development, principles of gully control, gully control measures, temporary and permanent gully control structures. **(06 Hrs)**
Unit-IV	**Erosion Control Measures-** Agronomical measures - contour cropping, strip cropping, mulching, wind erosion- mechanics, wind breaks and shelter belts, mechanical measures - bunds - contour bunds, graded bunds. **(07 Hrs)**
Unit-V	**Terracing** – functions, classifications, level and graded broad base terraces and their design, bench terraces, layout procedure, terrace planning. **(06 Hrs)**
Unit-VI	**Grassed Waterways-** basic terminologies, uses, applicability, design aspects, various cross sections, specifications and their design, numerical. **(06 Hrs)**

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	Sr. No.	Title	Author	Publication	Edition
References	1.	Manual of Soil & Water Conservation Engineering	Gurmel Singh, C. Venkataramanan, G. Sastry & B. P. Joshi	Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi.	6th
	2.	Soil & Water Conservation Engineering	R. Suresh	Standard Publishers, New Delhi	4th
	3.	Soil & Water Conservation Engineering	G. O. Schwab, D.D. Fangmeier, W. J. Elliot & R. K. Frevert	John Wiley & Sons, Inc. New York	3rd

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Faculty of Science & Technology Syllabus of Second Year B.Tech. (Agricultural Engineering) (Semester IV)	
Course Category: PCC Course Code: AED 252 Course: Post Harvest Engineering Teaching Scheme: Theory: 02 Hrs./week	**Credits: 2-0-0** In-Semester Examination-I: 15 Marks In-Semester Examination-II: 15Marks Teacher Assessment: 10 Marks Continuous Internal Evaluation: 10 Marks End Semester Examination: 50 Marks End Semester Examination (Duration): 02 Hrs.
Prerequisite	Knowledge of basic engineering physics.
Objectives	1. Quality Preservation: To understand the principles and techniques for preserving the quality and extending the shelf life of harvested crops. 2. Post-Harvest Technology: To learn about various post-harvest technologies and their applications in minimizing losses and maintaining product quality. 3. Processing and Storage: To gain knowledge on the methods of processing, packaging, and storage of agricultural produce to ensure safety and efficiency.
Unit-I	**Introduction:** Post-harvest engineering of crops – objectives – post-harvest systems and losses in agricultural commodities structure, engineering properties of agricultural materials, optimum stage of harvest, the importance of loss reduction; Post-harvest handling operations. Pre-drying operation, Moisture content, RH measurement, air-grain measurement. **(04 Hrs)**
Unit-II	**Unit operations of grain processing.** Machinery for cleaning and grading, aspiration, scalping, Grain grading system, Screens and sieves-Types, classification, Air screen cleaner- and capacity, effectiveness of screens. Various types of separators- specific gravity, magnetic, disc, spiral, pneumatic, inclined draper, velvet roll, colour sorters, cyclone, the effectiveness of separation and performance index, hydrothermal treatment, and conditioning of grains. **(04 Hrs)**
Unit-III	**Size reduction:** Principle, Bond's law, Kick's law, Rittinger's law, procedure (crushing, impact, cutting and shearing), Size reduction machinery: Jaw crusher, Hammer mill, Plate mill, Ball mill. Sieve analysis and particle size. **(04 Hrs)**
Unit-IV	**Drying: moisture content:** Free, bound and equilibrium moisture content, isotherm, hysteresis effect, EMC determination. Psychrometric chart and its use in drying. Drying principles and theory, Thin layer and deep bed drying analysis, Falling rate and constant rate drying periods, maximum and decreasing drying rate period. Drying equations, Mass and energy balance. Methods of drying, types of grain dryers. **(04 Hrs)**

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Unit-V	**Material Handling**: Introduction to different conveying equipment used for handling of grains, fruits and vegetables; Scope and importance of material handling devices Classification, principles of operation, conveyor system selection/design. Belt conveyor Principle, characteristics, relationship between belt speed and width, capacity, inclined belt conveyors, idler spacing, belt tension, drive tension, belt tripper. Chain conveyor -Principle of operation, advantages, disadvantages, capacity and speed, conveying chain. Screw conveyor Principle of operation, capacity, power, troughs, loading and discharge, inclined and vertical screw conveyors. Bucket elevator Principle, classification, operation, advantages, disadvantages, capacity, speed, bucket pickup, bucket discharge, relationship between belt speed, pickup and bucket discharge, buckets types, power requirement. Pneumatic conveying system types, air/product separators; Gravity conveyor design considerations, capacity and power requirement. **(04 Hrs)**
Unit-VI	**Principles and Practice of Storage**: Importance of scientific storage systems, post-harvest physiology of semi-perishables and perishables. Damages Direct damages, indirect damages, causes of spoilage in storage (moisture, temperature, humidity, respiration loss, heat of respiration, sprouting), destructive agents (rodents, birds, insects, etc.), sources of infestation and control. Storage structures: Traditional storage structures, improved storage structures, modern storage structures; Farm silos Horizontal silos, tower silos, pit silos, trench silos, size and capacity of silos. Storage of perishables Cold storage controlled and modified atmospheric storage, hypobaric storage, evaporative cooling storage, conditions for storage of perishable products, control of temperature and relative humidity inside storage. Integrated Pest management for grain, fumigation and controlled atmosphere storage of food grains, Rodent Control. **(06 Hrs)**

References

Sr. No.	Title	Author	Publication	Edition
1.	Unit Operations of Agricultural Processing.	Sahay K. M. and K.K. Singh	Vikas Publishing House	2nd
2.	Post Harvest Technology of Cereals, Pulses and Oilseeds.	A. Chakraverty	Oxford & IBH Publishing	3rd
3.	Unit operations in Food processing.	Earle, R. L.	Pergamon Press, New York.	2nd
4.	Agricultural Process Engineering.	Henderson, S.M., and Perry, R. L.	Chapman and hall, London	3rd

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Faculty of Science & Technology Syllabus of Second Year B.Tech. (Agricultural Engineering) (Semester IV)	
Course Category: PCC Course Code: AED 253 Course: Irrigation and Drainage Engineering Teaching Scheme: Theory: 02 Hrs./week	**Credits: 2-0-0** In-Semester Examination-I: 15 Marks In-Semester Examination-II: 15Marks Teacher Assessment: 10 Marks Continuous Internal Evaluation: 10 Marks End Semester Examination: 50 Marks End Semester Examination (Duration): 02 Hrs.

