HINDUSTHAN EDUCATIONAL AND CHARITABLE TRUST

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HINDUSTHAN

COLLEGE OF ENGINEERING AND TECHNOLOGY

(An Autonomous Institution)

Coimbatore– 641032

DEPARTMENT OF AGRICULTURAL ENGINEERING

Revised Curriculum and Syllabus for the

Batch 2020-2024, 2021 – 2025 and 2022 - 2026

(ODD SEMESTER)

(Academic Council Meeting Held on 19.06.2023)

2019 and 2022 REGULATIONS

VISION AND MISSION OF THE INSTITUTION

VISION

To become a premier institution by producing professionals with strong technical knowledge, innovative research skills and high ethical values.

MISSION

1M1: To provide academic excellence in technical education through novel teaching methods.

1M2: To empower students with creative skills and leadership qualities.

1M3: To produce dedicated professionals with social responsibility.

VISION AND MISSION OF THE DEPARTMENT

VISION

To become a department of excellence in agricultural engineering by producing socially conscious professionals with good technical knowledge and innovative skill sets.

MISSION

MI: To impart strong technical knowledge in agricultural engineering through conducive learning environment.

M2: To empower students with innovative skill sets to address agricultural issues.

M3: To produce socially responsible agricultural professionals and provide sustainable solutions

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PROGRAM OUTCOMES (POs)

Engineering Graduates will be able to:

PO 1. Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO 2. Problem analysis: Identify, formulate, review research literature, and analyze complex engmeenng problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineenng SCIences.

PO 3. Design/development o f solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

PO 4. Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

PO 5. Modern tool usage: Create, select, and apply appropriate techniques, resources, and modem engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

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PO 6. The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engmeenng practice.

PO 7. Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

PO 8. Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO 9. Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

POIO. Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

PO l l Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

POI2.Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long leamin in the broadest context of tech

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PROGRAM SPECIFIC OUTCOMES (PSOs)

PSO 1. Ability to understand agricultural scenario in World and India and superimpose agricultural engineering technologies for uplifting the agriculture.

PSO 2. Ability to solve various issues in agriculture by infusing farm mechanization, conservation strategies for soil, water and renewable energy, advanced irrigation techniques and post harvest technology.

PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

PEO 1. Graduates shall exhibit their sound theoretical, practical skills and knowledge for being a successful professional.

PEO 2. Graduates shall be creative with leadership qualities and lifelong learning skills.

PEO 3. Graduates shall hold high ethical values and be able to devise sustainable solutions to address agricultural issue.

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Department of Agricultural Engineering

Syllabus Revision carried out in 2023-2024 ODD Semester

2019 Regulation – 2021 Batch V semester- Syllabus revision

S.No	Year	Sem	Course Code & Name	Existing Syllabus	Revised Syllabus	% of Change
1	III	V	21AG5202- Refrigeration and Cold Chain Management	**Unit III: Psychrometric Process and Cooling Load Calculation** Representation of various psychometric processes on psychometric chart and their analysis, by-pass factor, Thermal comfort; Cooling and heating load Calculations sensible heat factor, latent heat factor, room sensible heat factor, equipment sensible heat factor, grand sensible heat factor, and apparatus dew point.	**Unit III: Psychrometric Process and Cooling Load Calculation** Psychometric chart-—various psychometric processes and their analysis-sensible heating, sensible cooling, humidification and dehumidification, by-pass factor, sensible heat factor, latent heat factor; Thermal comfort- Cooling load-components, sensible heat gain, latent heat gain-calculations.	16
				Unit IV: Air Conditioning System and Cold Storage Design Air conditioning systems-equipment used-classification-comfort and Industrial air conditioning system- winter, summer and year- round air conditioning system- unitary and central air conditioning system. Domestic refrigerator and freezer. Basic design requirements for cold storage, insulation materials properties and types. Cold storage design for fruits and vegetables.	**Unit IV: Air Conditioning System and Cold Storage Design** Air conditioning systems-equipment used-classification-comfort and Industrial air conditioning system- winter, summer and year- round air conditioning system- unitary and central air conditioning system. Cold storage- types-design consideration, insulation materials properties	4

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				Unit V: Shelf – Life & Cold Chain Management Defining overall Shelf-life, importance of shelf- life; remaining shelf life in the context of Chilled & Frozen foods; The premises of cold chain - Need for the chain for chilled / frozen food item, various links of the chain; Storage of frozen foods; Chilling and freezing; freeze drying, Chilling injury; cold – shortening; PPP and TTT concepts; Temperature monitoring; -Critical temperatures; Temperature – time indicators (TTI); Time – temperature –correlation-the kinetic approach, effective temperature; Transportation regulations.	**Unit V: Shelf – Life & Cold Chain Management** Defining overall shelf-life, importance of shelf- life; cold chain- optimum temperature, cold chain equipment- Chilling and freezing-methods; Storage of frozen foods; quality changes during freezing and frozen storage-Chilling injury; cold – shortening.	10
2	III	V	**21AG5203 & Theory of Machines**	**Unit II: CAM and Flywheel** Types of cams and followers - Follower motion - Uniform, Parabolic, SHM and cycloidal. Cam terminology - Cam profiles construction for roller, flat faced and knife edge follower - -Flywheels of engines and punching press- Turning moment diagrams – Fluctuation of energy, speed.	**Unit II: CAM and Flywheel** Types of cams and followers - Follower motion - Uniform, Parabolic, SHM and cycloidal. Cam terminology - Cam profiles construction for roller, flat faced and knife edge follower - Functions of fly wheel -Types of fly wheels- Flywheels of engines and punching press- Turning moment diagrams – Fluctuation of energy, speed.	8
				Unit V: Governors Governors - Types - Centrifugal governors – Porter & Proell governor, Hartnell,	**Unit V: Governors and Balancing** Governors - Types - Centrifugal governors – Porter	18

				Hartung – Characteristics	& Proell governor, Hartnell, Hartung – Characteristics- Need of balancing-Concept of static and dynamic balancing Balancing of rotating mass by another mass in the same plane- Concept of reference plane	
3	III	V	21AG5252 & Soil and Water Conservation Engineering	**Unit I: Mechanics of water and wind Erosion** Soil Erosion – Causes and Conservation status in India - Mechanics of water erosion – types of water erosions—Classification of Gully – Special forms of Erosion – Wind Erosion Mechanics of Wind Erosion -Sand Dunes and Desertification.	**Unit I: Mechanics of water and wind Erosion** Soil Erosion – Agents - Causes and Conservation status in India -Mechanics of water erosion –Factors of Erosion- types of water erosions—Classification of Gully – Special forms of Erosion – Wind Erosion Mechanics of Wind Erosion -Sand Dunes and Desertification.	4
				Unit II: Estimation of Soil Loss Rainfall and Runoff Erosivity – Soil Erodibility - Runoff computation for soil conservation: SCS-CN method –Rational Formula - Universal Soil Loss Equation (USLE) – standard plot – Modified Universal Soil Loss Equation (MUSLE) – Revised Universal Soil Loss Equation (RUSLE)- Tolerance limit (T Value) of soil loss– Land use capability classification - Wind drift losses. Soil loss measurement devices	**Unit II: Estimation of Soil Loss** Rainfall and Runoff Erosivity – Soil Erodibility - Runoff computation for soil conservation: SCS-CN method – Rational Formula - Universal Soil Loss Equation (USLE) – standard plot – Modified Universal Soil Loss Equation (MUSLE) – Revised Universal Soil Loss Equation (RUSLE)- Tolerance limit (T Value) of soil loss– Land use capability classification - Wind drift losses. Soil loss measurement devices – Runoff Plots, Multislot Divisor, Coshocton wheel silt sampler.	12

4	III	V	**21AG5002 & CAD for Agricultural Engineering**	**Exp.No.3** Creating 2D drawings with general steps and assembly of simple machines **Exp.No.6** Drawing of shaft coupling, splines, Gears and connecting road	**Exp.No.3** Creating 2D drawings with general steps of simple machines **Exp.No.6** Drawing of shaft coupling, Gears and connecting road	20

2019 Regulation – 2020 Batch VII semester- Syllabus revision						
S.No	**Year**	**Sem**	**Course Code & Name**	**Existing Syllabus**	**Revised Syllabus**	**Percentage (%) of Change**
1	IV	VII	**19AG7202R-Remote Sensing and Geographical Information System**	**Unit I: Concepts of Remote Sensing and Satellites** Introduction to Remote Sensing- Energy Sources and Interaction- Satellites - Types - Sun synchronous - Geo synchronous remote sensing satellites - LANDSAT, SPOT & IRS - Resolution - Spectral, spatial, radiometric and Temporal resolution -Remote Sensing Applications	**Unit I: Concepts of Remote Sensing and Satellites** Introduction to Remote Sensing- Energy Sources and Interaction- Satellites - Types - Sun synchronous - Geo synchronous remote sensing satellites - LANDSAT, SPOT & IRS - Resolution - Spectral, spatial, radiometric and Temporal resolution.	4
				Unit III: Concepts of GIS Definition – Map and their influences – Characteristics of Maps – Elements – Map scale, Projection, Coordinate systems – Sources of spatial data – History and development of GIS – Definition – Components – Hardware and Software.	**Unit III: Concepts of GIS** Definition – Map and their influences – Characteristics of Maps – Elements – Map scale, Projection, Coordinate systems – Sources of spatial data – Definition – Components – Hardware and Software – GIS tools	10

2	IV	VII	19AG7304R & Process Engineering of Fruits and Vegetables	**Unit I: Structure, Composition, Ripening and Spoilage** Importance of post harvest technology of horticultural crops – post harvest losses – factors causing losses - structure, cellular components, composition and nutritive value of horticultural crops – fruit ripening – mechanism and equipment - spoilage of perishable commodities – mechanism and factors causing spoilage	**Unit I: Structure, Composition, Ripening and Spoilage** Importance of post harvest technology of horticultural crops – post harvest losses – factors causing losses - structure, cellular components, composition and nutritive value of horticultural crops – fruit ripening – mechanism and equipment - spoilage of perishable commodities – mechanism and factors causing spoilage – Climatic and non-climatic fruits - Maturity indices for fruits.	8
				Unit II: Cleaning, Grading and On-Farm Processing Harvesting and washing of fruits and vegetables – cleaning and grading – fruits and vegetables - peeling - equipment's – construction and working – pre-cooling – importance, methods, pretreatments and advantages.	**Unit II: Cleaning, Grading and On-Farm Processing** Harvesting and washing of fruits and vegetables – cleaning and grading – fruits and vegetables - peeling - equipment's – construction and working – pre-cooling – importance, methods, pretreatments and advantages – Transportation and handling of fruits and vegetables – controlled atmosphere and modified atmosphere process	10

				Unit III: Preservation of Fruits and Vegetables Thermal and non-thermal techniques of preservation of fruits and vegetables and their products - methods - minimal processing of horticultural commodities – fruits and vegetables, advantages - quick freezing preservation - commercial canning of fruits, vegetables and other perishable commodities – processing and concentration of juice - membrane separation process and application - hurdle technology of preservation and techniques.	**Unit III: Preservation of Fruits and Vegetables** Thermal and non-thermal process of preservation of fruits and vegetables – canning of fruits and vegetables – process – methods – Advantage – Disadvantages – Drying and dehydration – freezing – Application – Methods quality parameters.	25
3	IV	VII	**19AG7001R & Renewable Energy Laboratory**	**Exp.No.4** Determine the efficiency of the pyrolysis reactor **Exp.No.5** Determine the efficiency of the biomass gasifier reactor	**Exp.No.4** Determine composition of biogas **Exp.No.5** Testing of engine performance	20
3	IV	VII	**19AG7002R & Remote Sensing and GIS Laboratory For Agricultural Engineers**	**Exp.No.1** Measurement of relief displacement using parallax bar **Exp.No.2** Stereoscopic vision test **Exp.No.3** Satellite images interpretation – visual **Exp.No.4** Image enhancement practice **Exp.No.5** Database Management Systems **Exp.No.6** Spatial data input	**Exp.No.1** Introduction to QGIS and SAGA **Exp.No.2** Projection by using QGIS **Exp.No.3** Georefrencing by Using QGIS **Exp.No.** Image Registration **Exp.No.5** Digitization of a Toposheet **Exp.No.6** Map Preparation using QGIS	60

				and editing - Digitising		

Syllabus Revision carried out in 2023-2024 ODD Semester

2019 Regulation (2020 batch) - VII semester = **11.42 %**
2019 Regulation (2021 batch) - V semester = **7.07 %**

Over all Percentage **18.49%** of Change Effected in the syllabus

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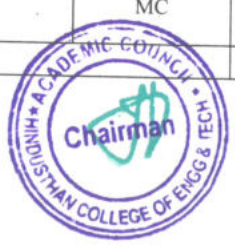
(For the students admitted during the academic year 2022-2023 and onwards)

SEMESTER I

S. NO	COURSE CODE	COURSE TITLE	COURSE CATEGORY	L	T	P	C	TCP	CIA	ESE	TOTAL
THEORY											
1.	22MA1101	MATRICES AND CALCULUS	BSC	3	1	0	4	4	40	60	100
2.	22ME1201	ENGINEERING DRAWING	ESC	1	4	0	3	5	40	60	100
THEORY WITH LAB COMPONENT											
3.	22PH1151	PHYSICS FOR NON-CIRCUIT ENGINEERING	BSC	2	0	2	3	4	50	50	100
4.	22HE1151	ENGLISH FOR ENGINEERS	HSC	2	0	2	3	4	50	50	100
5.	22IT1151	PYTHON PROGRAMMING AND PRACTICES	ESC	2	0	2	3	4	50	50	100
EEC COURSES (SE/AE)											
6.	22HE1071	UHV	AEC	2	0	0	2	3	40	60	100
7.	22HE1072	ENTREPRENEURSHIP & INNOVATION	AEC	1	0	0	1	1	100	0	100
MANDATORY COURSE											
8.	22MC1091	INDIAN CONSTITUTION	MC	2	0	0	0	2	100	0	100
	22MC1092	அறிவியல தமிழ									
TOTAL CREDITS				**17**	**5**	**6**	**19**	**29**	**470**	**330**	**800**

SEMESTER II

S. NO	COURSE CODE	COURSE TITLE	COURSE CATEGORY	L	T	P	C	TCP	CIA	ESE	TOTAL
THEORY											
1.	22MA2102	DIFFERENTIAL EQUATIONS AND COMPLEX VARIABLES.	BSC	3	1	0	4	4	40	60	100
2.	22CY2101	ENVIRONMENTAL STUDIES	ESC	2	0	0	2	3	40	60	100
3.	22PH2101	BASICS OF MATERIAL SCIENCE	BSC	2	0	0	2	3	40	60	100
THEORY WITH LAB COMPONENT											
4.	22CY2151	CHEMISTRY FOR BIOLOGICAL SCIENCES	BSC	2	0	2	3	4	50	50	100
5.	22AG2252	PRINCIPLES AND PRACTICES OF CROP PRODUCTION	PCC	2	0	2	3	4	50	50	100
6.	22HE2151	EFFECTIVE TECHNICAL COMMUNICATION	HSC	2	0	2	3	4	50	50	100
PRACTICAL											
7.	22ME2001	ENGINEERING PRACTICES	ESC	0	0	4	2	2	60	40	100
EEC COURSES (SE/AE)											
8.	22HE2071	DESIGN THINKING	AEC	1	0	2	2	2	100	0	100
9.	22HE2072	SOFT SKILLS -1	SEC	1	0	0	1	1	100	0	100
MANDATORY COURSE											
10.	22MC2091	தமிழர மரபு	MC	2	0	0	0	2	100	0	100
	22MC2092	ESSENCE OF INDIAN TRADITIONAL KNOWLEDGE									
11.	22MC2093	NCC */NSS / YRC / Sports / Clubs / Society Service - Enrollment	MC	All students shall enroll, on admission, in anyone of the personality and character development programmes and undergo training for about 80 hours							
TOTAL CREDITS				**17**	**1**	**12**	**22**	**29**	**630**	**370**	**1000**



SEMESTER III

S. NO	COURSE CODE	COURSE TITLE	COURSE CATEGORY	L	T	P	C	TCP	CIA	ESE	TOTAL
THEORY											
1.	22MA3109	TRANSFORMS AND APPLICATIONS	BSC	3	1	0	4	4	40	60	100
2.	22AG3201	SOIL TECHNOLOGY	PCC	3	0	0	3	3	40	60	100
3.	22AG3202	FLUID MECHANICS AND PUMPS	PCC	3	1	0	4	4	40	60	100
4.	22AG3203	ENGINEERING THERMODYNAMICS	PCC	3	0	0	3	3	40	60	100
THEORY WITH LAB COMPONENT											
5.	22AG3251	UNIT OPERATIONS IN AGRICULTURAL PROCESSING	PCC	2	0	2	3	4	50	50	100
6.	22AG3252	SURVEYING AND LEVELLING	PCC	2	0	2	3	4	50	50	100
PRACTICAL											
7.	22AG3001	SOIL TECHNOLOGY LABORATORY	PCC	0	0	4	2	4	60	40	100
EEC Courses (SE/AE)											
8	22HE3071	SOFT SKILLS -2	SEC	1	0	0	1	1	100	0	100
9	22AG3072	BASIC ELECTRICAL, ELECTRONICS AND INSTRUMENTATION ENGINEERING	AE	2	0	0	2	2	40	60	100
TOTAL CREDITS				**19**	**2**	**8**	**25**	**29**	**460**	**440**	**900**

SEMESTER IV

S. NO	COURSE CODE	COURSE TITLE	COURSE CATEGORY	L	T	P	C	TCP	CIA	ESE	TOTAL
THEORY											
1.	22HE4101	IPR AND START-UPS	HSC	2	0	0	2	2	40	60	100
2.	22MA4101	APPLIED PROBABILITY AND STATISTICS FOR AGRICULTURAL ENGINEERING	BSC	2	1	0	3	4	40	60	100
3.	22AG4201	FARM EQUIPMENT AND MACHINERY	PCC	3	0	0	3	3	40	60	100
4.	22AG4202	THEORY OF MACHINES	PCC	3	0	0	3	3	40	60	100
5.	22AG4203	HYDROLOGY AND WATER RESOURCES ENGINEERING	PCC	3	1	0	3	4	40	60	100
THEORY WITH LAB COMPONENT											
6.	22AG4251	SOIL AND WATER CONSERVATIONENGINEERING	PCC	2	0	2	3	4	50	50	100
7.	22AG4252	STRENGTH OF MATERIALS FOR AGRICULTURAL ENGINEERING	PCC	2	0	2	3	4	50	50	100
PRACTICAL											
8.	22AG4001	OPERATION AND MAINTENANCES OF FARM MACHINERY AND ENGINES LABORATORY	PCC	0	0	4	2	4	60	40	100
EEC COURSES (SE/AE)											
9.	22HE4071	SOFT SKILLS -3	SEC	1	0	0	1	1	100	0	100
TOTAL CREDITS				**18**	**2**	**8**	**23**	**29**	**460**	**440**	**900**

* Two weeks internship carries 1 credit and it will be done during Semester III summer vacation and same will be evaluated in Semester IV. If students unable to undergo in semester III then the Internship I offered in the semester IV can be clubbed with Internship II(Total: 4 weeks-2 credits)

SEMESTER V

S. NO	COURSE CODE	COURSE TITLE	COURSE CATEGORY	L	T	P	C	TCP	CIA	ESE	TOTAL
THEORY											
1.	22AG5201	TRACTORS AND ENGINE SYSTEMS	PCC	3	1	0	4	4	40	60	100
2.	22AG53XX	PROFESSIONAL ELECTIVE-1	PEC	3	0	0	3	3	40	60	100
3.	22AG53XX	PROFESSIONAL ELECTIVE-2	PEC	3	0	0	3	3	40	60	100
4.	22AG53XX	PROFESSIONAL ELECTIVE-3	PEC	3	0	0	3	3	40	60	100
THEORY WITH LAB COMPONENT											
5.	22AG5251	IRRIGATION AND DRAINAGE ENGINEERING	PCC	2	0	2	3	4	50	50	100
6.	22AG5252	FOOD AND DAIRY ENGINEERING	PCC	2	0	2	3	4	50	50	100
PRACTICAL											
7.	22AG5001	RENEWABLE ENERGY LABORATORY	PCC	0	0	4	2	4	60	40	100
EEC COURSES (SE/AE)											
8.	22HE5071	SOFT SKILLS -4 /FOREIGN LANGUAGES	SEC	1	0	0	1	1	100	0	100
TOTAL CREDITS				**17**	**1**	**8**	**22**	**26**	**420**	**380**	**800**

SEMESTER VI

S. NO	COURSE CODE	COURSE TITLE	COURSE CATEGORY	L	T	P	C	TCP	CIA	ESE	TOTAL
THEORY											
1.	22AG6201	REMOTE SENSING AND GEOGRAPHICAL INFORMATION SYSTEM	PCC	3	0	0	3	3	40	60	100
2.	22AG6202	PROFESSIONAL ETHICS	HSC	3	0	0	3	3	40	60	100
3.	22AG63XX	PROFESSIONAL ELECTIVE-4	PEC	3	0	0	3	3	40	60	100
4.	22AG63XX	PROFESSIONAL ELECTIVE-5	PEC	3	0	0	3	3	40	60	100
5.	22XX64XX	OPEN ELECTIVE – 1*	OEC	3	0	0	3	3	40	60	100
6.	22XX64XX	OPEN ELECTIVE – 2*	OEC	3	0	0	3	3	40	60	100
PRACTICAL											
7.	22AG6001	CAD FOR AGRICULTURAL ENGINEERING LABORATORY	PCC	0	0	4	2	4	60	40	100
8.	22AG6002	POST HARVEST TECHNOLOGY	ESC	0	0	4	2	4	60	40	100
EEC COURSES (SE/AE)											
9.	22HE6701	SOFT SKILLS - 5	SEC	2	0	0	2	2	100	0	100
TOTAL CREDITS				**20**	**0**	**8**	**24**	**28**	**460**	**440**	**900**

SEMESTER VII

S. NO	COURSE CODE	COURSE TITLE	COURSE CATEGORY	L	T	P	C	TCP	CIA	ESE	TOTAL
THEORY											
1.	22AG7201	MECHANICS OF TILLAGE AND TRACTION	PCC	3	0	0	3	3	40	60	100
2.	22AG7202	WASTE AND BY PRODUCT	PCC	3	1	0	4	4	40	60	100

OPEN ELECTIVE I AND II
(EMERGING TECHNOLOGIES)

To be offered for students other than CSE, IT, AI&ML, ECE & BIOMEDICAL

S. NO	COURSE CODE	COURSE TITLE	COURSE CATEGORY	L	T	P	C	TCP	CIA	ESE	TOTAL
1.	22AI6451	ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING FUNDAMENTALS	OEC	2	0	0	3	4	40	60	100
2.	22CS6451	BLOCKCHAIN TECHNOLOGY	OEC	2	0	0	3	4	40	60	100
3.	22EC6451	CYBER SECURITY	OEC	2	0	0	3	4	40	60	100
4.	22EC6452	IOT CONCEPTS AND APPLICATIONS	OEC	2	0	0	3	4	40	60	100
5.	22IT6451	DATA SCIENCE AND ANALYTICS	OEC	2	0	0	3	4	40	60	100
6.	22BM6451	AUGMENTED AND VIRTUAL REALITY	OEC	2	0	0	3	4	40	60	100

OPEN ELECTIVES I AND II

To be offered for students other than AUTO, AERO, AGRI, MECH, MCTS, CIVIL, EEE, CHEMICAL, FOOD TECH, E&I

S. NO	COURSE CODE	COURSE TITLE	COURSE CATEGORY	L	T	P	C	TCP	CIA	ESE	TOTAL
1.	22AE6401	SPACE SCIENCE	OEC	3	0	0	3	3	40	60	100
2.	22MT6401	INTRODUCTION TO INDUSTRIAL ENGINEERING	OEC	3	0	0	3	3	40	60	100
3.	22MT6402	INDUSTRIAL SAFETY AND ENVIRONMENT	OEC	3	0	0	3	3	40	60	100
4.	22CE6401	CLIMATE CHANGE AND ITS IMPACT	OEC	3	0	0	3	3	40	60	100
5.	22CE6402	ENVIRONMENT AND SOCIAL IMPACT ASSESSMENT	OEC	3	0	0	3	3	40	60	100
6.	22ME6401	RENEWABLE ENERGY SYSTEM	OEC	3	0	0	3	3	40	60	100
7.	22ME6402	ADDITIVE MANUFACTURING SYSTEMS	OEC	3	0	0	3	3	40	60	100
8.	22EI6401	INTRODUCTION TO INDUSTRIAL INSTRUMENTATION AND CONTROL	OEC	3	0	0	3	3	40	60	100
9.	22EI6402	GRAPHICAL PROGRAMMING USING VIRTUAL INSTRUMENTATION	OEC	3	0	0	3	3	40	60	100
10.	22AU6401	FUNDAMENTALS OF AUTOMOBILE ENGINEERING	OEC	3	0	0	3	3	40	60	100
11.	22AU6402	AUTOMOTIVE VEHICLE SAFETY	OEC	3	0	0	3	3	40	60	100
12.	22EE6401	DIGITAL MARKETING	OEC	3	0	0	3	3	40	60	100
13.	22EE6402	RESEARCH METHODOLOGY	OEC	3	0	0	3	3	40	60	100
14.	22FT6401	TRADITIONAL FOODS	OEC	3	0	0	3	3	40	60	100
15.	22CH6401	BIOMASS AND BIOREFINERY	OEC	3	0	0	3	3	40	60	100
16.	22AG6401	URBAN AGRICULTURE AND ORGANIC FARMING	OEC	3	0	0	3	3	40	60	100

		UTILIZATION									
3.	22AG73XX	PROFESSIONAL ELECTIVE-6	PEC	3	0	0	3	3	40	60	100
4.	22XX74XX	OPEN ELECTIVE – 3*	OEC	3	0	0	3	3	40	60	100
5.	22XX74XX	OPEN ELECTIVE – 4*	OEC	3	0	0	3	3	40	60	100
PRACTICAL											
6.	22AG7001	REMOTE SENSING AND GIS LABORATORY	PCC	0	0	4	2	4	60	40	100
EEC COURSES (SE/AE)											
7.	22AG7701	INTERNSHIP	SEC	-	-	-	2	2	100	0	100
TOTAL CREDITS				**15**	**1**	**4**	**20**	**22**	**360**	**340**	**700**
Two weeks internship carries 1 credit and it will be done during Semester VI summer vacation/placement training and same will be evaluated in Semester VII.											