Prerequisite	Importance of waterways and irrigation for the agricultural yield
Objectives	1. To understand the methods of irrigation and the impact on the agricultural fields. 2. To understand the issue of drainage and the remedies of the same for improvements in the agricultural cases.
Unit-I	**Irrigation–** the purpose of irrigation, merits and demerits of irrigation, source of irrigation water, the present status of development and utilization of different water resources of the country, major and medium irrigation schemes of India, and the environmental impact of irrigation projects. Measurement of irrigation water: weir, flumes orifices and other methods like water-volumetric measurement, velocity area method, tracers etc. **(04 Hrs)**
Unit-II	**Open Channel Water Conveyance System:** Design and lining of irrigation field channels on farm structures for water conveyance, control & distribution; Underground pipe conveyance system: components and design; Land grading; criteria for land leveling, land leveling design methods. **(04 Hrs)**
Unit-III	**Soil-Water-plant Relationship:** soil properties influencing irrigation management, soil water movement, infiltration, soil water potential, soil moisture characteristics, soil moisture constants, measurement of soil moisture, moisture stress and plant response; Water requirement of crops: the concept of evapotranspiration (ET), measurement and estimation of ET, water and irrigation requirement of crops, depth of irrigation, frequency of irrigation, irrigation efficiencies. **(05 Hrs)**
Unit-IV	**Surface Methods of Water Application:** border, check basin and furrow irrigation-adaptability, specifications, design considerations and hydraulic. **(03 Hrs)**
Unit-V	**Water Logging and Soil Salinity Causes and Impacts:** familiarization with the state and the country's water logging and soil salinity problems. Land drainage: Definition, objectives, history, and importance in agriculture; Drainage requirement of crops - factors influencing drainage; Drainage criteria and types - agricultural drainage criterion, factors and formulation, drainage coefficient: meaning, determination method. **(05 Hrs)**

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Unit-VI	**Surface Drainage Systems:** Random, parallel field, parallel open ditch, and bedding systems, determination of drainage coefficient, design of surface drainage systems - section, alignment, field structures, construction, and maintenance. Sub-surface drainage: Random drains, gridiron system, herringbone system, interceptor, and relief drains. Operation and maintenance, Derivation of Hooghoudt's and Ernst's drain spacing equations. **(05 Hrs)**

References

Sr. No.	Title	Author	Publication	Edition
1.	Principles of Agricultural Engineering Vol-II. 5th Edition.	Michael A M and Ojha T. P.	Jain Brothers Publication, New Delhi	2nd
2.	Irrigation: Theory and Practice.	Michael A M.	Vikas Publishing House, New Delhi.	2nd
3.	Land and Water Management Engineering	Murthy V. V. N. 2013.	Kalyani Publishers, New Delhi	6th
4.	Land Drainage, Principles, Methods and Applications.	Bhattacharya A K and Michael A M. 2013.	Vikas Publication House, Noida (UP).	1st

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Faculty of Science & Technology Syllabus of Second Year B.Tech. (Agricultural Engineering) (Semester IV)	
Course Category: MDM Course Code: AED261 Course: Climate Change in Agriculture Teaching Scheme: Theory: 02 Hrs./week	**Credits: 2-0-0** In-Semester Examination-I: 15 Marks In-Semester Examination-II: 15Marks Teacher Assessment: 10 Marks Continuous Internal Evaluation: 10 Marks End Semester Examination: 50 Marks End Semester Examination (Duration): 02 Hrs.
Prerequisite	Basic knowledge of environmental science Fundamental understanding of agricultural practices
Objectives	1. To comprehend the effects of climate change on agricultural systems and food security. 2. To learn and evaluate various strategies for mitigating and adapting to climate change in agricultural contexts. 3. To gain insights into climate-smart agricultural practices and their implementation for sustainable farming.
Unit-I	**Introduction to Climate Change:** Definition, causes, and consequences of climate change; historical and current trends in global climate patterns; the greenhouse effect and global warming. **(04 Hrs)**
Unit-II	**Impact of Climate Change on Agriculture:** How climate change affects crop production, soil health, water resources, and pest/disease dynamics; case studies of affected regions and crops. **(04 Hrs)**
Unit-III	**Mitigation Strategies in Agriculture:** Practices to reduce greenhouse gas emissions: sustainable farming practices, carbon sequestration, renewable energy use, and policy measures. **(04 Hrs)**
Unit-IV	**Adaptation Strategies in Agriculture:** Techniques for adapting agricultural practices to changing climate conditions: crop diversification, irrigation management, soil conservation, and breeding resilient crops. **(05 Hrs)**
Unit-V	**Climate-Smart Agriculture (CSA):** Overview of CSA, its principles, and practices; integrating CSA into agricultural policies and programs; case studies of CSA implementation around the world. **(05 Hrs)**
Unit-VI	**Future of Agriculture in a Changing Climate:** Predicting future climate scenarios and their potential impact on agriculture; research and innovation in climate-resilient agricultural practices. **(04 Hrs)**

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	Sr. No.	Title	Author	Publication	Edition
References	1.	Climate Change: The Science, Impacts and Solutions	A. Barrie Pittock	CSIRO Publishing	2nd
	2.	Climate Change and Crop Production	Matthew P. Reynolds	CABI Publishing	1st
	3.	Climate Change Mitigation and Agriculture	Eva Wollenberg, M.L. Tapio-Bistrom, Michael Main	Earthscan Publications	1st
	4	Adapting Agriculture to Climate Change	Chris Stokes, Mark Howden	CSIRO Publishing	1st
	5	Climate-Smart Agriculture: Building Resilience to Climate Change	Leslie Lipper, Nancy McCarthy, David Zilberman, Solomon Asfaw, Giacomo Branca	Springer	1st
	6.	Agriculture and Climate Beyond 2015	J.S. Samra, P.S. Minhas, Raj K. Gupta	Indian Council of Agricultural Research	1st

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Faculty of Science & Technology
Syllabus of Second Year B.Tech. (All Branches) (Semester IV)
Open Elective-2 offered by the Department of Agricultural Engineering

Course Category: **OEC** Course Code: OEC291A Course: **Smart Agriculture Practices** **Teaching Scheme:** Theory: 02 Hrs./week	**Credits: 2-0-0** In-Semester Examination-I: 15 Marks In-Semester Examination-II: 15Marks Teacher Assessment: 10 Marks Continuous Internal Evaluation: 10 Marks End Semester Examination: 50 Marks End Semester Examination (Duration): 02 Hrs.