SEMESTER VIII

S. NO	COURSE CODE	COURSE TITLE	COURSE CATEGORY	L	T	P	C	TCP	CIA	ESE	TOTAL
EEC Courses (SE/AE)											
1.	22AG8901	PROJECT WORK	SEC	0	0	20	10	20	100	100	200
TOTAL CREDITS				**0**	**0**	**20**	**10**	**20**	**100**	**100**	**200**

Note:

1. As per the AICTE guideline, in Semester I, II, III & IV NCC one credit subject is added as Value Added Course with Extra Credit. Further, the students' who enrolled his/her name in HICET NCC and Air Wing are eligible to undergo this subject. The earned extra credits printed in the Consolidated Mark sheet as per the regulation.
2. NCC course level 1 & Level 2 will be added in the list of open elective subjects in the appropriate semester. Further, the students' who have opted NCC subjects in Semester I, II, III & IV are eligible to undergo NCC Open Elective Subjects.
3. The above-mentioned NCC Courses will be offered to the students who are going to be admitted in the Academic Year 2021 – 22.

SEMESTER WISE CREDIT DISTRIBUTION

B.E. / B.TECH. PROGRAMMES										
S.No.	Course Area	Credits per Semester								Total Credits
		I	II	III	IV	V	VI	VII	VIII	
1.	HSC	3	3	-	2	-	3	-	-	**11**
2.	BSC	7	9	4	3	-	-	-	-	**23**
3.	ESC	6	4	3	-	-	2	-	-	**15**
4.	PCC	-	3	15	17	12	5	9	-	**61**
5.	PEC	-	-	-	-	9	6	3	-	**18**
6.	OEC	-	-	-	-	-	6	6	-	**12**
7.	EEC	3	3	3	1	1	2	2	10	**25**
8.	MC									
Total		**19**	**22**	**25**	**23**	**22**	**24**	**20**	**10**	**165**

OPEN ELECTIVE III

Students shall choose any one of the open elective courses such that the course content or title does not belong to their own programme. (Note: Each programme in our institution is expected to provide one course only)

1.	22AG7401	MODERN AGRICULTURAL TECHNOLOGIES	OEC	3	0	0	3	3	40	60	100

OPEN ELECTIVE IV

S. NO	COURSE CODE	COURSE TITLE	COURSE CATEGORY	L	T	P	C	TCP	CIA	ESE	TOTAL
1.	22LS7401	GENERAL STUDIES FOR COMPETITIVE EXAMINATIONS	OEC	3	0	0	3	3	40	60	100
2.	22LS7402	HUMAN RIGHTS, WOMEN RIGHTS AND GENDER EQUITY	OEC	3	0	0	3	3	40	60	100
3.	22LS7403	INDIAN ETHOS AND HUMAN VALUES	OEC	3	0	0	3	3	40	60	100
4.	22LS7404	FINANCIAL INDEPENDENCE AND MANAGEMENT	OEC	3	0	0	3	3	40	60	100
5.	22LS7405	YOGA FOR HUMAN EXCELLENCE	OEC	3	0	0	3	3	40	60	100
6.	22LS7406	DEMOCRACY AND GOOD GOVERNANCE	OEC	3	0	0	3	3	40	60	100
7.	22LS7407	NCC LEVEL - II	OEC	3	0	0	3	3	40	60	100

PROFESSIONAL ELECTIVE COURSES: VERTICALS

VERTICAL I Farm Machinery and Power	VERTICAL II Water Management and Protected cultivation	VERTICAL III Renewable Energy Engineering	VERTICAL IV Food Processing	VERTICAL V IT and Agricultural Business management	VERTICAL VI Advances in Agricultural Engineering
22AG5301 Farm Power & Machinery Management	**22AG5304** Watershed planning and Management	**22AG5307** Biomass Management for Fodder & Energy	**22AG5310** Heat and Mass Transfer for Agricultural Engineering	**22AG5313** Integrated Farming System	**22AG5316** Automation in Agriculture
22AG5302 Tractor Systems and Controls	**22AG5305** Groundwater and Well Engineering	**22AG5308** Renewable Energy Sources	**22AG5311** Food Process Equipment and Design	**22AG5314** Agri Business Management	**22AG5317** Electric and Hybrid Vehicle
22AG5303 Tractor Design and Testing	**22AG5306** Design of Micro-irrigationsystem	**22AG5309** Renewable Energy Technology	**22AG5312** Food Plant Design andManagement	**22AG5315** Sustainable Agriculture and Food Security	**22AG5318** Foundation of Robotics and Drone
22AG6301 Hydraulic Control system and design	**22AG6303** Protected Cultivation	**22AG6305** Solar and Wind energysystem	**22AG6307** Storage and Packaging Technology	**22AG6309** Systems Analysis in Agricultural Engineering	**22AG6311** Applications of RS & GIS in Resource Management
22AG6302 Testing and evaluation of farm machinery and equipment	**22AG6304** On-farm water management	**22AG6306** Biochemical and Thermochemical conversion of biomass	**22AG6308** Refrigeration and cold Storage	**22AG6310** IT in Agricultural System	**22AG6312** Fundamentals of Nano Technology in Agriculture
22AG7301 Human Engineering and Safety in Farm Machinery Operations	**22AG7302** Irrigation Water Quality andWaste Water Management	**22AG7303** Energy Audit	**22AG7304** Emerging Technologies in FoodProcessing	**22AG7305** Design and Maintenance of Green House	**22AG7306** Gender and Integrated water Resource Management

Note:

Students are permitted to choose all professional electives from any of the verticals.

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PROFESSIONAL ELECTIVE -I

S. NO	COURSE CODE	COURSE TITLE	COURSE CATEGORY	L	T	P	C	TCP	CIA	ESE	TOTAL
1.	22AG5301	FARM POWER & MACHINERY MANAGEMENT	PEC	3	0	0	3	3	40	60	100
2.	22AG5302	TRACTOR SYSTEMS AND CONTROLS	PEC	3	0	0	3	3	40	60	100
3.	22AG5303	TRACTOR DESIGN AND TESTING	PEC	3	0	0	3	3	40	60	100
4.	22AG6301	HYDRAULIC CONTROL SYSTEM AND DESIGN	PEC	3	0	0	3	3	40	60	100
5.	22AG6302	TESTING AND EVALUATION OF FARM MACHINERY AND EQUIPMENT	PEC	3	0	0	3	3	40	60	100
6.	22AG7301	HUMAN ENGINEERING AND SAFETY IN FARM MACHINERY OPERATIONS	PEC	3	0	0	3	3	40	60	100

PROFESSIONAL ELECTIVE -II

S. NO	COURSE CODE	COURSE TITLE	COURSE CATEGORY	L	T	P	C	TCP	CIA	ESE	TOTAL
1.	22AG5304	WATERSHED PLANNING AND MANAGEMENT	PEC	3	0	0	3	3	40	60	100
2.	22AG5305	GROUNDWATER AND WELL ENGINEERING	PEC	3	0	0	3	3	40	60	100
3.	22AG5306	DESIGN OF MICRO-IRRIGATION SYSTEM	PEC	3	0	0	3	3	40	60	100
4.	22AG6303	PROTECTED CULTIVATION	PEC	3	0	0	3	3	40	60	100
5.	22AG6304	ON-FARM WATER MANAGEMENT	PEC	3	0	0	3	3	40	60	100
6.	22AG7302	IRRIGATION WATER QUALITY AND WASTE WATER MANAGEMENT	PEC	3	0	0	3	3	40	60	100

PROFESSIONAL ELECTIVE -III

S. NO	COURSE CODE	COURSE TITLE	COURSE CATEGORY	L	T	P	C	TCP	CIA	ESE	TOTAL
1.	22AG5307	BIOMASS MANAGEMENT FOR FODDER & ENERGY	PEC	3	0	0	3	3	40	60	100
2.	22AG5308	RENEWABLE ENERGY SOURCES	PEC	3	0	0	3	3	40	60	100
3.	22AG5309	RENEWABLE ENERGY TECHNOLOGY	PEC	3	0	0	3	3	40	60	100
4.	22AG6305	SOLAR AND WIND ENERGY SYSTEM	PEC	3	0	0	3	3	40	60	100
5.	22AG6306	BIOCHEMICAL AND THERMOCHEMICAL CONVERSION OF BIOMASS	PEC	3	0	0	3	3	40	60	100
6.	22AG7303	ENERGY AUDIT	PEC	3	0	0	3	3	40	60	100

PROFESSIONAL ELECTIVE -IV

S. NO	COURSE CODE	COURSE TITLE	COURSE CATEGORY	L	T	P	C	TCP	CIA	ESE	TOTAL
1.	22AG5310	HEAT AND MASS TRANSFER FOR AGRICULTURAL ENGINEERING	PEC	3	0	0	3	3	40	60	100
2.	22AG5311	FOOD PROCESS EQUIPMENT AND DESIGN	PEC	3	0	0	3	3	40	60	100
3.	22AG5312	FOOD PLANT DESIGN AND MANAGEMENT	PEC	3	0	0	3	3	40	60	100
4.	22AG6307	STORAGE AND PACKAGING TECHNOLOGY	PEC	3	0	0	3	3	40	60	100
5.	22AG6308	REFRIGERATION AND COLD STORAGE	PEC	3	0	0	3	3	40	60	100
6.	22AG7304	EMERGING TECHNOLOGIES IN FOODPROCESSING	PEC	3	0	0	3	3	40	60	100

PROFESSIONAL ELECTIVE -V

S. NO	COURSE CODE	COURSE TITLE	COURSE CATEGORY	L	T	P	C	TCP	CIA	ESE	TOTAL
1.	22AG5313	INTEGRATED FARMING SYSTEM	PEC	3	0	0	3	3	40	60	100
2.	22AG5314	AGRI BUSINESS MANAGEMENT	PEC	3	0	0	3	3	40	60	100
3.	22AG5315	SUSTAINABLE AGRICULTURE AND FOOD SECURITY	PEC	3	0	0	3	3	40	60	100
4.	22AG6309	SYSTEMS ANALYSIS IN AGRICULTURALENGINEERING	PEC	3	0	0	3	3	40	60	100
5.	22AG6310	IT IN AGRICULTURAL SYSTEM	PEC	3	0	0	3	3	40	60	100
6.	22AG7305	DESIGN AND MAINTENANCE OF GREEN HOUSE	PEC	3	0	0	3	3	40	60	100

PROFESSIONAL ELECTIVE -VI

S. NO	COURSE CODE	COURSE TITLE	COURSE CATEGORY	L	T	P	C	TCP	CIA	ESE	TOTAL
1.	22AG5316	AUTOMATION IN AGRICULTURE	PEC	3	0	0	3	3	40	60	100
2.	22AG5317	ELECTRIC AND HYBRID VEHICLE	PEC	3	0	0	3	3	40	60	100
3.	22AG5318	FOUNDATION OF ROBOTICS AND DRONE	PEC	3	0	0	3	3	40	60	100
4.	22AG6311	APPLICATIONS OF RS & GIS IN RESOURCE MANAGEMENT	PEC	3	0	0	3	3	40	60	100
5.	22AG6312	FUNDAMENTALS OF NANO TECHNOLOGY IN AGRICULTURE	PEC	3	0	0	3	3	40	60	100
6.	22AG7306	GENDER AND INTEGRATED WATER RESOURCE MANAGEMENT	PEC	3	0	0	3	3	40	60	100

ENROLLMENT FOR B.E. / B. TECH. (HONOURS) / MINOR DEGREE (OPTIONAL)

A student can also optionally register for additional courses (18 credits) and become eligible for the award of B.E. / B. Tech. (Honours) or Minor Degree. For B.E. / B. Tech. (Honours), a student shall register for the additional courses (18 credits) from semester V onwards. These courses shall be from the same vertical or a combination of different verticals of the same programme of study only. For minor degree, a student shall register for the additional courses (18 credits) from semester V onwards. All these courses have to be in a particular vertical from any one of the other programmes.

Clause 4.10 of Regulation 2022 is applicable for the enrollment of B.E. / B. TECH. (HONOURS) / Minor Degree (Optional)

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Semester	I	II	III	IV	V	VI	VII	VIII	Total
Credits	19	22	25	23	22	24	20	10	165

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SEMESTER - III

Programme	Course Code	Name of the Course	L	T	P	C
B.Tech	22AG3201	SOIL TECHNOLOGY	3	0	0	3

Course Objective

- To expose the students to the fundamental knowledge on Soil physical parameters.
- To learn about Permeability – Compaction, Bearing Capacity and types and methods of soil survey and interpretative groupings

Unit	Description	Instructional Hours
I	**INTRODUCTION AND SOIL PHYSICS** Soil - definition - major components –Soil forming minerals and processes- soil profile - Physical properties - texture –density-porosity-consistence-colour- -specific gravity - capillary and non- capillary -plasticity. Soil air - soil temperature - soil water - classification of soil water- Movement soil water. Soil colloids – organic and inorganic matter-Ion exchange- pH – Plant nutrient availability	9
II	**SOIL CLASSIFICATION AND SURVEY** Soil taxonomy – Soils of Tamil Nadu and India. Soil survey - types and methods of soil survey – Field mapping- mapping units - base maps -preparation of survey reports - concepts and uses - land capability classes and subclasses - soil suitability -Problem soils – Reclamation.	9
III	**PHASE RELATIONSHIP AND SOIL COMPACTION** Phase relations- Gradation analysis- Atterberg Limits and Indices- Engineering Classification of soil – Soil compaction- factors affecting compaction- field and laboratory methods.	9
IV	**ENGINEERING PROPERTIESOF SOIL** Shear strength of cohesive and cohesionless - Mohr-Coulomb failure theory- Measurement of shear strength, direct shear, Triaxial and vane shear test- -Permeability- Coefficient of Permeability-Darcy's law-field and lab methods - Assessment of seepage - Compressibility	9
V	**BEARING CAPACITY AND SLOPE STABILITY** Bearing capacity of soils - Factors affecting Bearing Capacity- Shallow foundations- Terzaghi"s formula- BIS standards - Slope stability-Analysis of infinite and finite slopes- friction circle method- slope protection measures.	9
	Total Instructional Hours	**45**

COURSE OUTCOMES

After completion of the course the learner will be able to

CO1:Fundamental knowledge of soil physical parameters.
CO2:The procedures involved in soil survey, soil classification.
CO3:The phase relationship and soil compaction.
CO4:Concepts of bearing capacity and slope stability
CO5: Understanding the important of BIS standards

TEXT BOOKS:

T1 Nyle C. Brady, "The Nature and Properties of Soil", Macmillan Publishing Company, 10th Edition, New York, 2008

T2 Punmia, B.C., "Soil Mechanics and Foundation "Laxmi Publishers, New Delhi, 2007.

REFERENCE BOOKS:

R1 Edward J. Plaster., "Soil Science", Cengage Learning India Ltd, New Delhi, 2009.

R2 Arora, K.R. "Soil Mechanics and Foundation Engineering", Standard Publishers and Distributors, New Delhi, 2007

R3 Murthy, V.N.S. "Soil Mechanics and Foundation Engineering", UBS Publishers and Distributors, New Delhi, 2007

R4 Sehgal, S.B., "Text Book of Soil Mechanics", CBS Publishers and Distributors New Delhi, 2007.

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Programme	Course Code	Name of the Course	L	T	P	C
B.Tech.	22AG3202	FLUID MECHANICS AND PUMPS	3	1	0	4

Course Objective

1. To understand the properties of fluids
2. To acquire knowledge on fluid flow
3. To understand the behavior of fluid flow through pipes
4. To gain knowledge on open channel flows
5. To gather knowledge on dimensional analysis and study the various types of pumps

Unit	Description	Instructional Hours
	FLUID PROPERTIES AND FLOW CHARACTERISTICS	
I	Properties of fluids – Fluid statics – Pressure Measurements – Buoyancy and floatation – Flow characteristics – Eulerian and Lagrangian approach – Concept of control volume and system – Reynold's transportation theorem – Continuity equation, energy equation and momentum equation – Applications.	12
	FLOW THROUGH PIPES AND BOUNDARY LAYER	
II	Reynold's Experiment – Laminar flow through circular conduits – Darcy Weisbach equation – friction factor – Moody diagram – Major and minor losses – Hydraulic and energy gradient lines – Pipes in series and parallel – Boundary layer concepts – Types of boundary layer thickness.	12
	DIMENSIONAL ANALYSIS AND MODEL STUDIES	
III	Fundamental dimensions – Dimensional homogeneity – Rayleigh's method and Buckingham Pi theorem – Dimensionless parameters – Similitude and model studies – Distorted and undistorted models	12
	TURBINES	
IV	Impact of jets – Velocity triangles – Theory of rotodynamic machines – Classification of turbines – Working principles – Pelton wheel – Modern Francis turbine – Kaplan turbine – Work done – Efficiencies – Draft tube – Specific speed – Performance curves for turbines – Governing of turbines.	12
	PUMPS	
V	Classification of pumps – Centrifugal pumps – Working principle – Heads and efficiencies– Velocity triangles – Work done by the impeller – Performance curves – Reciprocating pump working principle – Indicator diagram and it's variations – Work saved by fitting air vessels – Rotary pumps.	12
	Total Instructional Hours	60

COURSE OUTCOMES	Upon successful completion of the course, students shall have ability to CO1: Comprehend the properties of fluids CO2: Understand the various types of fluid flow CO3: Calculate the discharge and compute energy losses in pipe flow CO4: Classify open channel flows and also design the most economical sections for open channel flows CO5: Select appropriate model to provide solution to a real time problem related to hydraulics and also assess the performance of pumps

TEXT BOOKS:

T1 Jain A. K. Fluid Mechanics including Hydraulic Machines, Khanna Publishers, New Delhi, 2014.

T2 S K Som; Gautam Biswas and S Chakraborty, Introduction to Fluid Mechanics and Fluid Machines, McGraw Hill Education (India) Pvt. Ltd., 2017.

T3 Chandramouli P N, Applied Hydraulic Engineering, Yes Dee Publisher, 2017.

REFERENCE BOOKS:

R1 Ven Te Chow, Open Channel Hydraulics, McGraw Hill, New York, 2009.

R2 Subramanya K, Fluid Mechanics and Hydraulic Machines: Problems and Solutions, McGraw Hill

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	22AG3203	ENGINEERING THERMODYNAMICS	3	0	0	3

Course Objective

- To make the students understand the basic laws of thermodynamics and heat transfer as applied in the different branches of Agricultural Engineering.
- To impart a good exposure on the principles of operation of thermal equipments like IC engine, boilers, turbine and refrigerator etc. applied to Agricultural Engineering Machinery and Process designs .

Unit	Description	Instructional Hours
I	**BASIC CONCEPTS OF THERMODYNAMICS** First law of thermodynamics – Energy balance for closed systems and steady flow systems – Applications of First law of Thermodynamics – Energy balance for Unsteady flow processes – Second law of Thermodynamics – Heat Reservoir, source and sink. Heat Engine, Refrigerator, and Heat pump-Entropy – Carnot principles – Change in Entropy – Entropy and irreversibility -Applications.	9
II	**FIRST AND SECOND LAW OF THERMODYNAMICS** First law of thermodynamics – Energy balance for closed systems and steady flow systems – Applications of First law of Thermodynamics – Energy balance for Unsteady flow processes – Second law of Thermodynamics – Entropy – Carnot principles – Change in Entropy – Entropy and irreversibility -Applications.	9
III	**HEAT ENGINES** Internal Combustion Engines – C.I and S.I Engines – Four Stroke and Two Stroke Engines - Boilers – Fire Tube Boiler & Water Tube Boilers , Boiler Accessories and Components. Turbines – Impulse Turbine and Reaction Turbine , Turbine Components - Refrigeration Cycle – Vapour Compression & Vapour Absorption System ,Gas Refrigeration System – Air Conditioning..	9
IV	**GASES AND VAPOUR MIXTURES** Ideal and Real gases – Vander waals equations – Reduced property – Compressibility chart -Properties of mixture of gases – Dalton"s law and Gibbs – Dalton law – Internal energy, Enthalpy and specific heats of gas mixtures.	9
V	**HEAT TRANSFER** Conduction – Plane Wall, Cylinder system, Composite Walls – Critical insulation thickness – Simple, fins convection – Free convection and forced convection – Flow over Flat plates and Flow through Pipes – Radiation – Black Body, Grey Body Radiation.	9
	Total Instructional Hours	45

Course Outcome	CO1: Classify mechanisms and inversions and determine mobility of a mechanism. CO2: Construct cam profiles for various followers and turning moment diagram for flywheel. CO3: Classify various gear trains and apply to automation. CO4: Apply friction principles to clutches, belt, brake and screw. CO5: Evaluate the sensitivity of governor

TEXT BOOKS:

T1	Yunus A. Cenegal and Michael A.Boles, "Thermodynamics: An Engineering Approach", Fourth Edition, Tata McGraw-hill, 2004.
T2	Michael J.Moran, Howard N.Shapiro, "Fundamentals of Engineering Thermodynamics", Fourth Editon, John wiley &Sons, 2000.