Prerequisite	Fundamentals of agriculture and basic sciences knowledge required
Objectives	1. To understand the concept and importance of smart agriculture. 2. To learn about the technologies and practices used in smart agriculture. 3. To explore the impact of smart agriculture on productivity and sustainability. 4. To develop practical skills in using smart agriculture technologies.
Unit-I	**Introduction to Smart Agriculture:** Definition and scope of smart agriculture Benefits and challenges of smart agriculture: productivity, reduced resource wastage (water, fertilizers, etc.), improved decision-making through data analysis, and enhanced sustainability. Challenges include high initial costs, technological complexity, and the need for training and education. **(04 Hrs)**
Unit-II	**Data Analytics in Agriculture:** Basics of data analytics. Data analytics involves the process of collecting, processing, and analyzing data to extract useful information and insights. **(04 Hrs)**
Unit-III	**Precision Agriculture:** Principles and components of precision agriculture. Technologies used in precision agriculture: GPS for location-based data, GIS for spatial analysis, and remote sensing for monitoring crop health and environmental conditions. Precision agriculture applications: Variable rate technology allows for the precise application of inputs (fertilizers, pesticides) based on localized conditions, and site-specific management tailors farming practices to the specific needs of different areas within a field. **(05 Hrs)**
Unit-IV	**Smart Irrigation Systems:** Introduction to smart irrigation: Benefits and challenges of smart irrigation: Benefits include water savings, improved crop yields, and reduced labor costs. Challenges include high initial costs and the need for proper maintenance and monitoring. **(04 Hrs)**

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Unit-V	**Smart Crop Management:** Crop monitoring and management practices: Smart agriculture technologies such as drones, sensors, and data analytics are used to monitor crop health, detect diseases and pests, and optimize crop management practices. Crop health monitoring using smart technologies: Sensors and drones can be used to monitor crop health indicators such as leaf color, temperature, and humidity. Crop modeling and forecasting: Data from sensors and other sources can be used to develop crop models that predict yields, water requirements, and optimal planting times. These models help farmers make informed decisions about crop management. **(05 Hrs)**
Unit-VI	**Case Studies and Practical Applications:** Real-world examples of smart agriculture practices: Case studies from around the world showcase how smart agriculture technologies are being used to improve farming practices, increase yields, and enhance sustainability. **(04 Hrs)**

References

Sr. No.	Title	Author	Publication	Edition
1.	Precision Agriculture Basics	Ancha Srinivasan	CRC Press	1st
2.	Internet of Things in Agriculture: Smart Agriculture	Ramesh K Sitaraman	Springer	1st
3.	Data Analytics in Agriculture	Pierre C. Robert	Wiley	1st
4.	Smart Agriculture: IoT, Robotics, and Big Data in Agriculture	Liege University	Elsevier	1st

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Faculty of Science & Technology
Syllabus of Second Year B.Tech. (All Branches) (Semester IV)
Open Elective-2 offered by the Department of Civil Engineering

Course Category: **OEC** Course Code: OEC291B Course: **Solid Waste Management** Teaching Scheme: Theory: 02 Hrs./week	**Credits: 2-0-0** In-Semester Examination-I: 15 Marks In-Semester Examination-II: 15Marks Teacher Assessment: 10 Marks Continuous Internal Evaluation: 10 Marks End Semester Examination: 50 Marks End Semester Examination (Duration): 02 Hrs.

Prerequisite	Basic knowledge of concepts of economics.
Objectives	1. Understanding the principles and functional elements of SWM 2. To know the way of generation of different kind of solid waste. 3. Effectively handling and shortening of waste. for recycle and energy transformation 4. Adopting suitable and efficient method of processing to get minimum disposable matter 5. Choosing the appropriate method of disposal and essential requirements 6. Handling hazardous Waste and getting it stabilized
Unit-I	**Introduction to Solid Waste Management:** need and objectives, waste management hierarchy, functional elements, environmental impact of mismanagement. solid waste: sources, types, composition, sampling and characteristics quantities, physical, chemical and biological properties. **(04 Hrs)**
Unit-II	**Generation of Solid Waste:** factors affecting. storage and collection: general considerations for waste storage at source, types of collection systems, transfer station: meaning, necessity, transportation of solid waste: means and methods, routing of vehicles. **(04 Hrs)**
Unit-III	**Segregation & Material Recovery:** objectives, stages of segregation, sorting operations, guidelines for sorting for materials recovery, e-waste management, biomedical waste management. **(05 Hrs)**
Unit-IV	**Waste Processing Technologies:** composting, thermal conversion technologies incineration, treatment of biomedical wastes. energy recovery from solid waste: parameters affecting energy recovery, bio-methanation, fundamentals of thermal processing, pyrolysis, incineration, advantages and disadvantages of various technological options. **(05 Hrs)**
Unit-V	**Disposal Terminology:** origin of domestic solid wastes, the quantity of refuse & transportation of refuse, the economics of refuse collection. solid waste in industries, agricultural waste – its effect on the environment. solid waste handling methods, treatment & disposal of solid wastes. sanitary landfills leachate and latest methods. integrated solid waste management. **(04 Hrs)**

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Unit-VI	**Hazardous Waste Management:** Types of hazardous waste (such as nuclear, biomedical, and industrial waste), problems and issues related to HWM, Need for HWM, Legislations on management and handling of HW, Hazardous Characteristics, reduction of wastes at source, Recycling and reuse, labeling and handling of hazardous wastes, incineration, solidification & stabilization of hazardous waste. **(04 Hrs)**

References

Sr. No.	Title	Author	Publication	Edition
1	Solid Waste Technology & Management, Volume 1 & 2	Christensen, H. T.	Wiley	2010
2	The Practical Handbook of Compost Engineering	Haug, T. R.	Lewis Publishers	1993
3	Landfill Bioreactor Design & Operation,	Reinhart, R. D. and Townsend, G. T.	CRC Press, 1997	1st
4	Handbook of Solid Waste Management	Tchobanoglous, G. and Kreith, F.	McGraw Hill, 2002	2nd

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Faculty of Science & Technology Syllabus of Second Year B.Tech. (All Branches) (Semester IV) Open Elective-2 offered by the Department of Computer Science and Engineering	
Course Category: OEC Course Code: OEC291C Course: Data Communication Teaching Scheme: Theory: 02 Hrs./week	**Credits: 2-0-0** In-Semester Examination-I: 15 Marks In-Semester Examination-II: 15Marks Teacher Assessment: 10 Marks Continuous Internal Evaluation: 10 Marks End Semester Examination: 50 Marks End Semester Examination (Duration): 02 Hrs.