REFERENCE BOOKS:

R1	R.K.Rajput, "A Text book of Engineering Thermodynamics", Third Edition, Laxmi publication (P) Ltd., 2007.
R2	Nag.P.K., "Engineering Thermodynamics", Third Edition, Tata McGraw hill, 2005.
R3	Domkundwar.S., C.P.Kothandaraman "A Course in Thermal Engineering", Fifth Edition, Dhanpat Rai & Co (p) Ltd, 2000.

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Programme	Course Code	Name of the Course	L	T	P	C
B.Tech.	22AG3251	UNIT OPERATIONS IN AGRICUTURAL PROCESSING	2	0	2	3

Course Objective The students would be exposed to the fundamental knowledge in Evaporation, Filtration, Sedimentation, Processing, Sieve analysis, Crystallization and Distillation in processing of agricultural produce.

Unit	Description	Instructional Hours
I	**EVAPORATION AND CONCENTRATION** Unit operations in food processing –conservation of mass and energy – overall view of an engineering process-dimensions and units – dimensional and unit consistency – dimensionless ratios-evaporation – definition – liquid characteristics – single and multiple effect evaporation- performance of evaporators and boiling point elevation – capacity – economy and heat balance- types of evaporators – once through and circulation evaporators – short tube evaporators and long tube evaporators – agitated film evaporator	9
II	**MECHANICAL SEPARATION** Filtration – definition –filter media – types and requirements-constant rate filtration – constant pressure filtration – filter cake resistance-filtration equipment – rotary vacuum filter – filter press- sedimentation – gravitational sedimentation of particles in a fluid – Stoke"s law, sedimentation of particles in gas-cyclones – settling under sedimentation and gravitational sedimentation-centrifugal separations – rate of separations – liquid – liquid separation – centrifuge equipment.	9
III	**SIZE REDUCTION** Size reduction – grinding and cutting – principles of comminuting – characteristics of comminuted products – particle size distribution in comminuted products-energy and power requirements in comminuting – crushing efficiency – Rittinger"s, Bond"s and Kick"s laws for crushing-size reduction equipments – crushers – jaw crusher, gyratory crusher-crushing rolls – grinders – hammer mills – rolling compression mills - attrition, rod, ball and tube mills – construction and operation.	9

IV	**CONTACTEQUILIBRIUM SEPARATION** Contact equilibrium separation processes – concentrations – gas-liquid and solid-liquid equilibrium equilibrium concentration relationships – operating conditions-calculation of separation in contact equilibrium processes-gas absorption – rate of gas absorption – stage – equilibrium gas – absorption equipment-properties of tower packing – types – construction – flow through packed towers-extraction – rate of extraction – stage equilibrium extraction-equipment for leaching coarse solids – intermediate solids – basket extractor-extraction of fine material – Dorr agitator – continuous leaching – decantation systems – extraction towers-washing – equipment	9
V	**CRYSTALLISATION AND DISTILLATION** Crystallization-Equilibrium –Rate of crystal growth stage-Equilibrium crystallization-Crystallizers- Equipment-Classification- Construction and operation – Crystallizers-Tank-Agitated batch- Swenson-Walker and Vacuum crystallizers-Distillation-Binary mixtures-Flash and differential distillation-Steam distillation –Theory-Continuous distillation with rectification –Vacuum distillation - Batch distillation-Operation and process-Advantages and limitation-Distillation equipments- Construction and operation-Factors influencing the operation.	9
	Total Instructional Hours	**45**

COURSE OUTCOMES

At the end of the study the student will have knowledge on

CO1:Fundamentals of various unit operations of Agricultural Processing.

CO2: Understand the liquid characteristics and performance of single and multiple effect evaporation

CO3: Classify the filter media types and its requirements and sedimentation of particles in a fluid.

CO4: Size reduction equipment and calculating the power requirements

CO5: Understand the equilibrium separation processes and importance of crystallisation and distillation in agricultural processing.

TEXT BOOKS:

T1 Earle, R.L., "Unit operations in Food Processing", Pergamon Press, Oxford, U.K, 1985.

T2 McCabe, W.L., and Smith, J.C., "Unit Operations of Chemical Engineering", Mc-Graw-Hill Inc., Kosaido Printing Ltd., Tokyo, 1990.

T3 Geankoplis, C.J. "Transport Processes and Separation Process Principles", 4th Edition, Prentice Hall,

REFERENCE BOOKS:

R1 Coulson, J.M and J.F. Richardson. Chemical Engineering. Volume I to V. The Pergamon Press. New York, 1999..

R2 Albert Ibarz and Gustavo V. Barbosa-Cánovas. Unit Operations in Food Engineering. CRC Press LLC, Florida, 2003..

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Programme	Course Code	Name of the Course	L	T	P	C
B.Tech.	22AG3252	SURVEYING AND LEVELLING	2	0	2	3

Course Objective

1. To gain knowledge on basic principle and concepts of different surveying methods.
2. To learn how to use compass to carryout land surveying.
3. To learn the basics of leveling and its applications.
4. To explore the types and characteristics of contours.
5. To understand the concepts of Theodolite survey in linear and angular measurements

Unit	Description	Instructional Hours
I	**FUNDAMENTALS AND CHAIN SURVEYING** Definition- Classifications - Basic principles – Equipment and accessories for ranging and chaining – Methods of ranging - well conditioned triangles - computation of cross sectional areas (Simpon's rule and Trapezoidal rule) **Aligning, Ranging and Chaining** **Computation of area of the plot using Chain traversing**	9
II	**COMPASS AND PLANE TABLE SURVEYING** Compass – Basic principles - Types - Bearing systems and conversions – Sources of Errors - Local attraction - applications - Plane table and its accessories - Merits and demerits. Computation of included angle between stations using Compass Traversing **Plane table Surveying - Radiation Method** **Plane table Surveying – Intersection Method**	9
III	**LEVELLING** Levelling- Principles and theory of Levelling - Datum - Bench Marks – Temporary and Permanent Adjustments- Methods of Levelling - Sources of errors in Levelling **Fly levelling using Dumpy Level (Height of Instrument and Rise & Fall method)**	9
IV	**CONTOURING** Contouring - Methods – Characteristics and uses of contours - Plotting – Methods of interpolating contours – Earthwork calculations - Capacity of reservoirs - Mass haul diagrams. Grid Contouring.	9
V	**THEODOLITE AND MODERN SURVEYING** Theodolite – components of theodolite - Temporary and permanent adjustments - Heights and distances by single plane and double method. **Computation of area by Theodolite Traverse** **Computation of area of an agricultural farmland using Total Station** **Using Global Positioning System (GPS) Technology for Tree marking in an agricultural farmland**	9
	Total Instructional Hours	**45**

COURSE OUTCOMES

At the end of the study the student will have knowledge on

CO1: Carryout preliminary surveying to prepare a layout of a given area.
CO2: Apply compass surveying and plane table surveying.
CO3: Understand the basics of leveling and measure the elevations.
CO4: Plot contours and also calculate the capacity of reservoirs.
CO5: To carry out linear and angular measurements using theodolite

Programme	Course Code	Name of the Course	L	T	P	C
B.E.	22AG3001	SOIL TECHNOLOGY LABORATORY	0	0	4	2

Course Objective

1. Students will able to impart the knowledge of basic properties of soil
2. Students should be able to verify various quality aspects of soil and water studied in theory by performing experiments in lab.
3. Students will able to investigate soil characteristics
4. Students will able to understand soil and properties for a multitude of objectives
5. Be able to evaluate soils for their sensitivity to impacts related to natural environmental changes and those influenced by man.

S.NO	LIST OF EXPERIMENTS
1	Identification of rocks and minerals
2	Collection and processing of soil samples
3	Determination of Ph and Electrical conductivity of soil
4	Determination of particle and bulk density of soil
5	Specific gravity determination by Pycnometer
6	Soil Compaction Test by using Standard Proctor
7	Textural analysis of soil by International Pipette method
8	Determination of particle size distribution
9	Determination of soil Organic matter
10	Determination of major available nutrients
11	Study the working principles of Agricultural sensors
12	Study on microwave plasma atomic emission spectrometer

Total Instructional Hours 30

Course Outcome

The students completing the course will have

CO1: Students will be able to describe the various mineral and organic components of soils, including how changes in various quantities affect soil physical and chemical properties

CO2: Students will understand pedogenesis and how different parent materials create soils with varying properties.

CO3: Students will understand water retention and movement in soils, especially as it relates to plant water availability

CO4: Students will develop a basic understanding of soil chemistry, including pH and CEC, especially how they relate to nutrient availability and, when feasible, adjustments, such as liming, that can improve conditions for plant growth.

CO5: Students will develop an introductory understanding of soil taxonomy, including the favorable traits and limitations of the various soil orders.

REFERENCE BOOKS

R1 Punmia, B.C, "Soil Mechanics and Foundation Engineering", Laxmi Publishers, New Delhi. 2007

R2 "Laboratory Manual" Centre for Water Resources, Anna University, Chennai.2012.

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Programme	Course Code	Name of the Course	L	T	P	C
B.Tech.	22AG3072	Basic Electrical, Electronics and Instrumentation Engineering	3	0	0	2

Course Objective

To introduce the basics of electric circuits and analysis
To impart knowledge in domestic wiring
To impart knowledge in the basics of working principles and application of electrical machines
To introduce analog devices and their characteristics
To introduce the functional elements and working of sensors and transducers.

Unit	Description	Instructional Hours
	ELECTRICAL CIRCUITS	
I	DC Circuits: Circuit Components: Conductor, Resistor, Inductor, Capacitor – Ohm's Law - Kirchhoff's Laws – Simple problems- Nodal Analysis, Mesh analysis with Independent sources .	9
	MAGNETIC CIRCUITS AND ELECTRICAL INSTALLATIONS	
II	Magnetic circuits- definitions- MMF, flux, reluctance, magnetic field intensity, flux density, fringing, self and mutual inductance-simple problems.	9
	ELECTRICAL MACHINES	
III	Construction and Working principle- DC Separately and Self excited Generators, EMF equation, Types and Applications. Working Principle of DC motors, Torque Equation, Types and Applications.	9
	ANALOG ELECTRONICS	
IV	Resistor, Inductor and Capacitor in Electronic Circuits- Semiconductor Materials: Silicon &Germanium – PN Junction Diodes, Zener Diode – Characteristics Applications.	9
	SENSORS AND TRANSDUCERS	
V	Sensors, solenoids, pneumatic controls with electrical actuator, mechatronics, types of valves and its applications, electron-pneumatic systems- proximity sensors.	9
	Total Instructional Hours	45

Course Outcome

After completing this course, the students will be able to

CO1: Compute the electric circuit parameters for simple problems
CO2: Explain the concepts of domestics wiring and protective devices
CO3: Explain the working principle and applications of electrical machines.

CO4: Analyze the characteristics of analog electronic devices

CO5: Explain the types and operating principles of sensors and transducers

TEXT BOOKS:

T1 D P Kothari and I.J Nagarath, "Basic Electrical and Electronics Engineering", McGraw Hill Education (India) Private Limited, Second Edition, 2020

T2 A.K. Sawhney, Puneet Sawhney 'A Course in Electrical & Electronic Measurements & Instrumentation', Dhanpat Rai and Co, 2015.

T3 S.K. Bhattacharya, Basic Electrical Engineering, Pearson Education, 2019

T4 James A Svoboda, Richard C. Dorf, Dorf's Introduction to Electric Circuits, Wiley,2018

REFERENCE BOOKS:

R1 John Bird, "Electrical Circuit theory and technology", Routledge; 2017.

R2 Thomas L. Floyd, 'Electronic Devices', 10th Edition, Pearson Education, 2018.

R3 Albert Malvino, David Bates, 'Electronic Principles, McGraw Hill Education; 7th edition, 2017

R4 Muhammad H.Rashid, "Spice for Circuits and electronics", 4th Edition.,Cengage India, 2019.

R5 H.S. Kalsi, 'Electronic Instrumentation', Tata McGraw-Hill, New Delhi, 2010

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HINDUSTHAN EDUCATIONAL AND CHARITABLE TRUST

HICET

Hindusthan College of Engineering and Technology

(An Autonomous Institution, Affiliated to Anna University, Chennai
Approved by AICTE, New Delhi & Accredited by NAAC with 'A' Grade)
Valley Campus, Pollachi Highways, Coimbatore, Tamilnadu.

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UNDERGRADUATE PROGRAMMES

B.E AGRICULTURE ENGINEERING (UG)

REGULATION-2019 (Revised on July 2021)

(For the students admitted during the academic year 2021-2025 and onwards)

SEMESTER I

S.No.	Course Code	Course Title	Category	L	T	P	C	CIA	ESE	TOTAL
THEORY										
1	21HE1101	Technical English	HS	3	0	0	3	25	75	100
2	21HE1001	Language Competency Enhancement Course-I	HS	3	1	0	4	25	75	100
3	21MA1102	Calculus and Linear Algebra	BS	3	0	0	3	25	75	100
4	21ME1101	Basics of civil and Mechanical Engineering	HS	3	0	0	3	25	75	100
THEORY WITH LAB COMPONENT										
5	21PH1151	Applied Physics	BS	2	0	2	3	50	50	100
6	21CY1151	Chemistry for Engineers	BS	2	0	2	3	50	50	100
7	21CS1151	Python Programming and Practices	ES	2	0	2	3	50	50	100
MANDATORY COURSES										
9	21HE1072	**Career Guidance Level – I** Personality, Aptitude and Career Development	EEC	2	0	0	0	100	-	100
			Total :	**16**	**1**	**10**	**22**	**350**	**450**	**800**

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SEMESTER II

S.No.	Course Code	Course Title	Category	L	T	P	C	CI A	ESE	TOTAL
THEORY										
1	21HE2101	Business English for Engineers	HS	3	0	0	3	25	75	100
2	21HE2001	Language Competency Enhancement Course-II	HS	3	1	0	4	25	75	100
3	21MA2101	Differential Equations and Complex Variables	BS	3	0	0	3	25	75	100
4	21AG2104	Principles of Food Science	PC	3	0	0	3	25	75	100
THEORY WITH LAB COMPONENT										
5	21PH2151	Material Science	BS	2	0	2	3	50	50	100
6	21CY2151	Environmental Studies	BS	2	0	2	3	50	50	100
7	21IT2151	Programming in C	ES	2	0	2	3	50	50	100
PRACTICAL										
8	21ME2001	Engineering Practices	ES	0	0	4	2	50	50	100
MANDATORY COURSES										
9	21HE2072	**Career Guidance Level** – II Personality, Aptitude and Career Development	EEC	2	0	0	0	100	-	100
10	21HE1073	Entrepreneurship & Innovation	EEC	1	0	0	0	100	-	100
			Total :	**16**	**1**	**10**	**22**	**500**	**500**	**1000**

SEMESTER III

S.No	Course Code	Course Title	Category	L	T	P	C	CIA	ESE	TOTA L
THEORY										
1	21MA3102	Fourier Analysis and Transforms	BS	3	1	0	4	25	75	100
2	21AG3201	Soil Science and Engineering	PC	3	0	0	3	25	75	100
3	21AG3202	Fluid Mechanics and Hydraulics	PC	3	1	0	4	25	75	100
4	21AG3203	Principles and practices of Crop Production	PC	3	0	0	3	25	75	100
THEORY WITH LAB COMPONENT										
5	21AG3251	Unit Operations in Agricultural Processing	PC	2	0	2	3	50	50	100
PRACTICAL										
6	21AG3001	Field Crop Production Practical	PC	0	0	3	1.5	50	50	100

7	21AG3002	Soil Science Laboratory	PC	0	0	3	1.5	50	50	100
MANDATORY COURSES										
8	21MC3191	Indian Constitution	AC	2	0	0	0	100	0	100
9	21HE3072	**Career Guidance Level – III** Personality, Aptitude and Career Development	EEC	2	0	0	0	100	-	100
10	21HE3073	Leadership Management Skills	EEC	1	0	0	0	100	-	100
			Total	**16**	**2**	**8**	**20**	**550**	**450**	**1000**

SEMESTER IV

S.No	Course Code	Course Title	Category	L	T	P	C	CIA	ESE	TOTAL
THEORY										
1	21AG4201	Farm Tractors	PC	2	1	0	3	25	75	100
2	21AG4202	Thermodynamics	PC	3	0	0	3	25	75	100
3	21AG4203	Irrigation and Drainage Engineering	PC	3	0	0	3	25	75	100
THEORY WITH LAB COMPONENT										
4	21MA4152	Statistics and Numerical Methods	BS	3	0	2	4	50	50	100
5	21AG4251	Bio-Energy Resource Technology	PC	2	0	2	3	50	50	100
6	21AG4252	Surveying and Leveling	PC	2	0	2	3	50	50	100
PRACTICAL										
7	21AG4001	Irrigation Field Laboratory	PC	0	0	4	2	50	50	100
MANDATORY COURSES										
8	21AC4191	Essence of Indian tradition knowledge/Value Education	AC	2	0	0	0	100	0	100
9	21HE4072	**Career Guidance Level – IV** Personality, Aptitude and Career Development	EEC	2	0	0	0	100	-	100
10	21HE4073	Ideation Skills	EEC	1	0	0	0	100	-	100
			Total	**17**	**0**	**10**	**21**	**575**	**425**	**1000**

SEMESTER V

S.No.	Course Code	Course Title	Category	L	T	P	C	CIA	ESE	TOTAL
THEORY										
1	21AG5201	Farm Machinery and Equipment	PC	3	0	0	3	25	75	100
2	21AG5202	Refrigeration and Cold Chain Management	PC	3	1	0	4	25	75	100
3	21AG5203	Theory of Machines	PC	3	0	0	3	25	75	100
4	21AG53XX	Professional Elective-I	PE	3	0	0	3	25	75	100
THEORY WITH LAB COMPONENT										
5	21AG5251	Groundwater and Well Engineering	PC	2	0	2	3	50	50	100
6	21AG5252	Soil and Water Conservation Engineering	PC	2	0	2	3	50	50	100
PRACTICALS										
7	21AG5001	Operation and Maintenance of Farm Machinery Laboratory	PC	0	0	3	1.5	50	50	100
8	21AG5002	CAD for Agricultural Engineering	PC	0	0	3	1.5	50	50	100
MANDATORY COURSES										
9	21HE5071	Soft Skills - I	EEC	1	0	0	1	25	75	100
10	21HE5072	Design Thinking	EEC	1	0	0	1	25	75	100
			Total	**16**	**1**	**10**	**22**	**350**	**650**	**1000**

SEMESTER VI

S.No.	Course Code	Course Title	Category	L	T	P	C	CIA	ESE	TOTAL
THEORY										
1	21AG6201	Hydrology and Water Resources Engineering	PC	3	0	0	3	25	75	100
2	21AG6202	Solar and Wind Energy Engineering	PC	3	1	0	4	25	75	100
3	21AG6181	Professional Ethics	HS	3	0	0	3	25	75	100
4	21AG63XX	Professional Elective-II	PE	3	0	0	3	25	75	100
5	21XX64XX	Open Elective-I	OE	3	0	0	3	25	75	100
THEORY WITH LAB COMPONENTS										

6	21AG6251	Food and Dairy Engineering	PC	2	0	2	3	50	50	100
PRACTICALS										
7	21AG6252	ICT in Agricultural Engineering	PC	0	0	4	2	50	50	100
MANDATORY COURSES										
8	21AG6701	Industrial Training	EEC	0	0	0	1	0	100	100
9	21HE6071	Soft Skills - II	EEC	1	0	0	1	25	75	100
10	21HE6072	Intellectual Property Rights (IPR)	EEC	1	0	0	1	25	75	100
			Total	**17**	**1**	**6**	**22**	**275**	**725**	**1000**

SEMESTER VII

S.No.	Course Code	Course Title	Category	L	T	P	C	CIA	ESE	TOTAL
THEORY										
1	21AG7201	Agricultural Extension	PC	3	0	0	3	25	75	100
2	21AG7202	Remote Sensing and Geographical Information System	PC	3	0	0	3	25	75	100
3	21AG73XX	Professional Elective-III	PE	3	0	0	3	25	75	100
4	21XX74XX	Open Elective-II	OE	3	0	0	3	25	75	100
THEORY WITH LAB COMPONENTS										
5	21AG7251	Precision Farming and Protected Cultivation	PC	2	0	2	3	50	50	100
PRACTICALS										
6	21AG7001	Renewable Energy Laboratory	PC	0	0	3	1.5	50	50	100
7	21AG7002	GIS Laboratory for Agricultural Engineers	PC	0	0	3	1.5	50	50	100
INNOVATION PROJECT										
8	21AG7901	Innovative Project	EEC	0	0	4	2	50	50	100
			Total	**14**	**0**	**12**	**20**	**300**	**500**	**800**

SEMESTER VIII

S.No.	Course Code	Course Title	Category	L	T	P	C	CIA	ESE	TOTAL
THEORY										
1	21AG83XX	Professional Elective-IV	PE	3	0	0	3	25	75	100
2	21AG83XX	Professional Elective-V	PE	3	0	0	3	25	75	100
PROJECT WORK										
3	21AG8901	Project work	EEC	0	0	16	8	100	100	200
			Total	**6**	**0**	**16**	**14**	**150**	**250**	**400**

TOTAL NUMBER OF CREDITS: 165

LIST OF PROFESSIONAL ELECTIVES

S.No.	Course Code	Course Title	Category	L	T	P	C	CIA	ESE	TOTAL
PROFESSIONAL ELECTIVE I										
1	21AG5301	Systems Analysis and Soft Computing in Agricultural Engineering	PC	3	0	0	3	25	75	100
2	21AG5302	Sustainable Agriculture and Food Security	PC	3	0	0	3	25	75	100
3	21AG5303	CDM and Carbon Trading Technology	PC	3	0	0	3	25	75	100
4	21AG5304	IOT in Agricultural Systems	PC	3	0	0	3	25	75	100
5	21AG5305	Ergonomics and Safety in Agricultural Engineering	PC	3	0	0	3	25	75	100
PROFESSIONAL ELECTIVE II										
1	21AG6301	Climate change and adaptation	PC	3	0	0	3	25	75	100
2	21AG6302	Heat and Mass Transfers for Agricultural Engineers	PC	3	0	0	3	25	75	100
3	21AG6303	Disaster Management	PC	3	0	0	3	25	75	100
4	21AG6304	Horticultural Crop Processing	PC	3	0	0	3	25	75	100
5	21AG6305	Organic Farming Technologies	PC	3	0	0	3	25	75	100