Prerequisite	Networking basics, Operating system, Internet, Wireless Communication
Objectives	1. Understand data communication principles through practical examples and case studies. 2. Evaluate the efficiency of data communication protocols by analyzing their asymptotic runtime complexity and identifying recurrence relations. 3. Analyze and compare the effectiveness of different data communication methods, aiding in the selection of the most suitable solutions for contexts.
Unit-I	**Introduction:** Data Communications, Networks, Network Types, Internet History, Protocols and Standards Protocol Layering, TCP/IP Protocol suite, The OSI model, Addressing. **(04 Hrs)**
Unit-II	**Data and Signals:** Data and Signals: Analog and Digital, Periodic Analog Signal, Digital Signals, Transmission Impairment, Data Rate limits, Performance. **(04 Hrs)**
Unit-III	**Digital and Analog Transmission**: Digital Transmission: Digital to Digital Conversion, Analog to Digital Conversion, Transmission Modes, Analog **Transmission:** Digital to Analog Conversion, Analog to Analog Conversion. **(04 Hrs)**
Unit-IV	**Bandwidth Utilization and Switching:** Bandwidth Utilization: Multiplexing, Spread Spectrum, Transmission Media: Guided Media, Unguided Media, switching: Circuit Switched Networks, Datagram Networks, Virtual Circuit Networks, Structure of a switch. **(05 Hrs)**
Unit-V	**Error Detection and Correction**: Introduction, Block Coding, Linear Block Codes, Cyclic Codes, Checksum **Data Link Control:** Data Link Control: Framing, Flow and Error Control, Protocols, Noiseless Channels, Noisy Channels, HDLC, Point to Point Protocol. **(05 Hrs)**

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Unit-VI	**Multiple Access and LANs:** Multiple Access: Random Access, Controlled Access, Channelization. **Wired LANs:** Ethernet, Wireless LANs: IEEE 802.11 and Bluetooth **(04 Hrs)**

	Sr. No.	Title	Author	Publication	Edition
References	1.	Data Communications and Networking	Behrouz A. Forouzan	McGraw-Hill Forouzan Networking Series	4th
	2.	Digital and Analog Communication Systems.	LEON W. Couch	Pearson	8th
	3.	Computer Networks and Internet	Douglas E. Comer	Pearson	5th

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Faculty of Science & Technology
Syllabus of Second Year B.Tech. (All Branches) (Semester IV)
Open Elective-2 offered by the Department of Electronics and Computer Engineering

Course Category: **OEC** Course Code: OEC291D Course: **E-Waste Management** Teaching Scheme: Theory: 02 Hrs./week	**Credits: 2-0-0** In Semester Examination-I: 15 Marks In Semester Examination-II: 15Marks Teacher Assessment: 10 Marks Continuous Internal Evaluation: 10 Marks End Semester Examination: 50 Marks End Semester Examination (Duration): 02 Hrs.

Prerequisite	Knowledge of Reduce, Recycle and Reuse
Objectives	1. To understand the scenario of E-waste 2. Discuss key elements of E-waste management 3. Understand key terms related to E-waste 4. To reduce the adverse effects of E-waste on human health, the environment, planetary resources, and aesthetics.
Unit-I	**Introduction:** E-waste, Indian and global scenario of e-waste, Growth of Electrical and Electronics industry in India, E-waste generation in India, Composition of e-waste, E-waste pollutants, Possible hazardous substances present in e-waste, Environmental and Health implications. Concept of E-waste management. **(04 Hrs)**
Unit-II	**E-waste Hazardous:** Regulatory regime for e-waste in India, the Hazardous Waste (Management and Handling) Rules 2003, E-waste Management Rules 2015, Regulatory compliance including roles and responsibility of different stakeholders – producer, manufacturer, consumer, etc., Extended producer responsibility (EPR). Estimation and recycling of E-waste in metro cities of India. **(04 Hrs)**
Unit-III	**End-of-life management of E-waste:** Historical methods of waste disposal – dumping, burning, landfill; Recycling and recovery technologies sorting, crushing, separation; Life cycle assessment of a product – introduction; Case study – optimal planning for computer waste. **(04 Hrs)**
Unit-IV	**Environmentally Sound E-waste Management:** Emerging recycling and recovery technologies, Guidelines for environmentally sound management of e-waste, environmentally sound treatment technology for e-waste, Guidelines for establishment of integrated e-waste recycling and treatment facility, Case studies, and unique initiatives from around the world. **(04 Hrs)**

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Unit-V	**E-Waste Rules**: E-waste (Management and Handling) Rules, 2011 and E-Waste (Management) rules 2016 –Salient features and its likely implication, Government assistance for TSDF's. **(04 Hrs)**
Unit-VI	**The International Legislation:** The Basel Convention, The Bamako Convention, The Rotterdam Convention, Waste Electrical and Electronic Equipment (WEEE), Directives of the European Union, Restriction of Hazard's Substances (RoHS) Directives. **(06 Hrs)**

References

Sr. No.	Title	Author	Publication	Edition
1.	E-waste: implications, regulations, and management in India and current global best practices	Johri R.	TERI Press, New Delhi.	--
2.	Electronics Waste (Toxicology and Public Health issues)	--	Elsevier	1st
3	Electronics Waste Management	Hester R.E. and Harrison R.M.	Science	2009

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Faculty of Science & Technology Syllabus of Second Year B.Tech. (All Branches) (Semester IV) Open Elective-2 offered by the Department of Electrical Engineering	
Course Category: OEC Course Code: OEC291E Course: Programmable Logic Controller Teaching Scheme: Theory: 02 Hrs./week	**Credits: 2-0-0** In-Semester Examination-I: 15 Marks In-Semester Examination-II: 15Marks Teacher Assessment: 10 Marks Continuous Internal Evaluation: 10 Marks End Semester Examination: 50 Marks End Semester Examination (Duration): 02 Hrs.
Prerequisite	Basic understanding of electrical circuits and industrial automation concepts. Familiarity with programming languages or logic diagrams.
Objectives	1. Characteristics of a PLC 2. Know general PLC issues 3. Understanding of PLC programming and ladder logic. 4. Understand and design basic input and output wiring 5. Analysis and classification of the process control 6. Interlocking process control 7. Sequential process control 8. Random process control 9. Understand the operation of a PLC 10. Understanding of Siemens PLC hardware units and utilizing them.
Unit-I	**PLC Fundamentals:** Architectural Evolution of PLC, Block diagram of PLC's, Applications and Types, specifications, Manufacturers. **(04 Hrs)**
Unit-II	**Selection of PLC components:** Power supply, CPU, I/Os List, Communication bus Various ranges available in PLC's)I/O list selection Open-Circuit and Short-Circuit Tests Types of Inputs & outputs / Source Sink Concepts, Wiring of the I/O devices. **(06 Hrs)**
Unit-III	**Programming instructions arithmetic and logical:** Programming instruction: AND, OR, AND-before-OR, OR-before-AND, NO / NC contacts, Edge detection instructions. Set / Reset, Elementary data type. **(04 Hrs)**
Unit-IV	**PLC Functions:** Timer function, Counter function, Arithmetic function, Number comparison functions, Numbering systems, and number conversion function. **(04 Hrs)**
Unit-V	**Analog PLC operations:** Different PLC operations and applications of PLCs: Stepper motor control, speed control of D.C. motor, water level control, Traffic control, Temperature control. **(04 Hrs)**