PROFESSIONAL ELECTIVE III										
1	21AG7301	Post-Harvest Technology	PC	3	0	0	3	25	75	100
2	21AG7302	Dairy Process Technology	PC	3	0	0	3	25	75	100
3	21AG7303	Storage and Packaging Technology	PC	3	0	0	3	25	75	100
4	21AG7304	Process Engineering of Fruits and Vegetables	PC	3	0	0	3	25	75	100
5	21AG7305	Fat and Oil Processing	PC	3	0	0	3	25	75	100
PROFESSIONAL ELECTIVE IV										
1	21AG8301	Agricultural Business Management and Entrepreneurship	PC	3	0	0	3	25	75	100
2	21AG8302	On-Farm Water Management	PC	3	0	0	3	25	75	100
3	21AG8303	Application of Drone and robotics Technology in Agriculture	PC	3	0	0	3	25	75	100
4	21AG8304	Agricultural Waste Management	PC	3	0	0	3	25	75	100
5	21AG8305	Energy Conservation in Agro based Industry	PC	3	0	0	3	25	75	100
PROFESSIONAL ELECTIVE V										
1	21AG8306	Special Farm Equipment's	PC	3	0	0	3	25	75	100
2	21AG8307	Mechanics of Tillage and Traction	PC	3	0	0	3	25	75	100
3	21AG8308	Watershed Hydrology and Management	PC	3	0	0	3	25	75	100
4	21AG8309	Micro Irrigation System	PC	3	0	0	3	25	75	100
5	21AG8310	Agriculture Economics and Farm Management	PC	3	0	0	3	25	75	100

LIST OF OPEN ELECTIVES										
AGRICULTURE ENGINEERING										
S.No.	**Course Code**	**Course Title**	**Category**	**L**	**T**	**P**	**C**	**CIA**	**ESE**	**TOTAL**
1	21AG6401	Research Methodology	OE	3	0	0	3	25	75	100
AGRICULTURE ENGINEERING										

2	21AG7401	Urban Agriculture and organic farming	OE	3	0	0	3	25	75	100
LIFE SKILL COURSES										
3	21LSZ401	General Studies for Competitive Examinations	OE	3	0	0	3	25	75	100
4	21LSZ402	Human Rights, Women's Rights and Gender Equality	OE	3	0	0	3	25	75	100
5	21LSZ403	Indian Ethos and Human Values	OE	3	0	0	3	25	75	100
6	21LSZ404	Indian Constitution and Political System	OE	3	0	0	3	25	75	100
7	21LSZ405	Yoga for Human Excellence	OE	3	0	0	3	25	75	100
NCC COURSES (Only for the students' who have opted NCC subjects in Semester I, II, III & IV are eligible)										
9	21HEZ401	NCC Course level -1	OE	3	0	0	3	25	75	100
10	21HEZ401	NCC Course level -2	OE	3	0	0	3	25	75	100

ADDITIONAL CREDIT COURSE FOR NCC CADETS

S.No.	Course Code	Course Title	Type	L	T	P	C	CIA	ESE	TOTAL
1	21HE1074	NCC General and National Integration	VA	1	0	0	1	100	-	100
2	21HE2074	Social services and community development	VA	1	0	0	1	100	-	100
3	21HE3074	Leadership Qualities and camp activities	VA	1	0	0	1	100	-	100
4	21HE4074	General awareness, communication and Aero engines	VA	1	0	0	1	100	-	100

(Note: Z Stands for semester, students can't choose twice the course)

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CREDIT DISTRIBUTION

Semester	I	II	III	IV	V	VI	VII	VIII	Total
Credits	20	22	20	21	22	22	20	18	165

Chairman, Board of Studies

Chairman - BoS
AGRI - HiCET

Dean - Academics

Dean (Academics)
HiCET

Principal

PRINCIPAL
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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	21AG5201	FARM MACHINERY AND EQUIPMENT	3	0	0	3

Course Objective

1. To introduce the students to the working principles of farm Machinery tillage implements.
2. To get thorough knowledge about the feasibility of primary and secondary tillage implements.
3. To gain knowledge about the sowing and fertilizer application methodologies
4. To acquire basic knowledge in the field of Weeding and Harvesting.
5. To expose the students to farm mechanization prospects and constraints alongside Cooperative Farming for shared usage of machinery.

Unit	Description	Instructional Hours
I	**FARM MECHANIZATION** Farm mechanization – objectives and level of mechanization in India- Materials of construction and Heat Treatment of farm equipment's- Selection of Farm Machines- Types of farm implements – trailed, mounted and self-propelled. Field capacity, efficiency, economics of machinery use with numerical / problems.	5
II	**PRIMARY TILLAGE IMPLEMENTS** Tillage - objectives - methods and terminology – classification of primary & secondary tillage equipment. Primary Tillage: objective- types – Mould board plough-accessories, adjustments, operation and material of construction. Disc plough-standard and vertical -principle of operation, adjustments and accessories. Sub-soiler and chisel plough: types, working and construction. Earth moving equipment-Bulldozer, Trencher, Elevator.	10
III	**SECONDARY AND MISCELLANEOUS TILLAGE IMPLEMENTS** Secondary tillage: objective- types -Construction and working of Disc harrows, Spike-tooth and spring-tine harrows- cultivator –Levelers-Ridger-Bund former. Miscellaneous tillage tools: rotary tillage tools, rotavators, stirring plough, auger plough, rotary hoes, Oscillating tools - Forces acting upon tillage tool/ implement – Hitching System	10
IV	**SOWING ,FERTILIZING APPLICATION, WEEDING AND PLANT PROTECTION EQUIPMENT** Methods of Crop planting/sowing – Types of seed drills and planters – calibration-fertilizer metering devices - seed cum fertilizer drills – paddy trans planters – nursery tray machines. Weeding equipment – dry land star weeder – wet land cono weeder and rotary weeder –Power Operated weeder: Engine/tractor/Battery- Sprayers –types-classification – methods of atomization, spray application rate, droplet size determination –drift control.	10
V	**HARVESTING TOOLS AND MACHINERY** Harvesting and Threshing Terminology- Principals and Type of Cutting Mechanism-Types of Harvesting Machinery: Mowers and Windrowers- Grain Combines and Straw Combines- Root Crop Harvesting Equipment - Fruit and Vegetable Harvesting Tools and Machines.	10
	Total Instructional Hours	45

Course Outcome

CO1: The students will be able to perceive the role and significance of mechanization in sustaining agricultural production

CO2: The students will get acquainted the contextual usage of various equipment used in the farm for different field operations.

CO3: The students will able to understand the working principle of every equipments used from sowing to harvesting.

CO4: The students will equip with technical knowledge and skills required for the operation, maintenance and evaluation of Tillage, Sowing and intercultural operational machinery needed for agricultural farms.

CO5: To develop skills in the students required to develop and modification of indigenous farm machines as per the need of the area and farmers

TEXT BOOKS

T1 Jagdishwar Sahay. Elements of Agricultural Engineering. Standard Publishers Distributors

T2 Jain S. C. and Grace Philip. 2012. Farm Machinery – An Approach. Standard Publishers Distributors., New Delhi

T3 Ojha, T. P. and Michael, A. M. 2011. Principles of Agricultural Engineering Vol. I. Jain Brothers, New Delhi

T4 Yadav, R., and Solanki, H. B. 2009.Numericals and Short Questions in Farm Machinery, Power and Energy in Agriculture.New India Publishing Agency, New Delhi.

T5 Liljedahl, J. B., Turnquist, P. K., Smith, D. W., and Hokey, M. 2004. Tractors and Their Power Units. CBS Publishers and Distributers Pvt. Ltd, New Delhi

REFERENCE BOOKS

R1 Kepner, R.A., et al. Principles of farm machinery. CBS Publishers and Distributers, Delhi. 99, 1997.

R2 Harris Pearson Smith et al. Farm machinery and equipment. Tata McGraw-Hill pub., New Delhi.,1996.

R3 Srivastava, A.C. Elements of Farm Machinery. Oxford and IBH Pub. Co., New Delhi, 1990

R4 Singh, S., and Verma, S. R. 2009.Farm Machinery Maintenance and Management. Indian Council of Agricultural Research, New Delhi

R5 Kirpal Singh. 2013. Automobile Engineering Vol. I. Standard Publishers Distributors, Delhi

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	21AG5202	REFRIGERATION AND COLD CHAIN MANAGEMENT	3	0	0	3

Course Objectives

- To understand the principles of unit operations involved in different Refrigeration and cold storage systems and its components.
- To impart the concept of the basic principles, working, scientific analysis and system components of different types of refrigeration and air conditioning systems
- To impart basic knowledge on design and maintenance aspects related to cold storage systems.
- To impart the knowledge of various types of refrigerants, their properties, selection criteria and environmental aspects.
- To acquire the basic knowledge about various aspects of cold chain management

Unit	Description	Instructional Hours
I	**REFRIGERATION PRINCIPLES** Refrigeration – principles - refrigeration effect – coefficient of performance – units of refrigeration - refrigeration components – compressor, condenser Expansion device and evaporators – types, construction and working	9
II	**REFRIGERANTS, VAPOUR COMPRESSION AND VAPOUR ABSORPTION CYCLE** Refrigerants – properties – classification – comparison and advantages – chloroflouro carbon (CFC) refrigerants - effect on environmental pollution - alternate refrigerants· Simple vapour compression cycle – T-S diagram – P-H chart - application of refrigeration. Vapour absorption cycle – theoretical - deviation in practice - Electrolux refrigerator and Lithium bromide refrigeration– construction and principles.	9
III	**PSYCHROMETRIC PROCESS AND COOLING LOAD CALCULATION** Representation of various psychometric processes on psychometric chart and their Analysis sensible heating, sensible cooling, humidification and dehumidification, by-pass factor, Thermal comfort; Cooling load- components, sensible heat gain, latent heat gain- calculations..	9
IV	**AIR CONDITIONING SYSTEM AND COLD STORAGE DESIGN** Air conditioning systems-equipment used-classification-comfort and Industrial air conditioning system- winter, summer and year- round air conditioning system- unitary and central air conditioning system. Cold storage- types- design consideration, insulation materials properties.	9
V	**SHELF – LIFE & COLD CHAIN MANAGEMENT** Defining overall shelf-life, importance of shelf- life; cold chain- optimum temperature, cold chain equipment- Chilling and freezing-methods; Storage of frozen foods; quality changes during freezing and frozen storage- Chilling injury; cold – shortening.	9
	Total Instructional Hours	45

Course Outcomes

CO1: Introduction of basic principle of different refrigerating systems

CO2: Students will able to understand the effect of different components on there frigerating machines.

CO3: Upon completion of this course, the students will be able to demonstrate the operations in different Refrigeration & cold storage systems

CO4: They will also able to design Refrigeration & Cold storage systems to increase the shelflife of different agricultural commodities.

CO5: Students will able to understand various aspects of cold chain management and able to rectify chilling injuries.

TEXT BOOKS

T1 Anand, M.L. " Refrigeration& Air-Conditioning". Asian Books Pvt., Ltd., 2002.

T2 Sun, Da-Wen. " Advances in Food Refrigeration". Leatherhead Publishing, 2001.

T3 Kennedy, Christopher J. "Managing Frozen Foods". CRC / Woodhead Publishing, 2000.

T4 Ballney P. L. 1994. Thermal Engineering. Khanna Publishers, New Delhi.

T5 Khurmi R S. 1992. Engineering Thermodynamics. S Chand and Co. Ltd., Ram Nagar, New Delhi.

REFERENCE BOOKS

R1 Evans, Judith. "Frozen Food Science and Technology". Wiley-Blackwell , 2008.

R2 Hui, Y.H. etal., " Handbook of Frozen Foods". Marcel Dekker, 2004.

R3 James, S.J. and C. James. " Meat Refrigeration". CRC / Woodhead Publishing, 2002.

R4 Stringer, Mike and C. Dennis. "Chilled Foods: A Comprehensive Guide". 2nd Edition, CRC / Woodhead Publishing, 2002.

R5 Nag P K.1995. Engineering Thermodynamics. Tata McGraw Hill Publishing Co.Ltd., 12/4 Asaf Ali Raod, New Delhi.

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	21AG5203	THEORY OF MACHINES	3	0	0	3

Course Objective

1. To understand the purpose of kinematics, Kinematic joint and mechanism.
2. To study the relative motion of parts in a machine without taking into consideration the forces involved.
3. To understand the theories and applications of cams and Flywheels.
4. To understand applications of different types of gears and gear profiles and its efficiency and gear trains.
5. To know principles of governors.

Unit	Description	Instructional Hours
I	**BASICS OF MECHANISMS** Introduction - Links - Pairs - Chain - Mechanism - Machine structure - Degrees of freedom - Four bar chains - Terminology and definition - Planar, Spherical and Spatial Mechanisms - Grashoff's law - Kutzback criterion - Grubler's criterion for plane mechanism. Inversion of mechanisms - Four bar, single slider crank and double slider crank mechanisms.	12
II	**CAM AND FLYWHEEL** Types of cams and followers - Follower motion - Uniform, Parabolic, SHM and cycloidal. Cam terminology - Cam profiles construction for roller, flat faced and knife edge follower - Functions of fly wheel -Types of fly wheels-Flywheels of engines and punching press- Turning moment diagrams – Fluctuation of energy, speed.	9
III	**GEARS AND GEAR TRAINS** Law of toothed gearing – Involutes and cycloidal tooth profiles – Spur Gear terminology and definitions – Gear tooth action – contact ratio – Interference and undercutting – Non–standard gear teeth – Helical, Bevel, Worm, Rack and Pinion gears – Gear trains – Speed ratio, train value – Parallel axis gear trains – Epicyclic Gear Trains – Differentials – Automobile gear box.	9
IV	**FRICTION AND FRICTION DRIVES** Surface contacts –Friction in screw threads -Friction clutches -Belt and rope drives, Friction aspects in Brakes.	9
V	**GOVERNORS AND BALANCING** Governors - Types - Centrifugal governors – Porter & Proell governor, Hartnell, Hartung – Characteristics-Need of balancing-Concept of static and dynamic balancing Balancing of rotating mass by another mass in the same plane- Concept of reference plane.	6
	Total Instructional Hours	45

Course Outcome	CO1: Classify mechanisms and inversions and determine mobility of a mechanism. CO2: Construct cam profiles for various followers and turning moment diagram for flywheel. CO3: Transmission through Gears: mechanism, gear trains, classification and analysis, familiarity with gear standardization. CO4: Power transmission through belts and chains, mechanisms, materials CO5: Evaluate the sensitivity of governor.

TEXT BOOKS

T1 Rattan S B. 1993.Theory of Machines.Tata McGraw Hill Publishing Co. Ltd., 12/4 Asaf Ali Road, New Delhi.

T2 Bevan Thomas. 1984. Theory of Machines. CBS Publishers and Distributors, Delhi.

T3 Ballaney P L. 1985. Theory of Machines.Khanna Publishers, 2-B Nath Market, NaiSarak, New Delhi.

T4 Khurmi R S and Gupta J K. 1994.Theory of Machines. Eurasia Publishing House Pvt. Ltd., Ram Nagar, New Delhi.

T5 LalJagdish. 1991. Theory of Mechanisms and Machines. Metropolitan Book Co. Pvt.Ltd., 1 NetajiSubashMarg, New Delhi..

REFERENCE BOOKS

R1 Shigley.J.E, and Uicker.J.J, "Theory of Machines and Mechanisms", McGraw Hill, 1995.

R2 Ghosh.A, and Mallick.A.K, "Theory of Mechanisms and Machines", Affiliated East-West Pvt Ltd., New Delhi, 1988.

R3 Rao.J.S, and Dukkipati.R.V, " Mechanism and Machine Theory" , Wiley-Eastern Ltd., New Delhi, 1995

R4 Khurmi R.S., "Theory of Machines" Khanna Publishers, Delhi, 2006.

R5 Sadhu Singh "Theory of Machines: Kinematics and Dynamics", Pearson; 3rd edition (12 December 2011).

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	21AG5251	GROUNDWATER AND WELL ENGINEERING	2	0	2	3

Course Objective

1. To understand the theories and applications of groundwater dynamics
2. To study the analysis of well hydraulics
3. To understand about groundwater exploration and recharge.
4. To study about construction of wells
5. To understand the Groundwater quality criteria.

Unit	Description	Instructional Hours
	GROUNDWATER DYNAMICS	
I	Ground water development and potential in India – Groundwater theory - Types of Aquifers: Unconfined (Water Table) Aquifer – Phreatic Surface - Confined (Artesian) Aquifer – Piezometric Surface - Perched Aquifer – Aquiclude, Aquitard and Aquifuge - Leaky Aquifers - Aquifer properties : Permeability, Specific Yield, Specific Retention, Porosity – Aquifer Constants : Transmissibility and Storage coefficient – Seepage and Flow net Analysis.	9
	WELL HYDRAULICS	
II	Pumping Tests – Drawdown – Cone of Depression – Hydraulic Gradient - Darcy's Law - Groundwater Flow Equations –Dupuit- Forcheimer Assumptions – Steady state radial flow – Thiem's Equation – Unsteady state radial flow – Theis method – Chow's Method - Cooper-Jacob method – Recuperation Tests – Theis Recovery Method - Image well theory – Partial penetration of wells.	9
	GROUNDWATER EXPLORATION AND RECHARGE	
III	Water Divining - Geophysical techniques – Electrical resistivity survey – Schlumberger and Wenner Electrode arrangements - Artificial Recharge Techniques – Subterranean Rainwater Harvesting - Infiltration Basins – Percolation Pits – Recharge Shafts – Sea water Intrusion	9
	DESIGN OF WELLS	
IV	Types of wells - Open (Dug)Wells and Bore (Tube) Wells - Design characteristics for wells - Well diameter, depth and Well screen design – Materials for well screens – Well casing – Design of collector wells and Infiltration gallery	9
	CONSTRUCTION AND MAINTENANCE OF WELLS	
V	Well drilling - Boring, Jetting – Rotary drilling, Hammer drilling - Construction – Installation of pipes and screens - Well development, Completion and disinfection – Well maintenance – Well performance test – Well effectiveness – Well losses – Pumping equipment – Rehabilitation of open wells and bore wells- groundwater quality analysis.	9
	Total Instructional Hours	45

Course Outcome

CO1: Students' knowledge base gets enriched with the technical aspects of groundwater, its availability, assessment and utilization

CO2: Student get nourished with the knowledge of well hydraulics in different types of aquifers

CO3: Students will get a thorough idea about different types of wells.

CO4: Students will gain notion about construction of well

CO5: Better exposure to the theory behind well design, construction and water quality management is ensured.

TEXT BOOKS

T1 Karanth, K.R. Groundwater Assessment, Development and Management. Tata Mc-Graw Hill, 2008.

T2 Raghunath, H.M. Groundwater Hydrology, Wiley Eastern Ltd., 2000.

T3 Tang Y, Zhou J, Yang P, Yan J, Zhou N. Groundwater engineering. Springer Singapore; 2017.

T4 Delleur JW, editor. The handbook of groundwater engineering. CRC press; 2006 Nov 16.

T5 Cushman JH, Tartakovsky DM, editors. The handbook of groundwater engineering. CRC Press; 2016 Nov 25.

REFERENCE BOOKS

R1 Rastogi,A.K. Numerical Groundwater Hydrology, Penram International Publishing. Pvt. Ltd., Bombay, 2008

R2 David Keith Todd. Groundwater Hydrology, John Wiley & Sons, Inc. 2007

R3 Fletcher.G.Driscoll, "Groundwater and Wells", Johnson Revision, New York, 1987

R4 Walton WC. Principles of groundwater engineering. CRC press; 2020 Jul 24.

R5 Howsam P, editor. Water Wells-Monitoring, Maintenance, Rehabilitation: Proceedings of the International Groundwater Engineering Conference, Cranfield Institute of Technology, UK. CRC Press; 1990 Aug 30.

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	21AG5252	SOIL AND WATER CONSERVATION ENGINEERING	2	0	2	3

Course Objective

1. To impart a thorough knowledge and understanding of the basic concepts of soil erosion
2. To get a basic idea about the relevant mitigation strategies.
3. To enable the students to design appropriate watershed based soil conservation structures
4. To grab knowledge about the applicability of rainwater harvesting systems.
5. To study about design of sediment detention tanks

Unit	Description	Instructional Hours
	MECHANICS OF WATER AND WIND EROSION	
I	Soil Erosion – Agents-Causes and Conservation status in India -Mechanics of water erosion – Factors of Erosion - types of water erosion-– Classification of Gully – Special forms of Erosion – Wind	5
	ESTIMATION OF SOIL LOSS	
II	Rainfall and Runoff Erosivity – Soil Erodibility - Runoff computation for soil conservation: SCS-CN method –Rational Formula - Universal Soil Loss Equation (USLE) – standard plot – Modified Universal Soil Loss Equation (MUSLE) – Revised Universal Soil Loss Equation (RUSLE)- Tolerance limit (T Value) of soil loss– Land use capability classification - Wind drift losses. Soil loss measurement devices – Runoff Plots, Multislot Divisor, Coshocton wheel silt sampler	9
	WATERSHED BASED SOIL CONSERVATION	
III	Agronomic practices: contour cultivation - strip cropping – tillage practices – Soil management practices – Mechanical Measures – Gully Control Structures: Drop Spillway, Drop Inlet, Chute Spillways – Contour, Graded and Compartmental Bunding – Bench Terracing for hill slopes – Broad based Terracing – Grassed waterways: Location, construction and maintenance — wind breaks and shelter belts- Landslide control measures – Afforestation.	13
	RAINWATER HARVESTING	
IV	Rainfall Frequency Analysis In-situ soil moisture conservation : Micro catchments, - Continuous Contour Trenching – Staggered Trenching – Random Tie Ridging – Crescent bunds - Farm ponds- Hydrologic, Hydraulic and Structural designs – Construction and Protection – Check dams - Earthen dam – Retaining wall.	9
	SEDIMENT TRANSPORT	
V	Sediment: Sources – Types of sediment load – Mechanics of sediment transport – Suspension, Saltation and surface Creep- Estimation of bed load – Sediment Graph - Reservoir sedimentation: Basics - Factors affecting sediment distribution pattern, Rates of reservoir sedimentation - Silt Detention Tanks.	9
	Total Instructional Hours	45

Course Outcome

CO1: The students will be able to gain fundamental knowledge on the concepts of erosion.

CO2: Students will obtain the knowledge of estimating soil erosion.

CO3: They get enriched with knowledge on Hydrologic, Hydraulic and Structural designs of soil and water conservation measures

CO4: Students can able to design Rainwater harvesting systems.

CO5: Students will receive concepts of sedimentation and detention tanks.

TEXT BOOKS

T1 Suresh, R., "Soil and Water Conservation Engineering", Standard Publication, New Delhi, 2007.