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Unit-VI	**HMI:** Architecture, types and specifications, Interfacing and Networking with PLC, SCADA: Introduction, features and applications. **(04 Hrs)**

	Sr. No.	Title	Author	Publication	Edition
References	1.	Programmable Logic Controllers	John W. Webb, Ronald A. Reis	Prentice Hall of India Private	5th
	2.	Programmable Logic Controllers: Programming Methods and Applications	John R. Hackworth, Fredrick D. Hackworth Jr	Pearson	5th
	3.	Programmable Logic Controllers	William Bolton	Elsevier	4th
	4.	Handbook of Industrial Automation	Richard L. Shell and Ernest L. Hall	McGraw Hill CRC press 2000	-

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Faculty of Science & Technology
Syllabus of Second Year B.Tech. (All Branches) (Semester IV)
Open Elective-2 offered by the Department of Emerging Science and Technology

Course Category: **OEC** Course Code: OEC291F Course: **Information and Knowledge Management** Teaching Scheme: Theory: 02 Hrs./week	**Credits: 2-0-0** In-Semester Examination-I: 15 Marks In-Semester Examination-II: 15Marks Teacher Assessment: 10 Marks Continuous Internal Evaluation: 10 Marks End Semester Examination: 50 Marks End Semester Examination (Duration): 02 Hrs.

Prerequisite	Computer Fundamentals
Objectives	1. To understand the importance of information and knowledge management in organizations. 2. To Gain knowledge of various theories and models related to information and knowledge management. 3. Learn techniques for effectively capturing, organizing, and sharing information and knowledge.
Unit-I	**Introduction to Information and Knowledge Management:** Information and Knowledge Management, Data Sources and Types, Methods of Data Collection, Challenges in Managing Digital Information, Organizational Data Management, Attributes of Data, The Data Lifecycle, Data Sharing and Reuse, Planning for Data Management, Aspects of Data Management. **(04 Hrs)**
Unit-II	**Information Documentation and Analysis:** Organizing Information Using Organizational Systems and Conventions, Database Utilization for Content Organization and Analysis, Managing Information Throughout the Analysis Process, Comparison Between Raw and Analyzed Data Management, and Techniques to Facilitate Analysis. **(04 Hrs)**
Unit-III	**Information Storage**: Identifying and Managing Secure and Private Information, Policies for Information Security, Short-term Storage Solutions, Practical Aspects of Storage and Backup, Best Practices to Avoid Information Loss, Preserving and Archiving Information, Long-term Storage and Preservation Strategies, including File Formats and Media Selection. **(05 Hrs)**
Unit-IV	**Information Architecture and Retrieval:** Information Architecture, Types of Information Architecture, Constructing Information Architecture for Analytics, Information Governance and Security Measures, Frameworks for Information Governance, Considerations for Data Privacy and Compliance, Best Practices for Information Security, Methods for Information Access and Retrieval. **(04 Hrs)**

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Unit-V	**Information Publishing and Reuse:** Sharing and Publishing Information, Objectives of Publicly Sharing Information, Intellectual Property Rights and Licensing for Datasets, Ethical Considerations in Information Management, Assessing the Impact of Publicly Shared Information. **(05 Hrs)**
Unit-VI	**Knowledge Systems:** Developing Reliable, Scalable, and Maintainable Knowledge Systems, Understanding Knowledge Systems Reliability, Factors Affecting Reliability (Hardware Faults, Software Errors, Human Errors), Importance of Reliability and Scalability in Knowledge Management, Load and Performance Description in Knowledge Systems, Coping Strategies for Handling Load, Considerations for Maintainability, Operability, and Complexity, Overview of Data Models and Query Languages (Relational Model vs. Document Model). **(04 Hrs)**

References

Sr. No.	Title	Author	Publication	Edition
1.	Information Management: Strategies for Gaining a Competitive Advantage with Data	William McKnight	Pearson	1st
2.	Data Science for Business: What You Need to Know about Data Mining and Data-Analytic Thinking	Foster Provost and Tom Fawcett	Oreilly	1st
3.	The Data Warehouse Toolkit: The Definitive Guide to Dimensional Modeling	Ralph Kimball and Margy Ross	Wiley	3rd
4.	Enterprise Architecture Planning: Developing a Blueprint for Data, Applications, and Technology	Steven H. Spewak and Steven C. Hill	Wiley	1st
5.	Knowledge Management in Theory and Practice	Kimiz Dalkir	MIT Press	3rd

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Faculty of Science & Technology
Syllabus of Second Year B.Tech. (All Branches) (Semester IV)
Open Elective-2 offered by the Department of Mechanical Engineering

Course Category: **OEC** Course Code: OEC291G Course: **Renewable Energy Resources** Teaching Scheme: Theory: 02 Hrs./week	**Credits: 2-0-0** In-Semester Examination-I: 15 Marks In-Semester Examination-II: 15Marks Teacher Assessment: 10 Marks Continuous Internal Evaluation: 10 Marks End Semester Examination: 50 Marks End Semester Examination (Duration): 02 Hrs.

Prerequisite	Basic understanding of concepts of physics and thermodynamics.
Objectives	1. To create awareness amongst students on sources of energy, energy crisis, and the alternatives available. 2. To get exposure to recent advances in energy in the contemporary world. 3. To know about various miscellaneous energy and its potential.
Unit-I	**Introduction:** Introduction to types of non-conventional energy sources, Energy Scenario in India and the world, Review of energy consumption pattern in various sectors in India, Introduction to energy policies and programs in India like International Solar Alliance, National Solar Mission, etc., Introduction to global climate change concerns like Clean Development Mechanism [CDM], Carbon Fund Concept of Carbon credit, Various international protocols. **(04 Hrs)**
Unit-II	**Solar Energy Systems**: Solar radiations, Types of solar radiation collectors, Estimation and measurement of solar energy, Characteristics of Photovoltaic cells, Solar cell arrays, Applications of Solar Heating & Cooling Systems like Solar still, Solar cookers, Solar ponds, Solar passive heating and cooling systems: Trombe wall, Solar power plant, Solar furnaces. **(04 Hrs)**
Unit-III	**Biofuels:** Review of Indian edible and non-edible oil sources, Examples of biodiesel crops in India, Storage and Characterization of biodiesel, Environmental and health effects of biodiesel, R&D in biodiesel **Energy Generation from Waste** Types: Biochemical Conversion: Sources of energy generation, Industrial waste, agro-residues; Aerobic & Anaerobic treatments, Factors affecting bio digestion. **(05 Hrs)**
Unit-IV	**Wind Energy Systems:** Basic principles of wind energy conversion, Site selection criteria, Wind data and energy estimation in India, Wind energy conversion systems, Horizontal and Vertical axis wind machines, Applications of wind energy, Environmental aspects, Wind Energy Program in India. **(05 Hrs)**