T2 Ghanshyam Das, "Hydrology and Soil Conservation Engineering", Prentice Hall of India Private Limited, New Delhi, 2000.

T3 "Sedimentation Engineering", 2006, ASCE manual and Report on Engineering Practice No. 54, Edited by Vito A. Vanoni. ASCE publishing.

T4 Troeh FR, Hobbs JA, Donahue RL. Soil and water conservation for productivity and environmental protection. Prentice-Hall, Inc.; 1980.

T5 Pierce FJ. Advances in soil and water conservation. CRC Press; 1998 Feb 1.

REFERENCE BOOKS:

R1 Murthy, V.V.N., "Land and Water Management Engineering", Kalyani Publishers, Ludhiana, 1998.

R2 Gurmail Singh, "A Manual on Soil and Water Conservation", ICAR Publication, New Delhi, 1982.

R3 Mal, B.C., "Introduction to Soil and Water Conservation Engineering", Kalyani Publishers, New Delhi, 2002

R4 Sidle RC, Pearce AJ, O'Loughlin CL. Hillslope stability and land use. American geophysical union; 1985.

R5 Ohlig CP, editor. Integrated Land and Water Resources Management in History: Proceedings of the Special Session on History, May 16th, 2005. BoD–Books on Demand; 2005.

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	21AG5001	OPERATION AND MAINTENANCE OF FARM MACHINERY LABORATORY	0	0	3	1.5

Course Objective

The students will be introduced to the practice of different farm machinery in the field on

1. Tillage, sowing, plant protection, harvesting and threshing
2. Care and maintenance; lubrication
3. Fits and tolerances and replacements
4. Adjustments of farm machines
5. Dismantling and reassembling of a disc harrow, seed-cum fertilizer drill, and sprayer and engine pumps.

S.NO	LIST OF EXPERIMENTS	Instructional Hours
1	Identification of major systems of a tractor and general guidelines on preliminary check measures.	
2	Identification of components of power tiller and general guidelines on preliminary check measures.	
3	Field operation and adjustments of ploughs	
4	Field operation of seed cum fertilizer drill and calibration	
5	Field operation of plant protection equipment	
6	Field operation on weeder and mowers	
7	Studies on methods of repair, maintenance and off-season storage of farm equipment	
8	To measure Draft and wheel slip with load and no-load condition.	
9	Hitching of agricultural implements and trailers	
10	Study and calculate harvesting losses of combine harvester and thrasher	
11	Study and operation of bulldozer/laser leveler and its roll in agriculture practices	
	Total Instructional Hours	30

Course Outcome

During this course, students have an ability

CO1: To identify farm equipment
CO2: To calculate and predict the actual field problem during the operation.
CO3: To trained to do adjustments of farm implements and Hitching of agricultural implements and trailers.
CO4: To give care and maintenance to the farm machinery implements.
CO5: To dismantle and assemble various machineries used in agriculture.

S.NO	LIST OF EQUIPMENTS	REQUIRED QUANTITY
1	Tractor	1
2	Power tiller	1

3	Disc plough	1
4	Disc harrow	1
5	Multi tyne cultivator	1
6	Paddy Transplanter	1
7	Seed drill	1
8	Sprayer	1
9	Mower	1
10	Weeder	1
11	Combine harvester (optional) – can be had as demonstration	1

TEXT BOOKS

T1 Jagdishwar Sahay. Elements of Agricultural Engineering. Standard Publishers Distributors

T2 Jain S. C. and Grace Philip. 2012. Farm Machinery – An Approach. Standard Publishers Distributors., New Delhi

T3 Ojha, T. P. and Michael, A. M. 2011. Principles of Agricultural Engineering Vol. I. Jain Brothers, New Delhi

T4 Yadav, R., and Solanki, H. B. 2009.Numericals and Short Questions in Farm Machinery, Power and Energy in Agriculture.New India Publishing Agency, New Delhi.

T5 Liljedahl, J. B., Turnquist, P. K., Smith, D. W., and Hokey, M. 2004. Tractors and Their Power Units. CBS Publishers and Distributers Pvt. Ltd, New Delhi

REFERENCES

R1 Jain, S.C. and C.R. Rai. Farm Tractor Maintenance and Repair. Standard publishers and Distributors, New Delhi, 1999.

R2 Herbert L.Nichols Sr., Moving the Earth, D. Van Nostrand company Inc. Princeton, 1959.

R3 John A Havers and Frank W Stubbs, Hand book of Heavy Construction, McGraw – Hill book Company, New York, 1971.

R4 Barger, E.L., J.B. Liljedahl and E.C. McKibben, Tractors and their Power Units. Wiley Eastern Pvt. Ltd., New Delhi, 1997.

R5 Kepner, R.A., et al. Principles of farm machinery. CBS Publishers and Distributers, Delhi. 99, 1997.

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	21AG5002	CAD FOR AGRICULTURAL ENGINEERING	0	0	4	2

Course Objective To draft the agricultural engineering related machineries and structures manually and also by computer aided methods.

S.NO	LIST OF EXPERIMENTS
1	Study on Basics of engineering drawing (Scale, Views and Projections)
2	Study on Basics of AUTOCAD
3	Creating 2D drawings with general steps of simple machines
4	Drawing of objects in 3D with general steps
5	Drawing of shafts, bearing, bolt and nut, keys and hubs.
6	Drawing of shaft coupling, Gears and connecting road.
7	Preparation of assemblies in 3D
8	Design and Drawing of Underground pipeline system
9	Design and Drawing of Check dam
10	Design and Drawing of Mould board plough, Disk plough and sprayers
11	Design and Drawing of Biogas plant.
12	Draw a simple building in 2D and 3D.

Course Outcome

CO1: Understand of basic of engineering drawing and software usage
CO2:The students also will be able to design and draw the components using computer aided methods.
CO3 The student will be able to understand the plan and layout of underground pipes, farm implements
CO4: Practicing to draw internal components of farm implements
CO5: Practice to draw farm shed in 2 D and 3 D view

S.NO	LIST OF EQUIPMENTS REQUIRED	REQUIRED QUANTITY
1	Computers	30
2	Licensed Software like CAD, Solid work and Pro E	1

REFERENCES

R1 Michael, A.M. "Irrigation Theory and Practice", Vikas Publishing House, New Delhi, 1999.

R2 Rai, G.D. "Nonconventional Sources of Energy", Khanna publishers, New Delhi, 1995.

R3 Srivastava, A.C."Elements of Farm Machinery", Oxford and IBH Publications Co., New Delhi, 1990.

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	21AG5301	SYSTEMS ANALYSIS AND SOFT COMPUTING IN AGRICULTURAL ENGINEERING	3	0	0	3

Course Objective

- To introduce the students to the application of systems concept to agricultural engineering problems, planning and management.
- To provide in depth knowledge of various techniques in Operations Research which are widely used in agricultural engineering.
- Soft computing techniques for modeling different problems in the field agricultural engineering.
- To acquire basic knowledge on concepts of Artificial Neural Networking.
- To grab basic ideas of fuzzy logic for solving problems in the field of Agriculture

Unit	Description	Instructional Hours
	SYSTEM CONCEPTS	
I	Definition, classification, and characteristics of systems – Scope and steps in systems engineering – Need for systems approach to water resources and irrigation.	9
	LINEAR PROGRAMMING & DYNAMIC PROGRAMMING	
II	Introduction to operations research – Linear programming, problem formulation, graphical solution, solution by simplex method – Sensitivity analysis – application – Bellman's optimality criteria, problem formulation and solutions – application.	9
	SIMULATION	
III	Basic principles and concepts – Random variate and random process – Monte Carlo techniques – Model development – Inputs and outputs – Deterministic and stochastic simulation – Irrigation Scheduling - application.	9
	NEURAL NETWORKS	
IV	Neuron, Nerve structure and synapse, Artificial Neuron and its model, Neural network architecture: networks, Various learning techniques; perception and convergence rule, Auto-associative and hetro-associative memory- Architecture: model, solution, single layer and multilayer perception model; back propagation learning methods, applications.	9
	FUZZY LOGIC AND GENETIC ALGORITHM	
V	Basic concepts of fuzzy logic, Fuzzy set theory and operations, Properties of fuzzy sets, Membership functions, interference in fuzzy logic, Fuzzy implications and Fuzzy algorithms, Fuzzy Controller, Industrial applications. Genetic Algorithm (GA) - Basic concepts, working principle, procedures, flow chart, Genetic representations, encoding, Initialization and selection, Genetic operators, Mutation – applications.	9
	Total Instructional Hours	45

Course Outcome Upon completion of the course,

CO 1:Student will aquire the knowledge on system concepts

CO2: Students will be able to apply the optimization techniques like LP & DP.

CO3: Students will get knowledge about how to simulate various natural processes. CO4: Students can simulate various natural processes by using ANN.

CO5: Students can able to solve various problems in the field of Agriculture Engineering by using fuzzy logic.

TEXT BOOKS

T1 Vedula, S., and Majumdar, P.P. Water Resources Systems – Modeling Techniques and Analysis Tata McGraw Hill, New Delhi, Fifth reprint, 2010.

T2 Robert M Peart and W David Shoup, Agricultural Systems Management – Optimizing efficiency and performance, CRC Press, 2013.

T3 Gupta, P.K., and Man Mohan, "Problems in Operations Research", (Methods and Solutions), Sultan Chand and Sons, New Delhi, 1995.

T4 Razmjooy, Navid, and Vania Vieira Estrela, eds. *Applications of image processing and soft computing systems in agriculture*. IGI Global, 2019.

T5 Ram, Mangey, and Suraj B. Singh. *Soft Computing: Techniques in Engineering Sciences (Volume 1)*. De Gruyter, 2020.

REFERENCE BOOKS

R1 Chaturvedi, M.C., "Water Resources Systems Planning and Management", Tata McGraw Hill, New Delhi, 1997.

R2 Taha, H.A., "Operations Research", McMillan Publication Co., New York, 1995.

R3 Hiller, F.S., and Liebermann, G.J., "Operations Research", CBS Publications and Distributions, New Delhi, 1992.

R4 Timothy J. Ross, "Fuzzy Logic with Engineering Applications" Wiley India.

R5 S. Rajsekaran & G.A. Vijayalakshmi Pai, "Neural Networks,Fuzzy Logic and Genetic Algorithm: Synthesis and Applications" Prentice Hall of India.

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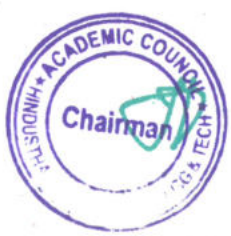
Programme	Course Code	Name of the Course	L	T	P	C
B.E.	21AG5302	SUSTAINABLE AGRICULTURE AND FOOD SECURITY	3	0	0	3

Course Objective

- To study the importance of sustainable agriculture for the growing population, various resources required and their sustainability.
- To study various practices to conserve soil and water in a sustainable way
- To inculcate the habit of sustainable farming in both rural and urban areas
- To get a basic idea about importance of science, food security and ecological balance
- To know about various policies and schemes in order to encourage sustainable agriculture and maintain food security

Unit	Description	Instructional Hours
	POTENTIAL LAND RESOURCES	
I	Land Resources of India - Population and land - Land utilization Patterns - Net Area Sown - changes in cropping pattern - land degradation – delineation of Agricultural Lands – Lands for non-agricultural purposes – Usable Waste Lands – Industrial Zones – Sand dunes and Deserts – Urban space for Greenery and crop production – Terrace Cultivation prospects – Heat Island effects.	9
	SUSTAINABLE WATER RESOURCES	
II	Rainfall forecasting - Adequacy of Rainfall for crop growth – Rainfall Analysis - Lands with buffer zones for Surface water resources - Drought and production instability – Irrigation potential – Availability, created and utilized – River basins; Watersheds and Utilizable surface water – Utilizable water in future – Augmentation of Groundwater.	9
	SUSTAINABLE RURAL AND URBAN FARMING	
III	Agro-ecosystems - Impact of climate change on crop yield & Soil fertility – Food grain production at State Level – Indicators of Sustainable food Availability – Indicators of food production sustenance – Natural Rural Farming principles – Sustainability in rainfed farming – organic farming – Urban Farming – Protected Cultivation Structures – Terrace and Kitchen Gardening – Hydroponics and Aquaponics - domestic food processing units	9
	CROP PRODUCTION AND FOOD SECURITY	
IV	Performance of Major Food Crops over the past decades – trends in food production – Decline in total factor productivity growth – Demand and supply projections – Impact of market force – Rural Land Market – Emerging Water market – Vertical farming - Sustainable food security indicators and index – Indicator of sustainability of food Security – Path to sustainable development.	9
	POLICIES AND PROGRAMMES	
V	Food and Crop Production polices – Agricultural credit Policy – Crop insurance – Policies of Natural Resources Use – Policies for sustainable Livelihoods – Virtual water and trade - Sustainable food Security Action Plan – Regulations of Terrace Gardening product Market	9
	Total Instructional Hours	45



Course Outcome

CO1: Upon completion of this course, the students will gain knowledge on the need for sustainable agriculture

CO2: They will be able to comprehend the need for food security on global level and the Nutritional Security.

CO3: The students will be able to demonstrate how ecological balance is required for sustainability of agriculture.

CO4: The students will be capable of understanding the applicability of rural and urban farming.

CO5: The students will be able to identify various policies and programmes related to sustainable agriculture and food security.

TEXT BOOKS

T1 M.S.Swaminathan, Science and sustainable food security, World Scientific Publishing Co., Singapore, 2010.

T2 B.K.Desai and Pujari, B.T. Sustainable Agriculture : A vision for future, New India Publishing Agency, New Delhi, 2007.

T3 Dhanarajan, Arulbalachandran, ed. Sustainable Agriculture Towards Food Security. Springer Singapore, 2017.

T4 Hatfield, Jerry L., David D. Songstad, and Dwight Thomas Tomes. Convergence of food security, energy security and sustainable agriculture. Springer, 2014.

T5 Campanhola, Clayton, and Shivaji Pandey, eds. Sustainable food and agriculture: an integrated approach. Academic Press, 2018.

REFERENCE BOOKS

R1 Swarna S.Vepa etal., Atlas of the sustainability of food security. MSSRF, Chennai, 2004.

R2 Sithamparanathan, J., Rengasamy, A., Arunachalam, N. Ecosystem principles and sustainable agriculture, Scitech Publications, Chennai, 1999.

R3 Tanji, K. K., and Yaron, B. Management of water use in agriculture, Springer Verlag, Berlin, Germany, 1994.

R4 Earles, Richard, and Paul Williams. Sustainable Agriculture an Introduction. ATTRA, 2005.

R5 Shetty, P. K., S. Ayyappan, and Monkombu Sambasivan Swaminathan. Climate change and sustainable food security (NIAS Books and Special Publications No. SP4-2013). NIAS; ICAR, 2013.

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Program	Course Code	Name of the Course	L	T	P	C
B.E.	21AG5303	CDM AND CARBON TRADING TECHNOLOGY	3	0	0	3

Course Objective

1. To grab the basic idea about impact of green house effect in environment.
2. To acquire knowledge about various policies and programmes related to reduce the impacts of greenhouse effect.
3. To know the basics, importance of clean development mechanism (CDM)
4. To know the concept of carbon trading
5. To introduce the alternatives for reducing the green house effect.

Unit	Description	Instructional Hours
	GREEN HOUSE GASES AND ENVIRONMENTAL CHANGE	
I	Global Environmental changes-United nations framework convention on climate change-United (UNFCC)-ozone layer depletion -land degradation-air and water pollution-sea-level rise-loss of biodiversity-climatic change problem GHG emissions by different countries-developing country responsibilities - India's Greenhouse gas emissions - The conference of parties.	9
	KYOTO PROTOCOL AND CDM PROJECTS	
II	Kyoto protocol and clean development mechanism-CDM and cooperative mechanism-CDM overview administration -participation-CDM institutions-procedures CDM project cycle-project design and formulation - eligibility-additionally. Approval of (DNA) Designated National Authority. Validation and registration-monitoring-validation and certification through the source of Certified Emission Reduction (CER).	9
	TYPES AND FEATURES OF CDM	
III	Types of CDM-topology -project activity -small scale CDM project categories-access station and cater station projects. PDO- project design document -General description of project activity-baseline methodology-monitoring methodology-auditing period-technical aspects.	9
	MONITORING OF CDM	
IV	Monitoring and verification-verification process principles of verification-report preparation-pitfalls. Joint implementation (JI)-institutions and procedures-guidelines-JI or small scale projects-JI Land Use, Land Use Change and Forestry (LULUCF) projects.	9
	SUSTAINABLE ENERGY DEVELOPMENT	
V	Low carbon technologies-low carbon building-alternative approaches-energy efficiency projects- sustainable energy policy concepts-mitigating energy related GHG emissions through renewable energy- carbon trading.	9
	Total Instructional Hours	45

Course Outcome

CO1: Examine the effects of greenhouse gas emission and explain the responsibilities of countries in GHG emission.

CO2: Outline the KYOTO PROTOCOL and develop clean development mechanism (CDM) projects.

CO3: Explain the features of CDM and employ monitoring and auditing techniques on CDM projects.

CO4: Develop guidelines for small scale and Land Use, Land Use Change and Forestry (LULUCF) CDM projects.

CO5: Compare the alternate techniques for lowering carbon emission.

TEXT BOOKS

T1 MyungKyoon Lee, Baseline Methodologies for clean Development Mechanism Projects- A Guide Book-Vol.1, UNEP publication, 2005

T2 Myungkyoon Lee, Information and Guide Book - the UNEP project CD4CDM-UNEP publication, June 2004.

T3 Yamin F. Climate change and carbon markets: A handbook of emissions reduction mechanisms. Routledge; 2012 Apr 27.

T4 Platonova-Oquab A, Spors F, Gadde H, Godin J, Oppermann K, Bosi M. CDM Reform: Improving the efficiency and outreach of the Clean Development Mechanism through standardization. World Bank; 2012.

T5 Hillebrand J. Carbon Credits and Global Emissions Trading: A Viable Concept for the Future?. GRIN Verlag; 2008 Sep 22.

REFERENCE BOOKS

R1 Manual for project developers and policy makers-UNFCCC Publication, 2007

R2 Aukland L, Bass S, Hug S, Landell Mals N, Tipper R, Laying the Foundations for clean Development, Preparing the Land use sector London, 2002

R3 Carbon sequestration in dryland soils, World Soil Resources report No.102, Food and Agriculture Organization, Rome, 2004.

R4 Lokey E. Renewable energy project development under the clean development mechanism: a guide for Latin America. Routledge; 2012 May 16.

R5 Chevallier J. Econometric analysis of carbon markets: the European Union emissions trading scheme and the clean development mechanism. Springer Science & Business Media; 2011 Sep 21.

Chairman - BoS
AGRI - HiCET

HINDUSTHAN ACADEMIC COUNCIL Chairman HINDUSTHAN COLLEGE OF ENGG & TECH

Dean (Academics)
HiCET

Program	Course Code	Name of the Course	L	T	P	C
B.E.	21AG5304	IOT IN AGRICULTURAL SYSTEMS	3	0	0	3

Course Objective

1. To impart the knowledge of electronic devices for the purpose automation in agricultural practice.
2. To get a basic idea about precision farming
3. To develop AI to control agricultural system and its management.
4. To acquire knowledge about system engineering in Agriculture
5. To know about e-governance in Agriculture Systems.

Unit	Description	Instructional Hours
I	**BASIC ELECTRONICS CIRCUITS** Passive devices -semi conductor devices - transistors - diode circuits - amplifier circuits- oscillator circuits- thyristor circuits-Integrated circuits and operational amplifier - logic gates - flip flop – counters digital to analog - analog to digital converters microprocessor introduction	9
II	**PRECISION FARMING** Precision agriculture and agricultural management-Ground based sensors, Remote sensing, GPS, GIS and mapping software -Yield mapping systems, Crop production modeling.	9
III	**ENVIRONMENT CONTROL SYSTEM** Artificial light systems - management of crop growth in greenhouses, simulation of CO_2 consumption in greenhouses, on-line measurement of plant growth in the greenhouse - models of plant production and expert systems in horticulture. Understanding and predicting world's climate system.	9
IV	**AGRICULTURAL SYSTEMS MANAGEMENT** Agricultural systems - managerial overview, Reliability of agricultural systems, Simulation of crop growth and field operations, Optimizing the use of resources - Linear programming, Project scheduling - Artificial intelligence and decision support systems.	9
V	**E-GOVERNANCE IN AGRICULTURAL SYSTEMS** Concept of Information Technology (IT) and its application potential - Role of IT in natural resources management - Expert systems, decision support systems, Agricultural and biological databases, e-commerce, e-business systems & applications - Technology enhanced learning systems and solutions, e-learning, Rural development and information society - Internet application tools and web technology.	9
	Total Instructional Hours	45

Course Outcome

During this course, students will be trained :

CO1: To know the Basic of Electric Circuits

CO2: To understand the importance of Precision Farming.

CO3: To manage the favourable conditions required for every crops separately

CO4: To solve the problems related to agriculture engineering by providing optimal conditions.

CO5: Understand about e-governance and agricultural systems management.

TEXT BOOKS

T1 Hammer, G.L., Nicholls, N., and Mitchell, C., Applications of Seasonal Climate, Springer, Germany, 20

T2 Peart, R.M., and Shoup, W. D., Agricultural Systems Management, Marcel Dekker, New York, 2004.

T3 Joe.J.Hanan. 1998. Green houses: Advanced Technology for Protected Horticulture, CRC Press, LLC. Florida.

T4 Adams, C.R. K.M. Bandford and M.P. Early. 1996. Principles of Horticulture. CBS publishers and distributors. Darya ganj, New Delhi.

T5 Pierce FJ, Clay DE, editors. GIS applications in agriculture. New York: CRC Press; 2007 Feb 13.

REFERENCE BOOKS

R1 National Research Council, Precision Agriculture in the 21st Century, National Academies Press, Canada, 1997.

R2 H. Krug, Liebig, H.P. International Symposium on Models for Plant Growth, Environmental Control and Farm Management in Protected Cultivation, 1989.

R3 Gupta, P.K., and Man Mohan, "Problems in Operations Research", (Methods and Solutions), Sultan Chand and Sons, New Delhi, 1995.

R4 Srinivasan A, editor. Handbook of precision agriculture: principles and applications. CRC press; 2006 Sep 6.

R5 Clay DE, Clay SA, Bruggeman SA. Practical mathematics for precision farming. John Wiley & Sons; 2020 Jan 22.

Chairman - BoS
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Dean (Academics)
HiCET

Programme	Course Code	Name of the Course	L	T	P	C
B.E.	21AG5305	ERGONOMICS AND SAFETY IN AGRICULTURAL ENGINEERING	3	0	0	3

Course Objective

1. To impart basic knowledge in ergonomics by understanding the fundamental concepts
2. To train with the ergonomic aspects in the design of agricultural machinery for improve field performance and safety of human beings.

Unit	Description	Instructional Hours
I	**ERGONOMICS AND ITS APPLICATION** Ergonomics -Human metabolism- Basal metabolism and work metabolism- application of ergonomics in farm implement and machinery design.	9
II	**ASSESSMENT OF ENERGY EXPENDITURE** Direct calorimetry- Indirect calorimetry- Assessment of energy expenditure byTechniques of measuring oxygen consumption- heart rate and calibration- subjective rating-Overall discomfort score and BPDS.	9
III	**ANTHROPOMETRY** Anthropometry- types of anthropometric data and measurement techniques- Analysis of anthropometric data and use of percentiles.	9
IV	**BIOMECHANICS OF MOTION.** Introduction-Vibration-hand arm vibration and whole-body vibration- physiological effects-Noise and its physiological effects.	9
V	**DESIGN CONSIDERATION AND SAFETY** Anthropometric consideration in tool/ equipment design-displays and controls – tractor seat design and location of controls in tractor.	9
	Total Instructional Hours	**45**

Course Outcome

By the end of the course student will be able

CO1: Understand role of human metabolism in design of agricultural implements.

CO2: To assessment of energy expenditure through various measuring techniques.

CO3: Understand the types of anthropometric data and its application in tool design

CO4: Understand the physiological effects of vibration and noise in work station.

CO5: To improve the performance of the farm systems by enlightening the human - machine interaction with safetymeasures.

TEXT BOOKS:

T1 Mark S.Senders,ErnestJ.Mccormick (1975) human factors in Engineering Design.

T2 McGraw Hill Book co., New York 2. Wesley E.Woodson (1981),Human factors design hand book,

T3 Gite LP. 2009. Anthropometric and strength data of Indian Agricultural Workers for farm equipment design. AICRP on ESA. CIAE, Bhopal.

T4 Astrand, P.O and Rodahl, K.1977. Text book of work physiology, McGraw Hill, New York

T5 Dul J and Weerdmeester B.1993.Ergonomics for Beginners. A Quick Reference Guide. Taylor and Francis, London.

T6 Kroemer, K.H.E., Kroemer,H.J. and K.E.Kroemer-Elbert. 1997. Engineering Physiology: bases of human factors/ergonomics, VAN NOSTRAND REINHOLD, New York.

REFERENCE BOOKS:

R1 Robert W.Bailey (1992).Human performance Engineering .PTR Prentice Hall, Englewood cliffs, New Jersey.07632.

R2 Bridger, R.S,1995. Introduction to Ergonomics, McGraw Hill, New York

R3 Rodal, K.1989.The Physiology of work, Taylor and Francis, London.

R4 K.U.E. Kroemer and E. Grandjean. 2001. Fitting the Task to the Human: A textbook of Occupational Ergonomics. Taylor and Francis.

R5 Mark S. Sanders and Ernest James McCormick,1993. Human Factors in Engineering and Design. Mc Hill Corporation, New York.

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CBCS PATTERN

UNDERGRADUATE PROGRAMMES

B.E AGRICULTURE ENGINEERING (UG)

REGULATION-2019 (Revised on Feb 2022)

(For the students admitted during the academic year 2020-2024)

SEMESTER I

S.No.	Course Code	Course Title	Category	L	T	P	C	CIA	ESE	TOTAL
THEORY										
1	19HE1101	Technical English	HS	3	0	0	3	25	75	100
2	19MA1102	Calculus and Linear Algebra	BS	3	1	0	4	25	75	100
3	19ME1101	Basics of Civil and Mechanical Engineering	ES	3	0	0	3	25	75	100
THEORY WITH LAB COMPONENT										
4	19PH1151	Applied Physics	BS	2	0	2	3	50	50	100
5	19CY1151	Chemistry for Engineers	BS	2	0	2	3	50	50	100
6	19CS1151	Python programming and practices	ES	2	0	2	3	50	50	100
PRACTICAL										
7	19HE1001	Language competency enhancement course - I	HS	0	0	1	1	100	-	100
			Total :	**15**	**1**	**6**	**20**			**700**
As per AICTE 3 weeks Induction programme is Added in the First Semester as an Audit Course										

SEMESTER II

S.No.	Course Code	Course Title	Category	L	T	P	C	CIA	ESE	TOTAL
THEORY										
1	19HE2101	Business English for Engineers	HS	3	0	0	3	25	75	100

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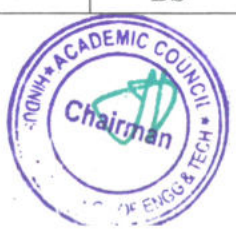
2	19MA2101	Differential Equations and Complex Variables	BS	3	1	0	4	25	75	100
3	19AG2104	Principles of Food Science	ES	3	0	0	3	25	75	100
THEORY WITH LAB COMPONENT										
4	19PH2151	Material Science	BS	2	0	2	3	50	50	100
5	19CY2151	Environmental studies	BS	2	0	2	3	50	50	100
6	19IT2151	Programming in C	ES	2	0	2	3	50	50	100
PRACTICAL										
7	19ME2001	Engineering Practices	ES	0	0	4	2	50	50	100
8	19HE2001	Language Competency Enhancement Course-II	HS	0	0	1	1	100	-	100
			Total :	**15**	**1**	**11**	**22**	**375**	**425**	**800**

SEMESTER III

S.No	Course Code	Course Title	Category	L	T	P	C	CIA	ESE	TOTAL
THEORY										
1	19MA3102	Fourier Analysis and Transforms	BS	3	1	0	4	25	75	100
2	19AG3201	Soil Science and Engineering	PC	3	0	0	3	25	75	100
3	19AG3202	Fluid Mechanics and Hydraulics	PC	3	1	0	4	25	75	100
4	19AG3203	Principles and practices of Crop Production	PC	3	0	0	3	25	75	100
THEORY WITH LAB COMPONENT										
5	19AG3251	Unit Operations in Agricultural Processing	PC	2	0	2	3	50	50	100
PRACTICAL										
6	19AG3001	Field Crop Production Practical	PC	0	0	3	1.5	50	50	100
7	19AG3002	Soil Science Laboratory	PC	0	0	3	1.5	50	50	100
MANDATORY COURSES										
8	19MC3191	Indian Constitution		2	0	0	0	100		100
			Total:	**16**	**2**	**8**	**20**	**350**	**450**	**800**

SEMESTER IV

S.No	Course Code	Course Title	Category	L	T	P	C	CIA	ESE	TOTAL
THEORY										
1	19AG4201	Farm Tractors	PC	2	1	0	3	25	75	100
2	19AG4202	Thermodynamics	PC	3	0	0	3	25	75	100
3	19AG4203	Irrigation and Drainage Engineering	PC	3	0	0	3	25	75	100
THEORY WITH LAB COMPONENT										
4	19MA4152	Statistics and Numerical	BS	3	0	2	4	50	50	100



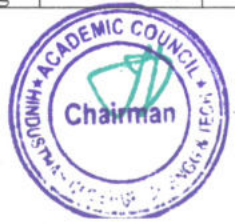
		Methods								
5	19AG4251	Bio-Energy Resource Technology	PC	2	0	2	3	50	50	100
6	19AG4252	Surveying and Leveling	PC	2	0	2	3	50	50	100
PRACTICAL										
7	19AG4001	Irrigation Field Laboratory	PC	0	0	4	2	50	50	100
MANDATORY COURSES										
8	19AC4191	Essence of Indian tradition knowledge/Value Education	AC	2	0	0	0	100		100
			Total	**17**	**1**	**10**	**21**	**375**	**425**	**800**

SEMESTER V

S.No.	Course Code	Course Title	Category	L	T	P	C	CIA	ESE	TOTAL
THEORY										
1	19AG5201	Farm Machinery and Equipment	PC	3	0	0	3	25	75	100
2	19AG5202	Refrigeration and Cold Chain Management	PC	3	1	0	4	25	75	100
3	19AG5203	Theory of Machines	PC	3	0	0	3	25	75	100
4	19AG53XX	Professional Elective-I	PE	3	0	0	3	25	75	100
THEORY WITH LAB COMPONENT										
5	19AG5251	Groundwater and Well Engineering	PC	2	0	2	3	50	50	100
6	19AG5252	Soil and Water Conservation Engineering	PC	2	0	2	3	50	50	100
PRACTICALS										
7	19AG5001	Operation and Maintenance of Farm Machinery Laboratory	PC	0	0	3	1.5	50	50	100
8	19AG5002	CAD for Agricultural Engineering	PC	0	0	3	1.5	50	50	100
MANDATORY COURSES										
9	19HE5071	Soft Skills - I	EEC	1	0	0	1	25	75	100
10	19HE5072	Design Thinking	EEC	1	0	0	1	25	75	100
			Total	**18**	**1**	**10**	**24**	**350**	**650**	**1000**

SEMESTER VI

S.No.	Course Code	Course Title	Category	L	T	P	C	CIA	ESE	TOTAL
THEORY										
1	19AG6201	Hydrology and Water Resources Engineering	PC	3	0	0	3	25	75	100



2	19AG6202	Solar and Wind Energy Engineering	PC	3	1	0	4	25	75	100
3	19AG6181	Professional Ethics	HS	3	0	0	3	25	75	100
4	19AG63XX	Professional Elective-II	PE	3	0	0	3	25	75	100
5	19XX64XX	Open Elective-I	OE	3	0	0	3	25	75	100
THEORY WITH LAB COMPONENTS										
6	19AG6251	Food and Dairy Engineering	PC	2	0	2	3	50	50	100
PRACTICALS										
7	19AG6252	ICT in Agricultural Engineering	PC	0	0	4	2	50	50	100
8	19AG6701	Industrial Training	EEC	0	0	0	1	0	100	100
MANDATORY COURSES										
9	19HE6071	Soft Skills - II	EEC	1	0	0	1	25	75	100
10	19HE6072	Intellectual Property Rights (IPR)	EEC	1	0	0	1	25	75	100
			Total	**19**	**1**	**6**	**24**	**275**	**725**	**1000**

SEMESTER VII

S.No.	Course Code	Course Title	Category	L	T	P	C	CIA	ESE	TOTAL
THEORY										
1	19AG7201	Agricultural Extension	PC	3	0	0	3	25	75	100
2	19AG7202	Remote Sensing and Geographical Information System	PC	3	0	0	3	25	75	100
3	19AG73XX	Professional Elective-III	PE	3	0	0	3	25	75	100
4	19XX74XX	Open Elective-II	OE	3	0	0	3	25	75	100
THEORY WITH LAB COMPONENT										
5	19AG7251	Precision Farming and Protected Cultivation	PC	2	0	2	3	50	50	100
PRACTICALS										
6	19AG7001R	Renewable Energy Laboratory	PC	0	0	3	1.5	50	50	100
7	19AG7002R	Remote Sensing and GIS Laboratory for Agricultural Engineers	PC	0	0	3	1.5	50	50	100
PROJECT WORK										
8	19AG7901	Innovative Project	EEC	0	0	4	2	50	50	100
			Total	**14**	**0**	**12**	**20**	**300**	**500**	**800**

SEMESTER VIII

S.No.	Course Code	Course Title	Category	L	T	P	C	CIA	ESE	TOTAL
THEORY										
1	19AG83XX	Professional Elective-IV	PE	3	0	0	3	25	75	100
2	19AG83XX	Professional Elective-V	PE	3	0	0	3	25	75	100
PROJECT WORK										
3	19AG8901	Project work	EEC	0	0	16	8	100	100	200
			Total	**6**	**0**	**16**	**14**	**150**	**250**	**400**

TOTAL NO OF CREDITS: 165

LIST OF PROFESSIONAL ELECTIVES

S.No.	Course Code	Course Title	Category	L	T	P	C	CIA	ESE	TOTAL
PROFESSIONAL ELECTIVE I										
1	19AG5301	Systems Analysis and Soft Computing in Agricultural Engineering	PC	3	0	0	3	25	75	100
2	19AG5302	Sustainable Agriculture and Food Security	PC	3	0	0	3	25	75	100
3	19AG5303	CDM and Carbon Trading Technology	PC	3	0	0	3	25	75	100
4	19AG5304	IOT in Agricultural Systems	PC	3	0	0	3	25	75	100
5	19AG5305	Ergonomics and Safety in Agricultural Engineering	PC	3	0	0	3	25	75	100
PROFESSIONAL ELECTIVE II										
1	19AG6301	Climate change and adaptation	PC	3	0	0	3	25	75	100
2	19AG6302	Heat and Mass Transfers for Agricultural Engineers	PC	3	0	0	3	25	75	100
3	19AG6303	Disaster Management	PC	3	0	0	3	25	75	100
4	19AG6304	Horticultural Crop Processing	PC	3	0	0	3	25	75	100
5	19AG6305	Organic Farming Technologies	PC	3	0	0	3	25	75	100
PROFESSIONAL ELECTIVE III										
1	19AG7301	Post-Harvest Technology	PC	3	0	0	3	25	75	100
2	19AG7302	Dairy Process Technology	PC	3	0	0	3	25	75	100
3	19AG7303	Storage and Packaging Technology	PC	3	0	0	3	25	75	100

4	19AG7304R	Process Engineering of Fruits and Vegetables	PC	3	0	0	3	25	75	100
5	19AG7305	Fat and Oil Processing	PC	3	0	0	3	25	75	100
PROFESSIONAL ELECTIVE IV										
1	19AG8301	Agricultural Business Management and Entrepreneurship	PC	3	0	0	3	25	75	100
2	19AG8302	On-Farm Water Management	PC	3	0	0	3	25	75	100
3	19AG8303	Intellectual Property Rights	PC	3	0	0	3	25	75	100
4	19AG8304	Agricultural Waste Management	PC	3	0	0	3	25	75	100
5	19AG8305	Energy Conservation in Agro based Industry	PC	3	0	0	3	25	75	100
6	19AG8306	Cooling Technology: Why and How utilized in Food	MOOC (NPTEL-	3	0	0	3	25	75	100
7	19AG8307	Novel Technologies for Food Processing and Self life	MOOC (NPTEL-	3	0	0	3	25	75	100
8	19AG8308	Machine Learning for soil and crop management	MOOC (NPTEL-	3	0	0	3	25	75	100
PROFESSIONAL ELECTIVE V										
1	19AG8309	Special Farm Equipment's	PC	3	0	0	3	25	75	100
2	19AG8310	Mechanics of Tillage and Traction	PC	3	0	0	3	25	75	100
3	19AG8311	Watershed Hydrology and Management	PC	3	0	0	3	25	75	100
4	19AG8312	Micro Irrigation System	PC	3	0	0	3	25	75	100
5	19AG8313	Agriculture Economics and Farm Management	PC	3	0	0	3	25	75	100

LIST OF OPEN ELECTIVES										
AGRICULTURE ENGINEERING										
S.No.	**Course Code**	**Course Title**	**Category**	**L**	**T**	**P**	**C**	**CIA**	**ESE**	**TOTAL**
1	19AG6401	Modern Agricultural Practices	OE	3	0	0	3	25	75	100
AGRICULTURE ENGINEERING										
2	19AG7401	Urban Agriculture and organic farming	OE	3	0	0	3	25	75	100
LIFE SKILL COURSES										
3	19LSZ401	General Studies for Competitive Examinations	OE	3	0	0	3	25	75	100
4	19LSZ402	Human Rights, Women's Rights and Gender Equality	OE	3	0	0	3	25	75	100
5	19LSZ403	Indian Ethos and Human Values	OE	3	0	0	3	25	75	100

6	19LSZ404	Indian Constitution and Political System	OE	3	0	0	3	25	75	100
7	19LSZ405	Yoga for Human Excellence	OE	3	0	0	3	25	75	100

CREDIT DISTRIBUTION

Category	SEM I	SEM II	SEM III	SEM IV	SEM V	SEM VI	SEM VII	SEM VIII	Total credit
Total	20	22	20	21	24	24	20	14	165

*** Student can earn extra credit 35 over and above the total credits**

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AGRI - HiCET

Dean - Academics

Dean (Academics)
HiCET

Principal

PRINCIPAL
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COIMBATORE - 641 032.

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SEMESTER VII

Programme	Course Code	Name of the Course	L	T	P	C
B.E.	19AG7201	AGRICULTURAL EXTENSION	3	0	0	3

Course Objective

- To explain the extension functionaries on the latest developments in the field of agricultural extension
- To equip the extension functionaries in latest tools and techniques for participatory decision making
- To develop an insight into various extension models to enrich the agri - value chain

Unit	Description	Instructional Hours
I	**Principles of Extension** Extension Education – Meaning, objectives, concepts, principles and philosophy– Extension teaching methods and factors influencing the selection of teaching.	9
II	**Methods of contact** Individual contact-Group contact Exhibition-campaign and public speaking -Field trips and tours -purpose procedure, advantage and limitations	9
III	**Methods of communication** Mass contact -written communication, circular letter, leaflet, folder, pamphlet and newspaper-purpose procedure advantages and limitations. Organizing youth club -farmer club mahila mandal purpose and procedure.	9
IV	**Visual communication** Audio -visual aids-definition, importance, selection, use and factors influencing selection, merits and demerits-Electronic media -radio, television and video procedure – advantage and limitations.	9
V	**Current Approaches in Extension** Decentralised Decision Making-Bottom up Planning-Farming System Approach, Farming Situation Based Extension- Market – Led – Extension.	9
	Total Instructional Hours	**45**

Course Outcome

By the end of the course student will be able

CO1: To critically analyze different Agricultural Extension approaches.

CO2: Understand Agricultural Knowledge Information System

CO3: New trends in agriculture extension: privatization extension.

CO4: Monitoring and evaluation – concept and definition, monitoring, and evaluation of Extension programmes, Transfer of Technology- Concept and models

CO5:To expose with various Rural development programmes aimed at poverty alleviation and to increase employment opportunities and their analysis.

TEXT BOOKS

T1 Annamalai, R., M. Manoharan, S.Somasundarm and K.N.Krishnakumar, 1987;Extension methods and their principles. Palaniappa printers, Tirunelveli.

T2 Berlo,1970; Process of communication. Holt Rinehart Winston Inc. Newyork.

T3 Dahama,O.P. and O.P.Bhatnagar,1985; Education and communication for development, Oxford and IBH publishing Co.,New Delhi.

T4 Gallagher K. 1999. Farmers Field School (FFS) – A Group Extension Process based on Non-Formal Education Methods. Global EPM Facility, FAO.

T5 Jalihal KA & Veerabhadraiah V. 2007. Fundamentals of Extension Education and Management in Extension. Concept, Publ. Khan.

T6 Grover I, Kaushik S, Yadav L & Varma SK. 2002. Communication and Instructional Technology. Agrotech Publ. Academy.

REFERENCE BOOKS

R1 Directorate of extension, 1968; Extension education in community development, Ministry of food and agriculture, Government of India, New Delhi

R2 Ray G.L.1971;Extension communication and management, Naya Prakash, Kolkata

R3 Rogers E. 1985; Diffusion of innovation, Collier McMillan publishers, London.

R4 Dimensions of agriculture extension - TNAU

R5 Extension communication and management- G. L. Ray

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	19AG7202R	REMOTE SENSING AND GEOGRAPHICAL INFORMATION SYSTEM	3	0	0	3

Course Objective

To introduce the basic principles and concepts of Remote Sensing and GIS as applicable to the multi-facets of Agricultural Engineering
To introduce the spatial data models, analysis and presentation techniques.
To introduce the methods of image enhancement and classification techniques
To describe various aspects of possible applications of Remote Sensing techniques in Agriculture.

Unit	Description	Instructional Hours
I	**CONCEPTS OF REMOTE SENSING AND SATELLITES** Introduction to Remote Sensing- Energy Sources and Interaction- Satellites - Types - Sun synchronous - Geo synchronous remote sensing satellites - LANDSAT, SPOT & IRS - Resolution - Spectral, spatial, radiometric and Temporal resolution	9
II	**DATA PRODUCTS AND IMAGE ANALYSIS** Data products –based on level of processing- o/p – scale – area/coverage – data availability – data ordering- data price - Image interpretation – Visual interpretation elements – interpretation key. Digital image processing – Image enhancement – image classification – Supervised and unsupervised – Vegetation Indices.	9
III	**CONCEPTS OF GIS** Definition – Map and their influences – Characteristics of Maps – Elements – Map scale, Projection, Coordinate systems – Sources of spatial data –Definition – Components – Hardware and Software - GIS tools.	9
IV	**DATA INPUT AND ANALYSIS** Data – Spatial, Non-Spatial – Database models – Hierarchical network, Relational and Object-Oriented Data Models – Raster and Vector – Methods of Data input – Data Editing – Files and formats – Data structure – Data compression. Introduction to analysis – Measurements – Queries– Reclassification – Simple spatial analysis – Buffering – Neighboring functions – Map overlay –Vector and raster – Spatial interpolation – Modelling in GIS – Digital Elevation Modelling – Expert systems.	9
V	**APPLICATION OF RS AND GIS** Application in Precision Agriculture - Monitor Crop Health -. Estimation of Crop Water Requirement – Crop condition - Soil mapping– classification of soil with digital numbers – soil erosion mapping- reservoir sedimentation using image processing - Inventory of water resources – water quality assessment- Management Decision Support Systems	9
	Total Instructional Hours	45

Course Outcome

CO1: The students will understand the remote sensing principles, remote sensing systems satellite data processing and available data products.

CO2: Describe the process of data acquisition of satellite images and their characteristics

CO3: Compute an image visually and digitally with digital image processing techniques.

CO4:The students will understand decision making process using DBMS and utilization of these advanced techniques in addressing the real world problems

CO5: Compute knowledge of remote sensing and GIS in different agriculture engineering application

TEXT BOOKS:

T1 Anji Reddy. M, Remote Sensing and Geographical Information Systems, BS Publications, Hyderbad, 2001

T2 Lillesand, T. M., and Kiefer, R.W., Remote Sensing and Image Interpretation, John Wiley and Sons, New York, 2000.

T3 Bhatta, B., 2010, Remote Sensing and GIS, Oxford University Press, New Delhi, pp. 7-8, 64-96.

T4 Liu, J.G., and Mason, P.J. (2009). Mason P.J, Essential Image Processing and GIS For Remote Sensing; Imperial college, London, UK

T5 Lillesand, T. M., Kiefer, R. W., 2002, Remote Sensing and Image Interpretation. Fourth Edition, pp. 310-319.

REFERENCE BOOKS:

R1 Bettinger, P., and Michael, G.W., "Geographical Information System: Applications in Forestry and Natural Resources Management," Tata McGraw–Hill Higher Education, New Delhi, 2003

R2 Ian Heywood., "An Introduction to GIS", Pearson Education, New Delhi, 2001.

R3 Jeffery Star and John Estes, "Geographical Information System – An Introduction," Prentice Hall India Pvt. Ltd., New Delhi, 1998.

R4 Patel A.N & Surendra Singh, "Remote sensing principles & applications", Scientific Publishers, Jodhpur 1992

R5 www.isro.org/satellites/earthobservationsatellites.aspx; July 27, 2012

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	19AG7251	PRECISION FARMING AND PROTECTED CULTIVATION	2	0	2	3

Course Objective

1. To impart knowledge on the protected all season confined space cultivation strategies for vegetables, fruits and flower crops
2. To sensitize the students on hi-tech production technology under open field Precision Farming applications.