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Unit-V	**Geothermal Energy:** Structure of earth, Geothermal Regions, Hot Springs. Hot Rocks, Hot Aquifers. Analytical methods to estimate thermal potential. Harnessing techniques, Electricity generating systems. **Direct Energy Conversion:** Nuclear Fusion: Fusion, Fusion reaction, P-P cycle, Carbon cycle, Deuterium cycle, Condition for controlled fusion, Fuel cells and photovoltaic. Thermionic & thermoelectric generation, MHD generator. **(04 Hrs)**
Unit-VI	**Introduction to new energy technology**: Hydrogen production - water splitting - electrolytic methods Chemical cycle - photo splitting - photo galvanic - photochemical. Application of Hydrogen Fuel for Vehicle, Introduction to Magneto Hydro Dynamic system (MHD) and Electro gas dynamics (EGD): principles and types. **(04 Hrs)**

References

Sr. No.	Title	Author	Publication	Edition
1	Solar Energy-Principles of Thermal Collection & Storage	S. P. Sukhatme	TMH Publishing Co., New Delhi.	4th
2	Non-Conventional Energy Sources	G. D. Rai	Khanna publisher, New Delhi	6th
3	Non-Conventional Energy Resources	B. H. Khan	TMH New Delhi	3rd
4	Technology and Application of Biogas	Srivastava, Shukla and Ojha	Jain Brothers, New Delhi	1993
5	Renewable Energy Resources-Basic Principles and Applications	G. N. Tiwari & M. K. Ghosal	Narosa Publications	2004
6	Biogas systems: Principles and Applications	Mital K.M	New Age International Publishers	1996
7	Basics of Solid & Hazardous Waste Management Technology	Shah, Kanti L.	Prentice Hall,	2007
8	Engine for Biogas	Klaus VonMitzlaff	Friedr Vielveg and Sohn Braunschweig	1988
9	Wind Power Plants: Theory and Design	Desire Le Gouriers	Pergamon Press	1982
10	Solar Energy – Fundamentals and Applications	H. P. Garg and J. Prakash	Tata McGraw Hill	2000
11	Solar Energy Thermal Processes	John A Duffie and William A Beckman	Wiley -Inter Science Publication, New York	1974

Additional References	1. https://isolaralliance.org/publications/annual-reports 2. https://mnre.gov.in/img/documents/uploads/file_f-1618564141288.pdf 3. https://mnre.gov.in/knowledge-center/publication

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Faculty of Science & Technology Syllabus of Second Year B.Tech. (All Branches) (Semester IV) Open Elective-2 offered by the Department of Plastic and Polymer Engineering	
Course Category: OEC Course Code: OEC291H Course: Plastic Recycling Teaching Scheme: Theory: 02 Hrs./week	**Credits: 2-0-0** In-Semester Examination-I: 15 Marks In-Semester Examination-II: 15Marks Teacher Assessment: 10 Marks Continuous Internal Evaluation: 10 Marks End Semester Examination: 50 Marks End Semester Examination (Duration): 02 Hrs.
Prerequisite	Basic knowledge of polymeric materials, additives, and their properties.
Objectives	To learn the basic concepts used in the recycling of polymers.
Unit-I	**Significance of Recycling:** Introduction and classification of waste. Global polymer production and consumption. Global polymer waste composition, quantities, and disposal, Identification of polymer for recycling. **(04 Hrs)**
Unit-II	**Recycling Process:** Collection, sorting, and segregation of waste; Use of advanced technologies such as artificial intelligence in sorting; recycling methods: primary, secondary, tertiary, and quaternary recycling, landfilling. **(05 Hrs)**
Unit-III	**Recycling Equipment/Machinery:** Equipment for primary and secondary recycling: shredder, granulator, pulverizer, shredder, cutter. Classification and types of reactors for tertiary recycling, use of x-ray photoelectron spectroscopy (XPS) in recycling, international standards in recycling. **(04 Hrs)**
Unit-IV	**Recycling Techniques of Various Plastic and Rubber Products:** PE/PP packaging films and woven sacks, PET bottles and films, PVC products, fiber-reinforced plastics (FRP), and rubber products, PP batteries. **(04 Hrs)**
Unit-V	**Recycling of Plastics from Urban Waste:** Physiochemical, mechanical, and rheological characteristics of recycled plastics, hydrolytic treatment of plastics waste containing paper, mixed plastic waste and its processing, recycling extrusion, and additives used in polymer recycling. **(05 Hrs)**
Unit-VI	**Recycled Plastics End Use Applications**: Use of recycling plastics in food packaging, Use of recycled plastics in construction and architecture. Single-use plastics recycling, healthcare plastic waste recycling. **(04 Hrs)**

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	Sr. No.	Title	Author	Publication	Edition
References	1.	Plastics Fabrication and Recycling	Manas Chanda and Salil K. Roy	CRC Press	4th
	2.	Recycling of Polymers	Raju Francis	Wiley-VCH	1st
	3.	Mixed Plastic Recycling Technology	B. Hegberg, G. Brenniman	Noyes Data Corporation	1st
	4.	Feedstock Recycling and pyrolysis of waste plastics	John Schiers & W. Kaminsky	John Wiley and Sons	1st

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Faculty of Science & Technology Syllabus of Second Year B.Tech. (All Branches) (Semester IV)	
Course Category: HSSM Course Code: HSM201 Course: Engineering Economics and Management Teaching Scheme: Theory: 2 Hrs./week	**Credits: 2-0-0** In-Semester Examination-II: 10 Marks Teacher Assessment: 15 Marks
Refer Page No. 27 and 28 for detail Syllabus	

Faculty of Science & Technology Syllabus of Second Year B.Tech. (All Branches) (Semester IV)	
Course Category: HSSM Course Code: HSM202 Course: Innovation and Entrepreneurship Teaching Scheme: Theory: 02 Hrs./week	**Credits: 2-0-0** In-Semester Examination-II: 10 Marks Teacher Assessment: 15 Marks
Refer Page No. 29 and 30 for detail Syllabus	

Faculty of Science & Technology Syllabus of Second Year B.Tech. (All Branches) (Semester IV)	
Course Category: VEC Course Code: VEC201 Course: Universal Human Values Teaching Scheme: Theory: 01 Hrs./week Practical: 02 Hrs./Week	**Credits: 1-0-1** In-Semester Examination-II: 10 Marks Teacher Assessment: 15 Marks
Refer Page No. 31 and 32 for detail Syllabus	