Unit	Description	Instructional Hours
I	**PROTECTED CULTIVATION FEATURES** Conceptual features of protected cultivation in horticultural crops - Importance and scope of protected cultivation – different growing structures of protected culture viz., green house, polyhouse, net house, poly tunnels, screen house, protected nursery house - study of environmental factors influencing green house production – cladding / glazing / covering material – ventilation systems – cultivation systems including nutrient film technique / hydroponics / aeroponic culture growing media and nutrients – canopy management – micro irrigation and fertigation systems.	9
II	**PROTECTED CULTIVATION OF VEGETABLE CROPS** Protected cultivation technology for vegetable crops - Hi-tech protected cultivation techniques for tomato, capsicum nursery, cucumber, gherkins strawberry and melons – integrated pest and disease management – post harvest handling.	9
III	**PROTECTED CULTIVATION OF FLOWER CROPS** Protected cultivation technology for flower crops - Hi-tech protected cultivation of cut roses, cut chrysanthemum, carnation, gerbera, asiatic lilies, anthurium, orchids, cut foliages and fillers – integrated pest and disease management – postharvest handling.	9
IV	**PRECISION FARMING TECHNIQUES** Concept and introduction of precision farming – Importance, definition, principles and concepts – Role of GIS and GPS - Mobile mapping system and its application in precision farming – design, layout and installation of drip and fertigation – georeferencing and photometric correction –Sensors for information gathering – UAV - geostatistics – robotics in horticulture – postharvest process management (PPM) – Remote sensing.	9
V	**PRECISION FARMING OF HORTICULTURAL CROPS** Precision farming techniques for horticultural crops - Precision farming techniques for tomato, chilli, bhendi, bitter gourd, bottle gourd, cauliflower, cabbage, grapes, banana, rose, jasmine, chrysanthemum, marigold, tuberose, china aster, turmeric, coriander, coleus and gloriosa.	9
	Total Instructional Hours	45

Course Outcome	CO1:The students will be able to appreciate the different methods of protected cultivation practices available for vegetable crops and flowers. CO2:A clear understanding of precision farming techniques and its application to horticultural crops is possible. CO3: The students will be able to assess the technology available for vegetable crops CO4: The students will be able to assess precision farming techniques using sensors and Geographic information systems for the crops CO5: The students will be able to assess the technology available for horticulture crops

TEXT BOOKS:

T1 Joe.J.Hanan, "Green houses: Advanced Technology for Protected Horticulture", CRC Press, LLC. Florida. 1998

T2 Paul V. Nelson.," Green house operation and management". Ball publishing USA,1991.

REFERENCE BOOKS:

R1 Lyn. Malone, Anita M. Palmer, Christine L. VIoghat Jach Dangeermond, "Mapping out world: GIS lessons for Education". ESRI press.2002.

R2 David Reed, "Waer, media and nutrition for green house crops", Ball publishing USA.1996

R3 Adams, C.R. K.M. Bandford and M.P. Early, "Principles of Horticulture", CBS publishers and distributors. Darya ganj, New Delhi,1996.

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	**19AG7001R**	**RENEWABLE ENERGY LABORATORY**	**0**	**0**	**3**	**1.5**

Course Objective

- To facilitate the students to achieve a clear conceptual understanding of technical and commercial aspects of renewable energy.
- To develop managerial skills to our students for assess feasibility of alternative approaches and drive strategies regarding renewable energy.

S.NO	Description	Instructional Hours
1	Characterization of biomass – proximate analysis	3
2	Determination of caloric value of fuels – solids and gases	3
3	Design of KVIC / Deenbandhu model biogas plant	3
4	Determine composition of biogas	3
5	Testing of engine performance.	3
6	Study on briquetting and Stoichiometric calculations	3
7	Analysis of wind data and prediction	3
8	Testing of solar water heater	3
9	Testing of natural convection solar dryer	3
10	Study on Solar power and I-V Characteristics	3
11	Testing of solar photovoltaic water pumping system	3
	Total Instructional Hours	**33**

Course Outcome

On completion of the lab course, the students will be familiarized to;

CO1: Identifying categories of renewable energy sources and their application.
CO2: Design of floating drum and fixed doom type Bio-gass plant
CO3: Analysis gas composition like CH_4, CO2 and CO and H_2S through orsat apparatus
CO4: Understand the Stoichiometric calculations, weather station I-V Characteristics.
CO5: Testing of engines and solar water heater, dryer and Photovoltaic system and identifying performance of system.

S.NO	LIST OF EQUIPMENTS REQUIRED	REQUIRED QUANTITY
1	Hot air oven	1
2	Muffle furnace	1
3	Junkers gas calorimeter	1
4	Bomb calorimeter	1

5	Model of Biogas and Deenabandhu biogas plant	1
6	Biogas scrubbing unit	1
7	Gasifier - Lab Scale	1
8	Pyrolysis unit	1
9	Biogas/ Producer gas dual fuel Engine	1
10	Briquetting Machine - Lab Scale	1
11	Automatic weather station.	1
12	Solar water heater	1
13	Solar dryer	1
14	Solar PV training kit-	1
15	Solar PV water pumping system	1

The equipment's includes the basic requirements like petri plates, silica crucible with lid, weighing balance, tongs, gloves, solarimeter, hand held anemometer, temperature and humidity sensor.

REFERENCES

R1 Khandelwal, K.C. and Mahdi, S.S. "Biogas Technology". Tata Mc Graw Hill Pub. Co. Ltd., New Delhi, 1986.

R2 Nijaguna, B. T. "Biogas Technology" New Age International Pvt. Ltd., New Delhi, 2006.

R3 Rao. S and B.B. Parulekar. Energy Technology – Non conventional, Renewable and Conventional. Khanna Publishers, New Delhi, 2000.

R4 Solanki, C.S. "Solar Photovotaics – Fundamentals, Technologies and Applications", PHI Learning Pvt. Ltd., New Delhi, 2011.

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	19AG7002R	REMOTE SENSING AND GIS LABORATORY FOR AGRICULTURAL ENGINEERS	0	0	3	1.5

Course Objective

To introduce the principles and basic concepts of Remote Sensing and GIS through intensive hands on training.

S.NO	Description	Instructional Hours
1	Introduction to QGIS and SAGA	3
2	Projection by using QGIS	3
3	Georefrencing by Using QGIS	3
4	Image Registration	3
5	Digitization of a Toposheet	3
6	Map Preparation using QGIS	3
7	Visual Interpretation of Images by Using Saga	3
8	Mosaicking and Subsetting Images using SAGA	3
9	Supervised and Unsupervised Classification using SAGA	3
10	Terrain Analysis and Change Detection using SAGA	3
11	Watershed Delineation and Calculating Brightness temperature using Landsat-8	3
Total Instructional Hours		**33**

Course Outcome

CO1: Understand the process of data acquisition of satellite images and their characteristics
CO2: Understand the Image enhancement, Supervised and Unsupervised classification of image.
CO3: Understand the Database Management Systems of GIS application in agriculture.
CO4: Understand the DEM usage in watershed analysis, rainfall -runoff and erosion modelling
CO5: The students will have adequate knowledge in application of RS and GIS in various fields of agricultural engineering.

S.NO	LIST OF EQUIPMENTS REQUIRED	REQUIRED QUANTITY
1	Computers	30
2	Licensed software like GIS	1

REFERENCES

R1 Lillesand, T.M. and Kiefer, R.W. 2005. "Remote Sensing and Image Interpretation ", II edition. John Wiley & sons.

R2 Heywood, I., Cornelius. S., Carver. S 2002. An Introduction to Geographical Information Systems. Addison Wesley Longman, New York.

R3 Floyd F.Sabins. 2005. "Remote Sensing: Principles and Interpretation", III edition. Freeman and Company New York.

R4 Jensen, J.R., 2004. "Introductory Digital Image Processing: A Remote Sensing Perspective". Prentice – Hall. New Jersey.

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	19AG7901	INNOVATION PROJECT	0	0	4	2

Course Objective

1. To develop the ability to solve a specific problem right from its identification and literature review till the successful solution of the same.
2. To train the students in preparing project reports and to face reviews and viva voce examination.
3. Students in a group of 3 or 4 shall work on a topic approved by the head of the department under the guidance of a faculty member and prepare a comprehensive project report after completing the work to the satisfaction of the supervisor.
4. The progress of the project is evaluated based on three reviews by the review committee constituted by the Head of the Department.
5. The project work is evaluated based on oral presentation and the final project report jointly by a team of examiners including one external examiner.

Course Outcome

.CO1: Understand the current need of technology to improve agriculture production.

CO2: To learn mechanical component, sensors and software's application in agricultural machineries.

CO2: Understand the variables involved in process sequence and optimization.

CO3: To analyze the research problem and formulate methodology to find a solution.

CO4: On completion of the innovation project work, students will be in a position to take up any challenging practical problem and find solution by formulating proper methodology

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Professional Elective-III

Programme	Course Code	Name of the Course	L	T	P	C
B.E.	19AG7301	POST HARVEST TECHNOLOGY	3	0	0	3

Course Objective

- The students would be exposed to fundamental knowledge in engineering properties of agricultural materials, different Post Harvest operations and processing methods of harvested crops and storage of produces.

Unit	Description	Instructional Hours
	BASICS OF POST HARVEST OPERATIONS	
I	Postharvest technology – introduction –objectives –post harvest losses of cereals, pulses and oilseeds – importance - optimum stage of harvest. Threshing – traditional methods mechanical threshers – types-principles and operation-moisture content – measurement –direct and indirect methods – moisture meters – equilibrium moisture content.	9
	PSYCHROMETRY AND DRYING	
II	Psychrometry – importance – Psychrometric charts – Drying – principles and theory of drying – Moisture Content expressions - thin layer and deep bed drying – Hot air drying – methods of producing hot air – Types of grain dryers – selection – construction, operation and maintenance of dryers – Design of dryers.	9
	CLEANING AND GRADING	
III	Principles of Cleaning - air screen cleaners – adjustments - cylinder separator - spiral separator – magnetic separator - colour sorter - inclined belt separator – length separators - effectiveness of separation and performance index.	9
	SHELLING AND HANDLING	
IV	Principles and operation – maize sheller, husker sheller for maize – groundnut decorticator –castor sheller – material handling – belt conveyor –screw conveyor – chain conveyor – bucket elevators – pneumatic conveying.	9
	CROP PROCESSING	
V	Paddy processing – parboiling of paddy – methods – merits and demerits dehusking of paddy –methods – merits and demerits – rice polishers –types – constructional details – polishing –layout of modern rice mill - wheat milling – pulse milling methods – oil seed processing – millets processing.	9
	Total Instructional Hours	45

COURSE OUTCOMES

CO1: At the end of the study the student will have knowledge on material handling and processing equipment's
CO2: Different Post Harvest operations and processing methods of harvested crops.
CO3: Fundamentals of various unit operations of Agricultural Processing.
CO4: Understand the principles and theory of drying
CO5: To learn layout of modern industries

TEXT BOOKS

T1 Chakraverty, A.Post harvest technology for Cereals, Pulses and oilseeds. Oxford & IBH publication Pvt Ltd, New Delhi, Third Edition, 2000.

T2 Sahay, K.M., and Singh, K.K. Unit operations of Agricultural Processing. Vikas publishing house Pvt. Ltd., New Delhi, 1994.

REFERENCE BOOKS

R1 Pande, P.H. Principles of Agriculture Processing. Kalyani Publishers, Ludhiana, 1994.

R2 Henderson, S.M. and R.L. Perry. Agricultural Process Engineering. John Wiley and Sons, New York. 1955.

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	19AG7302	DAIRY PROCESS TECHNOLOGY	3	0	0	3

Course Objective

To describe the chemical-physico-thermal properties and their applications

To illustrate the technologies involved in processing of dairy products.

Unit	Description	Instructional Hours
I	**CHEMISTRY OF MILK** Milk definition, composition and variation; Structure of milk - fat globules, casein micelles, globular proteins, lipoprotein particles and their properties and grading of milk; Milk proteins - Introduction, definition and nomenclature of milk proteins, milk proteins classification and its importance, Protein denaturation and hydrolysis; Enzymes in milk, Carbohydrates and Lipids in milk, Salt composition in milk.	9
II	**SEPARATION EQUIPMENT** Mechanical Separation: Fundamentals involved in separation - Gas-Solid Seperations, Liquid-Solid Separations; Principle Involved in filtration, Types, Rates of filtration, Pressure drop Calculations; Gravity setting, Sedimentation, Principles of centrifugal separation, Different types of centrifuges, application in dairy industry; Clarifies, Tri-Processors, Cream Separator, Self-De sludging centrifuge, Bacto –Fuge; Care And Maintenance Of Separators and Clarifiers.	9
III	**HOMOGENIZERS, PASTEURIZERS AND STERILIZERS** Homogenization: classification, single stage and two stage homogenizer pumps, Power requirement for homogenization, Care and maintenance of homogenizers, Aseptic Homogenizers; Pasteurization: Batch, Flash And Continuous (HTST) Pasteurization, Care and maintenance of pasteurizer; Sterilizer - Different types Of Sterilizer, In Bottle Sterilizers, Autoclaves Continuous sterilization plant, UHT Sterilization, Care And Maintenance Of Sterilizers.	9
IV	**MECHANIZATION IN MANUFACTURE OF INDIGENOUS DAIRY PRODUCTS** Butter Making Machines - Introduction, Batch Butter Churns - Rotating Churns, Batch Method Using Rotating Churns, Continuous Churns, Continuous Butter Making; Ghee Making Machines – Introduction, Ghee making equipments; Ice-Cream Making Equipment - Introduction, types, controls and automation; Cheese Making Equipments.	9
V	**PACKAGING MACHINES FOR MILK & MILK PRODUCTS** Packaging machines for Milk – Introduction, Sequence of operation, Controls; UHT Milk Packing Machine; Package Terminologies; Tetra Brik Filling Machines; Packaging Machines For Milk Products - Cheese Packing Machine Types, Aseptic packaging and equipment, Vacuum Packaging.	9
	Total Instructional Hours	45

Course Outcome	CO1: Acquire the basic knowledge in dairy Technology CO2: The ability to use the acquired knowledge during dairy processing CO3: Students will learn about technologies to handle physical aspects of fluid-based process. CO4: Understand the working principles of mordant equipment's which involves in dairy technology. CO5: Understand the Sequence of operation during the packing process.

TEXT BOOKS:

T1 Chandra Gopala Rao. Essentials of Food Process Engineering. B.S. Publications, Hyderabad, 2006.

T2 Walstra. P., Jan T. M. Wouters., Tom J. Geurts "Dairy Science and Technology", CRC press, 2005.

T3 Kurmann, J. A., Rasic, J. L. and Kroger, M. (1992). Encyclopedia of Fermented Fresh Milk Products: An International Inventory of Fermented Milk, Cream, Buttermilk, Whey and Related Products: CBS Publications, New Delhi.

T4 Fox, P. F. and McSweeney, P. L. H. (1998). Dairy Chemistry and Biochemistry: Kluwer Academic, New York.

T5 Kutty, C. I. and Khamer, S. (2004). Milk Production and Processing: Daya, Delhi.

REFERENCE BOOKS

R1 Subbulakshmi.G., and Shobha A. Udipi, Food Processing and Preservation, New Age International Publications, New Delhi, 2007.

R2 Toledo, R.T., "Fundamentals of Food Process Engineering", CBS Publishers and Distribution, New Delhi, 1997.

R3 Dairy Science and Technology Handbook, Volumes 1-3, John Wiley & Sons,1993.

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	19AG7303	STORAGE AND PACKAGING TECHNOLOGY	3	0	0	3

Course Objective

1. To explain food material damage and control measure of losses in storage and estimation of losses
2. To explain different types of packaging materials and their forms used in food industries.
3. To describe package performance and various testing of packaging materials
4. To explain importance of storage of food materials .

Unit	Description	Instructional Hours
I	**SPOILAGE AND STORAGE** Direct damages, Indirect damages of perishable and durable commodities – control measures - factors affecting storage – types of storage – Losses in storage and estimation of losses.	9
II	**FUNCTIONS OF PACKAGING MATERIALS** Improved storage methods for grain-modern storage structures-infestation-temperature and moisture changes in storage structures-CAP storage-CA storage of grains and perishables construction operation and maintenance of CA storage facilities.	9
III	**STORAGE METHODS** Introduction – packaging strategies for various environment – functions of package – packaging materials – cushioning materials – bio degradable packaging materials – shrink and stretch packaging materials.	9
IV	**FOOD PACKAGING MATERIALS AND TESTING** Introduction – paper and paper boards - flexible - plastics - glass containers – cans – aluminium foils - package material testing-tensile, bursting and tear strength.	9
V	**SPECIAL PACKAGING TECHNIQUES** Vacuum and gas packaging - aseptic packaging - retort pouching – edible film packaging – tetra packaging – antimicrobial packaging – shrink and stretch packaging.	9
	Total Instructional Hours	45

Course Outcome

The students will have a clear

CO1: Understand about different methods of food material damage and storage losses and estimation.

CO2: Understand the packaging strategies for various environment in food industries.

CO3: Understand different types of packaging material and their properties and apply the knowledge in packaging various food materials.

CO4: Understand the selection of packages for specific food & agricultural commodities and advancement in food packaging

CO5: Understand the working principles of special packing equipment and its role emerging food industries.

TEXT BOOKS:

T1 Sahay, K.M. and K.K.Singh. 1996. Unit operations of agricultural processing. Vikas Publishing House Pvt. Ltd., New Delhi.

T2 Food Packaging Technology, Hand book, 2004. NIIR Board, New Delhi.

T3 Pandey, P.H.2002. Post harvest engineering of horticultural crops through objectives. Saroj Prakasam. Allahabad.

T4 Robertson G.L." Food Packaging: Principles and Practice"

T5 Mahadeviah M. and Gowramma R.V." Food Packaging Materials"

REFERENCE BOOKS:

R1 Himangshu Barman. 2008, Post Harvest Food grain storage. Agrobios (India), Jodhpur.

R2 Chakaraverty, A. 2000. 3rd edition. Post harvest technology of cereals, pulses and oil seeds. Oxford & IBH publishing & Co.Pvt.Ltd. New Delhi.

R3 Alexandru Grumezescu Alina Maria Holban"Food Packaging and Preservation"

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	19AG7304R	PROCESS ENGINEERING OF FRUITS AND VEGETABLES				

Course Objective

1. To understand the basics of Post Harvest Technology of fruits and vegetables through their structure and composition
2. To study the different methods of processing and preservation of fruits and vegetables including drying and dehydration
3. To learn the latest methods of storage of fruits and vegetables.

Unit	Description	Instructional Hours
I	**STRUCTURE, COMPOSITION, RIPENING AND SPOILAGE** Importance of post harvest technology of horticultural crops – post harvest losses – factors causing losses - structure, cellular components, composition and nutritive value of horticultural crops – fruit ripening – mechanism and equipment - spoilage of perishable commodities – mechanism and factors causing spoilage - Climatic and non-climatic fruits - Maturity indices for fruits.	9
II	**CLEANING, GRADING AND ON-FARM PROCESSING** Harvesting and washing of fruits and vegetables – cleaning and grading – fruits and vegetables - peeling - equipment's – construction and working – pre-cooling – importance, methods, pretreatments and advantages - Transportation and handling of fruits and vegetables – controlled atmosphere and modified atmosphere process.	9
III	**PRESERVATION OF FRUITS AND VEGETABLES** Thermal and non-thermal process of preservation of fruits and vegetables – canning of fruits and vegetables – process – methods – Advantage – Disadvantages – Drying and dehydration – freezing – Application – Methods quality parameters.	9
IV	**DRYING AND DEHYDRATION** Dehydration of fruits and vegetables – types of dryers, construction and working - methods – fluidized bed dryer, freeze drying, osmotic dehydration and foam mat drying – principles, construction, operation and applications - quality parameters and advantages.	9
V	**STORAGE** Storage of fruits and vegetables – storage under ambient conditions, low temperature storage, evaporative cooling – cold storage of horticultural commodities – estimation of cooling load - controlled atmosphere storage – concept and methods –modified atmosphere packaging – gas composition, quality of storage – waxing of fruits – types of wax, equipment and advantages.	9
	Total Instructional Hours	45

Course Outcome	CO1:Understand the Importance of post harvest technologies and preventions of post harvesting losses. CO2:Understand the basic of cleaning, grading and on-farm processing for increasing the self-life of food grains CO3:Understand the thermal and non-thermal techniques for preservation of fruits and vegetables CO4:Understand the working principles of drying technologies and dehydration of fruits and vegetables CO5:Understand the current storage technologies and its role in agriculture commodities

TEXT BOOKS:

T1 Fellows. P. 2000. Food Processing Technology – Principles and Practice, second edition, CRC Press, Woodland Publishing Limited, Cambridge, England.

T2 Sudheer K. P. and V. Indra.2007. Post harvest Technology of Horticultural Crops. New India Publishing Company, New Delhi.

T3 L.R.Verma and V.K.Joshi. 2000. Post Harvest Technology of Fruits and Vegetables – handling, Processing, Fermentation and waste management. Indus Publishing company, New Delhi.

REFERENCE BOOKS:

R1 Heid,J.L. and M.A.Joslyn. 1983. Food processing operations. Vol. II. AVI Publishing Co. Inc. Westport, Connecticut.

R2 Potter, N.N.1976. Food science. AVI Publishing Co. Inc.Westport, Connecticut, 2nd edition.

R3 Sivetz Michael and N.W.Desrosier. 1979. Coffee Technology. AVI Publishing Co. Inc, Westport, Connecticut.

R4 Humberto vega and Gustavo v Barbosa. 1996. Dehydration of foods. Springer Science, Business Media, Chapman&Hall Publishers, U.K.

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	19AG7305	FAT AND OIL PROCESSING	3	0	0	3

Course Objective

To study the Composition, Analysis and Processing of oils and fats.

To study technologies in oilseed processing and lipid deterioration

To study Chemical modification and Hydrogenation in oil processing

Unit	Description	Instructional Hours
I	**Physico-chemical aspects of fats and oils** Present status and future prospects of oilseeds, Morphology of oilseeds; Classification and types of oilseeds, Chemical composition, nutritional value and anti-nutritional compounds in oilseeds, Methods of removal of anti- nutritional compounds, Physical properties, Factors affecting physical properties.	9
II	**Oil seed milling** Oil seed milling, Ghanis, hydraulic presses, expellers, solvent extraction methods, machines, milling quality, milling efficiency, factors affecting milling quality and quantity; Problems in oil milling industry; Desolventization; Refining of oils: Degumming, neutralization, bleaching, filtration, deodorization, their principles and process controls; Hydrogenation of oils.	9
III	**Processing of fats and oils** Introduction, extraction, refining, bleaching, deodorization, storage & handling; Modification of fats and oils - Physical modification - Fractionation, winterisation; Chemical modification - Hydrogenation, esterification; Blending, Emulsification, Interesterification, Votation; Fats and oils products - vegetable oils, vegetable fats, animal oils, animal fats, fat substitutes.	9
IV	**Analysis of fats and oils** Composition and identity, Tests for adulteration, Lipids, functional foods and nutraceuticals, Distinction between functional and nutraceutical, Omega-e polyunsaturated fatty acids; Stability of fats & oils. Quality assessment, assurance and measurement- Iodine value, Peroxide value, Acid value and saponification value, Antioxidants: Use and application of antioxidants.	9
V	**New technologies in oilseed processing and lipid deterioration** New technologies in oilseed processing; Utilization of oil seed meals for different food uses: High protein products like protein concentrates and isolates; By-products of pulse and oil milling and their value addition. Lipid deterioration – Lypolysis, Factors affecting oxidation, thermal oxidation of fats and oils, photosensitised oxidation, Auto oxidation, Role of lipids in food flavour, Nutritional aspects, Fats and oils functionality, Palatability, Satiety.	9
	Total Instructional Hours	45

Course Outcome	CO1: The student will be familiarized with the composition, analysis and processing of oil seeds.
	CO2: Understand the Chemical composition and nutritional value of oil seed
	CO3: Understand the Physical and chemical modification of oil seed at end the process
	CO4: Understand the Role of lipids in food flavor
	CO5: Effective utilization of New technologies in oilseed processing

TEXT BOOKS

T1 Chakraverty, A. Post harvest technology for Cereals, Pulses and Oilseeds. Oxford & IBH Publication Pvt Ltd, New Delhi, Third Edition, 2000.