Faculty of Science & Technology Syllabus of Second Year B.Tech. (All Branches) (Semester IV)	
Course Category: VEC Course Code: VEC202 Course: Environmental Studies Teaching Scheme: Theory: 01 Hr/week, Practical: 02 Hrs/Week	**Credits: 1-0-1** In-Semester Examination-II: 10 Marks Teacher Assessment: 15 Marks
Refer Page No. 33 and 34 for detail Syllabus	

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Faculty of Science & Technology Syllabus of Second Year B.Tech. (All Branches) (Semester IV)	
Course Category: VSEC Course Code: VSE271 Course: Professional English Teaching Scheme: Theory: 01 Hr./week Practical: 02 Hrs./Week	**Credits: 1-0-1** In-Semester Examination-II: 10 Marks Teacher Assessment: 15 Marks

Prerequisite	Knowledge of the English Language, Knowledge of LSRW techniques
Objectives	1. To understand the concept of effective communication. 2. To make use of the principles of business etiquette in professional behavior 3. To utilize different strategies of reading and listening for effective communication 4. To understand various forms of communication and demonstrate knowledge of surroundings during different communication situations. 5. To construct an appropriate format of business documents and build a positive image as an effective communicator. 6. To apply professional etiquette in professional life and inculcate the habit of standard behavior.
Unit-I	**Basics of Communication:** Communication Process and its elements, verbal and nonverbal communication, barriers of communication and strategies to overcome them, characteristics of effective communication. **(02 Hrs)**
Unit-II	**Interpersonal Skills:** Teamwork and team building: Team formation, team dynamics, leadership styles, Time Management: concept, strategies, Stress Management: types and techniques. **(02 Hrs)**
Unit-III	**Receptive Skills of Language:** Listening Skills: Purpose and importance of Listening, different types of listening, barriers & strategies of effective listening **Reading Skills:** Purpose and importance, types, barriers & strategies of reading. **(03 Hrs)**
Unit-IV	**Oral Communication:** Group Discussion, Interview techniques, public speaking. **(02 Hrs)**
Unit-V	**Writing Skills:** Business Letters, drafting an email, Writing Job Applications Resume Preparation, Writing reports. **(02 Hrs)**

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Unit-VI	**Professional Etiquettes:** Introductions and First Impressions, E-mail etiquettes, telephone etiquettes, dining table etiquettes, corporate dressing. **(02 Hrs)**
List of Exercise	1. Self-Introduction in formal situations. 2. Team Formation: Different stages of Team building 3. Book Review (English book) with PPT presentations 4. Enhancing Listening Skills: TED talks or audio lectures on theory syllabus topics 5. Mock Group discussions. 6. Formal PPT presentations 7. Mock Interviews (techniques and etiquette) 8. Cover letter and resume writing (format, styles, and strategies) 9. Telephonic conversation (Interview & Formal situations) 10. Dining Etiquettes (Manners and code of conduct)

References

Sr. No.	Title	Author	Publication	Edition
1.	Effective Technical Communication	M. Ashraf Rizvi	McGraw Hill Education	1st
2.	Communication Skills	Sanjay Kumar, Pushp Lata,	Oxford University Press	1st
3.	How to Succeed in Group Discussions & Personal Interviews	Dr. S. K. Mandal	Jaico Publishing House	1st
4.	Excellence in Business Communication,	John Thill, Courtland Bovee	Pearson	12th
5.	The ACE of Soft Skills: Attitude, Communication and Etiquette for Success	Gopalswamy Ramesh	Pearson Education	1st
6.	Master of Business Etiquette	Cyrus M. Gonda	Embassy Books	2017

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Faculty of Science & Technology Syllabus of Second Year B.Tech. (All Branches) (Semester IV)	
Course Category: AEC Course Code: AEC272 Course: Personality and Leadership Development Skills Teaching Scheme: Practical: 04 Hrs./Week	**Credits: 0-0-2** Teacher Assessment: 25 Marks

Prerequisite	Nil
Objectives	1. Equip engineering graduates with the essential soft skills and leadership skills necessary to succeed in the professional world. 2. Empower students to effectively market themselves through resume building, cover letter writing, and professional networking. 3. Prepare students for the job search process by providing strategies for job market research, effective job search techniques, and interview preparation. 4. Foster a mindset of continuous learning and career development to ensure long-term success and adaptability in the evolving engineering landscape. 5. Prepare the student to appear for Aptitude test as a part of the campus recruitment process
List of Practical	**Activities to be performed in each session (session duration – 2 hrs.).** 1. Skills Assessment: Students assess their hard and soft skills, discuss within groups, and create a skills matrix. 2. Problem-Solving Challenge: Teams brainstorm solutions to a complex engineering problem, present their solutions, and discuss their decision-making process. 3. Industry Trends Research: Students research industry trends and create visual presentations summarizing their findings. 4. Job Profile Analysis: In pairs, students analyse job profiles, compare and contrast them, and present their analysis to the class. 5. Goal Setting: Students set SMART goals, create action plans, and receive feedback from peers. 6. Resume Building Workshop: Students learn about resume writing best practices, review sample resumes, and draft their own resumes with guidance and feedback. 7. LinkedIn Profile Development: Students update their LinkedIn profiles, receive peer feedback, and ensure completeness and professionalism. 8. Elevator Pitch Competition: Students craft and deliver elevator pitches, compete for the most compelling presentations, and receive feedback. 9. Internship Application Workshop: Students draft effective internship applications, review each other's materials, and receive guidance on researching opportunities. 10. Mock Interview Marathon: Students participate in mock interviews, rotate through different scenarios, and receive feedback on their interview skills.

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	11. Hackathon Preparation Workshop: Students learn about hackathons, form teams, brainstorm project ideas, and begin planning for participation. 12. Project Competition Bootcamp: Students prepare for project competitions, form teams, brainstorm ideas, and develop prototypes or proposals for submission. 13. Team Building Challenge: Split the batch into smaller teams for collaborative problem-solving tasks that emphasize communication and teamwork. 14. Mock Leadership Scenarios: Assign students roles in various leadership scenarios to practice decision-making, delegation, conflict resolution, and empathy. 15. Community Service Project Planning: Guide students in planning a community service project, allowing them to take on different leadership roles and develop project management skills while addressing real-world issues. 16. Students will learn and solve problems related to fundamental numerical concepts, including the number system, LCM, HCF, and divisibility. 17. In this session, students will focus on percentages and ratios, learning to solve problems related to these concepts. 18. Students will delve into the application of time and work principles, solving problems that require understanding and application of these concepts. 19. This session will concentrate on profit and loss calculations, with students learning to solve related problems effectively. 20. Students will tackle problems related to determining ages, applying appropriate mathematical techniques to arrive at solutions. 21. Geometric concepts will be the focus of this session, with students learning about shapes, their properties, and perimeter calculations. 22. Arithmetic concepts like progressions and equations will be covered in this session, with students practicing solving problems based on these topics. 23. Students will review and consolidate their understanding of average and decimal fraction concepts, solving related problems to reinforce learning. 24. This session will cover the intricacies of calendar and clock problems, with students learning to solve such problems effectively. 25. Students will learn and solve problems based on word patterns and number series, honing their pattern recognition skills. 26. Logical reasoning basics will be covered in this session, with students learning and solving problems related to blood relations and coding-decoding. 27. Direction sense and symbols will be the focus of this session, with students learning to solve problems based on these concepts effectively. 28. Advanced logical reasoning skills will be developed in this session, with students tackling problems related to syllogism and logical puzzles. 29. Visual reasoning concepts will be explored in this session, with students learning to solve problems based on visual patterns effectively. 30. In the final session, students will engage in a comprehensive review of all topics covered in the course and participate in a mock test simulation to assess their understanding and readiness for placement exams.

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	Sr. No.	Title	Author	Publication	Edition
Reference Books, e- books, e- Journals	1	What Color Is Your Parachute? 202X: A Practical Manual for Job-Hunters and Career-Changers	Richard N. Bolles	Ten Speed Press	-
	2	The Start-Up of You: Adapt to the Future, Invest in Yourself, and Transform Your Career	Reid Hoffman and Ben Casnocha	Crown Business	1st
	3	Designing Your Life: How to Build a Well-Lived, Joyful Life	Bill Burnett and Dave Evans	Knopf	1st
	4	How to Win Friends and Influence People	Dale Carnegie	Simon & Schuster	-
	5	The 7 Habits of Highly Effective People: Powerful Lessons in Personal Change	Stephen R. Covey	Simon & Schuster	-
	6	Quantitative Aptitude for Competitive Examinations	Dr. R. S. Aggarwal,	S. Chand Publications	-
	7	A Modern Approach to Logical Reasoning	Dr. R. S. Aggarwal,	S. Chand Publications	-
	8	The Hands-on Guide to Analytical Reasoning and Logical Reasoning	Peeyush Bhardwaj	Arihant Publication	1st
	9	How to Prepare for Logical Reasoning	Arun Sharma	McGraw Hill Publication	-
	10	How to Prepare for Quantitative Aptitude	Arun Sharma	McGraw Hill Publication	-
Additional References	• LinkedIn Learning • Coursera • edX • Khan Academy • Codecademy				

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Faculty of Science & Technology Syllabus of Second Year B.Tech. (Agricultural Engineering) (Semester IV)	
Course Category: PCC Course Code: AED273 Course: Post Harvest Engineering Laboratory Teaching Scheme: Practical: 02 Hrs/Week	**Credits: 0-0-1** Teacher Assessment: 25 Marks End Semester Oral Examination: 25 Marks
Objectives	1. To develop practical skills in post-harvest engineering techniques such as moisture content determination, drying methods, and storage techniques. 2. To apply theoretical knowledge to real-world scenarios through practical experiments in seed cleaning, grading, and processing of cereals, pulses, and oilseeds. 3. To enhance problem-solving abilities in agricultural processing by exploring biogas technology, waste management, and ethical considerations in engineering and business communication.
List of Practical	1. Determination of grain moisture content and numerical 2. Determination of drying curves 3. Determination of relative humidity and use of a psychrometric chart and numerical 4. Study of EMC curves and numerical. 5. Study of Air screen cleaner. 6. Study of Specific gravity separator. 7. Study of spiral separator. 8. Study of the indented separator. 9. Study of various types of grain dryers. 10. Study of hammer mill and attrition mill. 11. Study of rice mill. 12. Determination of fineness modulus and uniformity index. 13. Study of mixing equipment. 14. Study of bucket elevator. 15. Study of screw conveyor and belt conveyor. 16. Visit to rice mill, roller mill, dal mill and oil mill (any two) **Note: A minimum of 10 practicals Should be performed.**

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Faculty of Science & Technology Syllabus of Second Year B.Tech. (Agricultural Engineering) (Semester IV)	
Course Category: PCC Course Code: AED274 Course: Irrigation and Drainage Engineering Laboratory Teaching Scheme: Practical: 02 Hrs/Week	**Credits: 0-0-1** Teacher Assessment: 25 Marks End Semester Oral Examination: 25 Marks
Objectives	To inculcate the practical knowledge of students regarding measurement, scheduling, methods and efficiencies of irrigation.
List of Practical	1. Measurement of irrigation water 2. Design of underground pipeline system 3. Measurement of infiltration rate 4. Measurement of soil moisture by different soil moisture measuring instruments 5. Computation of evaporation and transpiration 6. Estimation of irrigation efficiencies 7. Study of border irrigation system 8. Study of furrow irrigation system design 9. Field visit for Irrigation water resources and methods of irrigation 10. Determination of chemical properties of soil and irrigation water 11. Design of surface drainage systems and subsurface drainage systems. 12. Determination of drainage coefficient **Note: A minimum of 10 practicals Should be performed.**

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Brief about - Honor and Double Minor Degree program

As per the NEP 2020 guidelines, **Honor Degree** courses are **offered by Department (Major Discipline)**, whereas the Minor Degree courses (referred as **Double Minor**) are **offered by another department**. Honor Degree or Double Minor Degree is **Optional**. The students those who fulfills the eligibility norms can enroll for it. The Table 1 and 2 give the list of such programs.

Table 1: Honours Degree Programs

Sr. No.	Name of Honours Degree Program	Offered by
1	Smart Agritech	Agricultural Engineering
2	Green Technology and Sustainable Environment	Civil Engineering
3	Digital Media	Computer Science and Design
4	Cloud Computing	Computer Science and Engineering
5	Internet of Things	Electronics and Computer Engineering
6	Electric Vehicles	Electrical Engineering
7	Generative AI	Artificial Intelligence and Data Science
8	Robotics and Automation	Mechanical Engineering
9	Polymeric Materials	Plastic and Polymer Engineering

Table 2: Minor Degree Programs

Sr. No.	Name of Minor Degree Program	Offered by
1	Advanced Agricultural Engineering	Agricultural Engineering
2	Sustainable Infrastructure and Smart Cities	Civil Engineering
3	Design Engineering	Computer Science and Design
4	Cyber Security	Computer Science and Engineering
5	Data Science	Electronics and Computer Engineering
6	Sustainable Energy Engineering	Electrical Engineering
7	Data Analytics	Artificial Intelligence and Data Science
8	Mechanical Engineering Systems and Automation	Mechanical Engineering
9	Polymeric Products and Project Economics	Plastic and Polymer Engineering

Student can opt for either Honor or Minor degree program at a time and not the both.

The course curriculum and guidelines are given in a separate Information Booklet, available at the Department.

Dr. Ajij D. Sayyad, Dean (Academics)

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