T2 Sahay, K.M., and Singh, K.K. Unit operations of Agricultural Processing, Vikas Publishing House Pvt. Ltd., New Delhi, 1994.

REFERENCE BOOKS

R1 Pande, P.H. Principles of Agriculture Processing. Kalyani Publishers, Ludhiana, 1994.

R2 Henderson, S.M. and R.L. Perry. Agricultural Process Engineering. John Wiley and Sons, New York. 1955. 3. Mohsenin, N.N. Physical Properties of Plant and Animal Materials Gordon and Breach Publishers, Ludhiana, 1970.

Chairman - BoS
AGRI - HiCET

HINDUSTHAN COLLEGE OF ENGG & TECH ACADEMIC COUNCIL Chairman

Dean (Academics)
HiCET

Open Elective-II

Programme	Course Code	Name of the Course	L	T	P	C
B.E.	19AG7401	URBAN AGRICULTURE AND ORGANIC FARMING	3	0	0	3

Course Objective

- To impart knowledge to students on the importance of gardening and organic farming
- To impart theoretical and practical knowledge on layout of different types of gardens and their maintenance.

Unit	Description	Instructional Hours
I	Urban Agriculture History, importance and scope of gardening; principles of gardening; types of gardens. special types of gardens - roof garden vertical garden, terrace garden.	9
II	**Professional Skills** Usage and maintenance of equipment's for gardening- Planting suitable varieties to suit different types of gardens- Install and maintenance of water fountains- design consideration and construction of roof garden.	9
III	**Importance of Organic farming** Organic farming, principles and its scope in India; Initiatives taken by Government (central/state), NGOs and other organizations for promotion of organic agriculture.	9
IV	**Certification process** Choice of crops and varieties in organic farming; Certification process and standards of organic farming; Processing, leveling, economic considerations and viability, marketing and export potential of organic products.	9
V	**Business Opportunity** Business Opportunity Identification- Market Survey and Business Plan Development-Import and Export certification - Planning and Risk Assessment.	9
	Total Instructional Hours	45

Course Outcome

- Effectively manage roof gardening as a small agri-business enterprise.
- Will have gained all round knowledge of roof gardening and organic farming as an agri-business enterprise rather than as a community profession.

TEXT BOOKS:

T1 David (Ed) Fletcher, Rooftop Garden Design, Images Publishing Group Pty Ltd. ,(1 October 2015), ISBN-10 : 1864706465

REFERENCE BOOKS:

R1 http://ecoursesonline.iasri.res.in/course/view.php?id=152

R2 http://www.asci-india.com/BooksPDF/Gardener.pdf

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ACADEMIC COUNCIL * HNCE * HINDUSTHAN COLLEGE OF ENGINEERING
Chairman

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MAPPING OF COURSE OUTCOME AND PROGRAMME OUTCOME:

CBCS PATTERN

UNDERGRADUATE PROGRAMMES B.E

AGRICULTURE ENGINEERING (UG)

REGULATION-2022

Year	Sem	Course code & Name	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO 1	PSO 2
I	I	22MA1101 & Matrices and Calculus	3	3	3	2.6	2.8	-	-	-	-	-	-	2	1.8	2
		22ME1201 & Engineering Drawing	3	2	2.6	-	2	-	-	-	-	2.2	-	1	2	1.8
		22PH1151 & Physics for Non-Circuit Engineering	3	2.6	2.6	1.6	2.2	1	1	-	1	-	1.6	2.2	2.4	1.4
		22HE1151 & English for Engineers	2	1	-	-	1	1	1.6	2.2	2.4	3	1	1.2	1	2
		22IT1151 & Python programming and practices	2	3	3	-	2	-	-	-	2	-	-	2	2	2
I	II	22MA2102 & Differential Equations and Complex Variables	3	3	3	2.4	2.4	-	-	-	-	-	-	2	2	2
		22CY2101 & Environmental Studies	2	1	1.7	-	-	1	2	3	2	-	-	2	-	-
		22PH2101 & Basics of Material Science	3	2.4	1.2	1.8	1.8	1	2	-	-	-	-	1	2	2.2

		22CY2151 & Chemistry For Biological Sciences	**3**	**2**	**2**	**2**	**2**	**1**	**1**	**-**	**-**	**-**	**-**	**1**	**1**	**1**
		22AG2252 & Principles and Practices of Crop Production	**1**	**1.6**	**1.5**	**1**	**1.2**	**1.6**	**1**	**-**	**1**	**-**	**-**	**-**	**1.6**	**2**
		22HE2151 & Effective Technical Communication	**1.6**	**1.6**	**1**	**1**	**1.2**	**2**	**1.8**	**1.8**	**2.2**	**3**	**1**	**2.8**	**1**	**1**
		22ME2001 & Engineering Practices	**3**	**-**	**3**	**-**	**3**	**-**	**-**	**-**	**1**	**-**	**-**	**-**	**1**	**2**
II	**III**	**22MA3109 & Laplace Transform, Fourier Series and Transforms**	**3**	**2.8**	**3**	**2**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**2.2**	**1.8**	**1.8**
		22AG3201 & Soil Technology	**2**	**4**	**2**	**3**	**2**	**2**	**2**	**2**	**2**	**2**	**1**	**2**	**3**	**2**
		22AG3202 & Fluid Mechanics and Pumps	**3**	**3**	**3**	**2.6**	**2.8**	**2.6**	**2.2**	**1**	**1.3**	**1.5**	**1.8**	**1**	**3**	**2**
		22AG3203 & Engineering Thermodynamics	**3**	**2.6**	**2**	**2**	**1**	**2.4**	**2.4**	**-**	**2.6**	**1**	**1**	**2.4**	**2.4**	**2.6**
		22AG3251 & Unit Operations in Agricultural Processing	**3**	**2**	**2**	**2**	**2**	**1**	**1**	**-**	**1**	**1**	**2**	**1**	**1**	**2**
		22AG3252 & Surveying and Levelling	**3**	**3**	**2.6**	**2.4**	**1.8**	**1.2**	**1**	**1**	**2**	**1**	**1**	**1**	**2**	**2**
		22AG3001 & Soil Technology Laboratory	**3**	**2**	**2**	**2**	**2**	**2**	**1**	**1**	**1**	**1**	**1**	**2**	**1**	**1**

MAPPING OF COURSE OUTCOME AND PROGRAMME OUTCOME:

CBCS PATTERN

UNDERGRADUATE PROGRAMMES B.E

AGRICULTURE ENGINEERING (UG)

REGULATION-2019

Year	Sem	Course code & Name	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO 1	PSO 2
I	I	19HE1101 & Technical English	1	1	1	1	1	1	1	1	2	3	1	2	2	2
		19MA1102 & Calculus and Linear Algebra	3	3	3	3	3	-	-	-	-	-	-	2	2	2
		19ME1101 & Basics of Civil and Mechanical Engineering	3	1	1	-	-	1	-	-	-	-	-	1	3	2
		19PH1151 & Applied Physics	3	2	2	2	2	1	-	-	-	-	-	1	2	2
		19CY1151 & Chemistry for Engineers	3	2	2	2	2	1	1	-	-	-	-	1	1	1
		19CS1151 & Python programming and practices	2	3	3	-	2	-	-	-	2	-	-	2	2	2
I	II	19HE2101 & Business English for Engineers	2	2	1	1	1	2	2	2	2	3	1	3	1	1
		19MA2101 & Differential Equations and Complex Variables	3	3	3	2	2	-	-	-	-	-	-	2	2	2
		19AG2104 & Principles of Food Science	1	1	1	1	1	1	1	-	1	-	-	-	1	2

		19PH2151 & Material Science	**3**	**2**	**1**	**2**	**2**	**1**	**2**	**-**	**-**	**-**	**-**	**1**	**2**	**2**
		19CY2151 & Environmental studies	**2**	**1**	**1**	**-**	**-**	**1**	**2**	**3**	**2**	**-**	**-**	**2**	**-**	**-**
		19IT2151 & Programming in C	**2**	**3**	**3**	**-**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**2**	**2**
		19ME2001 & Engineering Practices	**3**	**-**	**3**		**3**	**-**	**-**	**-**	**1**	**-**	**-**	**-**	**1**	**2**
II	**III**	**19MA3102 & Fourier Analysis and Transforms**	**3**	**3**	**3**	**1**	**1**	**2**	**-**	**-**	**-**	**-**	**-**	**2**	**2**	**2**
		19AG3201 & Soil Science and Engineering	**2**	**1**	**2**	**2**	**2**	**2**	**2**	**1**	**1**	**2**	**1**	**2**	**1**	**1**
		19AG3202 & Fluid Mechanics and Hydraulics	**2**	**2**	**1**	**1**	**2**	**1**	**1**	**1**	**-**	**2**	**-**	**1**	**2**	**1**
		19AG3203 & Principles and practices of Crop Production	**1**	**1**	**1**	**1**	**1**	**-**	**1**	**-**	**1**	**1**	**2**	**2**	**2**	**2**
		19AG3251 & Unit Operations in Agricultural Processing	**3**	**2**	**1**	**1**	**2**	**2**	**2**	**2**	**2**	**2**	**1**	**1**	**2**	**1**
		19AG3001 & Field Crop Production Practical	**1**	**1**	**1**	**1**	**1**	**-**	**1**	**-**	**1**	**1**	**2**	**2**	**2**	**2**
		19AG3002 & Soil Science Laboratory	**3**	**2**	**2**	**2**	**2**	**2**	**1**	**1**	**1**	**1**	**1**	**2**	**1**	**1**
II	**IV**	**19AG4201 & Farm Tractors**	**2**	**1**	**1**	**2**	**2**	**1**	**1**	**2**	**1**	**1**	**1**	**2**	**1**	**2**
		19AG4202 & Thermodynamics	**3**	**1**	**2**	**2**	**-**	**2**	**-**	**-**	**-**	**-**	**-**	**2**	**3**	**3**
		19AG4203 & Irrigation and Drainage Engineering	**2**	**1**	**2**	**2**	**-**	**-**	**1**	**-**	**2**	**-**	**3**	**1**	**1**	**2**
		19AG4251 & Bio-Energy Resource Technology	**2**	**3**	**2**	**1**	**2**	**1**	**2**	**0**	**2**	**1**	**1**	**2**	**3**	**2**
		19AG4252 & Surveying	**3**	**1**	**2**	**2**	**2**	**3**	**1**	**1**	**0**	**0**	**0**	**1**	**1**	**1**

		and Leveling														
		19AG4001 & Irrigation Field Laboratory	**2**	**2**	**2**	**3**	**0**	**0**	**1**	**0**	**3**	**0**	**3**	**1**	**2**	**2**
III	**V**	**19AG5201 & Farm Machinery and Equipment**	**2**	**2**	**3**	**3**	**2**	**1**	**2**	**2**	**0**	**0**	**1**	**3**	**2**	**3**
		19AG5202 & Refrigeration and Cold Chain Management	**2**	**3**	**2**	**1**	**2**	**1**	**2**	**0**	**2**	**1**	**1**	**2**	**3**	**2**
		19AG5203 & Theory of Machines	**2**	**2**	**2**	**2**	**2**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**2**	**2**
		19AG5301 & Systems Analysis and Soft Computing in Agricultural Engineering	**2**	**2**	**2**	**1**	**2**	**1**	**1**	**1**	**1**	**1**	**1**	**2**	**2**	**1**
		19AG5302 & Sustainable Agriculture and Food Security	**2**	**2**	**2**	**1**	**2**	**1**	**2**	**1**	**2**	**1**	**1**	**2**	**2**	**2**
		19AG5303 & CDM and Carbon Trading Technology	**2**	**2**	**2**	**2**	**2**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**2**	**2**
		19AG5304 & IOT in Agricultural Systems	**2**	**1**	**2**	**2**	**2**	**1**	**1**	**1**	**1**	**2**	**1**	**2**	**2**	**2**
		19AG5305 & Ergonomics and Safety in Agricultural Engineering	**2**	**1**	**2**	**1**	**2**	**1**	**2**	**1**	**2**	**1**	**1**	**2**	**2**	**2**
		19AG5251 & Groundwater and Well Engineering	**3**	**2**	**2**	**2**	**3**	**2**	**2**	**2**	**-**	**-**	**-**	**2**	**2**	**3**
		19AG5252 & Soil and Water Conservation Engineering	**2**	**2**	**3**	**3**	**2**	**2**	**3**	**1**	**2**	**2**	**2**	**3**	**3**	**2**
		19AG5001 & Operation and Maintenance	**2**	**2**	**2**	**3**	**2**	**-**	**1**	**0**	**3**	**0**	**3**	**2**	**2**	**2**

		of Farm Machinery Laboratory														
		19AG5002 & CAD for Agricultural Engineering	**3**	**2**	**2**	**2**	**3**	**2**	**2**	**2**				**2**	**2**	**2**
III	**VI**	**19AG6201 Hydrology and Water Resources Engineering**	**3**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**-**	**-**	**-**	**2**	**2**	**3**
		19AG6202 Solar and Wind Energy Engineering	**2**	**2**	**2**	**3**	**-**	**1**	**2**	**1**	**-**	**-**	**1**	**2**	**2**	**2**
		19AG6181 Professional Ethics	**2**	**3**	**2**	**1**	**2**	**1**	**2**	**-**	**2**	**1**	**1**	**2**	**3**	**2**
		19AG6301 Climate change and adaptation	**2**	**2**	**2**	**1**	**2**	**1**	**2**	**1**	**2**	**1**	**1**	**2**	**2**	**2**
		19AG6302 Heat and Mass Transfers for Agricultural Engineers	**1**	**2**	**2**	**1**	**1**	**2**	**1**	**-**	**1**	**-**	**-**	**-**	**2**	**2**
		19AG6251 Food and Dairy Engineering	**1**	**2**	**2**	**1**	**1**	**2**	**1**	**-**	**1**	**-**	**-**	**-**	**2**	**2**
		19AG6252 ICT in Agricultural Engineering	**2**	**2**	**2**	**2**	**1**	**2**	**2**	**-**	**1**	**2**	**2**	**2**	**2**	**2**
		19AG6701 Industrial Training	**3**	**2**	**2**	**3**	**-**	**2**	**-**	**-**	**-**	**-**	**-**	**2**	**3**	**3**
		19AG6303 Disaster Management	**2**	**2**	**1**	**2**	**2**	**2**	**2**	**1**	**1**	**1**	**1**	**2**	**2**	**2**
		19AG6304 Horticultural Crop Processing	**2**	**1**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**3**	**3**	**2**	**1**	**1**
		19AG6305 Organic Farming Technologies	**2**	**2**	**1**	**3**	**1**	**1**	**2**	**1**	**2**	**2**	**2**	**2**	**2**	**1**
		19AG6401 Modern Agricultural Practices	**2**	**2**	**3**	**3**	**2**	**1**	**2**	**2**	**2**	**-**	**-**	**3**	**2**	**3**
IV	**VII**	**19AG7201 Agricultural Extension**	**2**	**1**	**2**	**1**	**2**	**2**	**2**	**-**	**2**	**2**	**2**	**2**	**1**	**1**

		19AG7202R Remote Sensing and Geographical Information System	**2.2**	**2.6**	**2.2**	**1.4**	**2**	**1**	**1.5**	**1**	**1.5**	**1.6**	**1.4**	**2.2**	**3**	**2**
		19AG7251 Precision Farming and Protected Cultivation	**2**	**2**	**2**	**2**	**1**	**2**	**2**	**2**	**2**	**3**	**2**	**2**	**2**	**3**
		19AG7001R Renewable Energy Laboratory	**2**	**3**	**2**	**1**	**2**	**2**	**2**	**0**	**2**	**1**	**1**	**2**	**2**	**2**
		19AG7002R Remote Sensing and GIS Laboratory for Agricultural Engineers	**2**	**2**	**1**	**1**	**2**	**1**	**2**	**0**	**2**	**1**	**1**	**2**	**3**	**2**
		19AG7901 Innovative Project	**1**	**1.2**	**1**	**-**	**1.2**	**1**	**0**	**1**	**1**	**1**	**1**	**1**	**1**	**2**
		19AG7301 Post-Harvest Technology	**2.4**	**2**	**1.75**	**4**	**1.5**	**2**	**2**	**1.6**	**1.6**	**1.75**	**1.75**	**1.6**	**1.6**	**1.6**
		19AG7302 Dairy Process Technology	**2**	**2**	**2**	**1**	**1**	**2**	**2**	**1**	**1**	**2**	**1**	**2**	**2**	**1**
		19AG7303 Storage and Packaging Technology	**3**	**2**	**1**	**3**	**2**	**2**	**2**	**2**	**1**	**2**	**1**	**1**	**2**	**2**
		19AG7304 Process Engineering of Fruits and Vegetables	**1**	**2**	**1**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**1**
		19AG7305 Fat and Oil Processing	**1**	**2**	**2**	**2**	**2**	**2**	**2**	**1**	**2**	**1**	**1**	**2**	**2**	**1**
		19AG7401 Urban Agriculture and organic farming	1	1	1	1	1	1	1	0	1	-	-	2	1	2
IV	**VIII**	**19AG8901 Project work**	**1**	**2**	**1**	**-**	**-**	**1**	**-**	**1**	**1**	**1**	**1**	**1**	**1**	**2**
		19AG8301 Agricultural Business Management and Entrepreneurship	**2**	**2**	**1**	**1**	**2**	**2**	**2**	**2**	**1**	**2**	**1**	**2**	**1**	**1**

		19AG8302 On-Farm Water Management	**1**	**2**	**2**	**2**	**2**	**2**	**2**	**1**	**2**	**2**	**3**	**3**	**1**	**1**
		19AG8303 Intellectual Property Rights	**2**	**2**	**2**	**2**	**2**	**2**	**3**	**2**	**1**	**2**	**2**	**3**	**1**	**2**
		19AG8304 Agricultural Waste Management	**1**	**2**	**1**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**1**
		19AG8305 Energy Conservation in Agro based Industry	**1**	**2**	**2**	**2**	**2**	**2**	**2**	**1**	**2**	**1**	**1**	**2**	**2**	**1**
		19AG8306 Special Farm Equipment's	**2**	**2**	**1**	**1**	**2**	**2**	**2**	**2**	**1**	**2**	**1**	**2**	**1**	**1**
		19AG8307 Mechanics of Tillage and Traction	**2**	**2**	**2**	**2**	**2**	**2**	**3**	**2**	**1**	**2**	**2**	**3**	**1**	**2**
		19AG8308 Watershed Hydrology and Management	**1**	**2**	**2**	**2**	**2**	**2**	**2**	**1**	**2**	**2**	**3**	**3**	**1**	**1**
		19AG8309 Micro Irrigation System	**2**	**2**	**3**	**3**	**2**	**1**	**2**	**2**	**2**	**-**	**-**	**3**	**2**	**3**
		19AG8310 Agriculture Economics and Farm Management	**2**	**2**	**1**	**3**	**1**	**1**	**2**	**1**	**2**	**2**	**2**	**2**	**2**	**1**

HINDUSTHAN
EDUCATIONAL AND CHARITABLE TRUST

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HINDUSTHAN

COLLEGE OF ENGINEERING AND TECHNOLOGY

(An Autonomous Institution)

Coimbatore– 641032

DEPARTMENT OF AGRICULTURAL ENGINEERING

Revised Curriculum and Syllabus for the

Batch 2023-2027 (Even SEMESTER)

(Academic Council Meeting Held on 26.12.2023)

2022 REGULATIONS

(For the students admitted during the academic year 2023-2024 and onwards)

SEMESTER I

S. NO	COURSE CODE	COURSE TITLE	COURSE CATEGORY	L	T	P	C	TCP	CIA	ESE	TOTAL
THEORY											
1.	22MA1101	MATRICES AND CALCULUS	BSC	3	1	0	4	4	40	60	100
2.	22ME1201	ENGINEERING DRAWING	ESC	1	4	0	3	5	40	60	100
THEORY WITH LAB COMPONENT											
3.	22PH1151	PHYSICS FOR NON-CIRCUIT ENGINEERING	BSC	2	0	2	3	4	50	50	100
4.	22HE1151	ENGLISH FOR ENGINEERS	HSC	2	0	2	3	4	50	50	100
5.	22IT1151	PYTHON PROGRAMMING AND PRACTICES	ESC	2	0	2	3	4	50	50	100
EEC COURSES (SE/AE)											
6.	22HE1072	ENTREPRENEURSHIP & INNOVATION	AEC	1	0	0	1	1	100	0	100
7.	22HE1073	INTRODUCTION TO SOFT SKILLS	SEC	2	0	0	0	1	100	0	100
MANDATORY COURSE											
8.	22MC1093	தமிழர்மரபு	MC	2	0	0	1	2	100	0	100
	22MC1094	HERITAGE OF TAMIL									
9.	22MC1095	UNIVERSAL HUMAN VALUES	MC	2	0	0	0	2	100	0	100
TOTAL CREDITS				**17**	**5**	**6**	**18**	**27**	**630**	**270**	**900**

SEMESTER II

S. NO	COURSE CODE	COURSE TITLE	COURSE CATEGORY	L	T	P	C	TCP	CIA	ESE	TOTAL
THEORY											
1.	22MA2101	DIFFERENTIAL EQUATIONS AND COMPLEX ANALYSIS.	BSC	3	1	0	4	4	40	60	100
2.	22CY2101	ENVIRONMENTAL STUDIES	ESC	2	0	0	2	3	40	60	100
3.	22PH2101	BASICS OF MATERIAL SCIENCE	BSC	2	0	0	2	3	40	60	100
THEORY WITH LAB COMPONENT											
4.	22CY2151	CHEMISTRY FOR ENGINEERS	BSC	2	0	2	3	4	50	50	100
5.	22AG2252R	PRINCIPLES AND PRACTICES OF CROP PRODUCTION	PCC	2	0	2	3	4	50	50	100
6.	22HE2151	EFFECTIVE TECHNICAL COMMUNICATION	HSC	2	0	2	3	4	50	50	100
PRACTICAL											
7.	22ME2001	ENGINEERING PRACTICES	ESC	0	0	4	2	2	60	40	100
EEC COURSES (SE/AE)											
8.	22HE2071	DESIGN THINKING	AEC	2	0	2	2	2	100	0	100
9.	22HE2072	SOFT SKILLS AND APTITUDE	SEC	1	0	0	1	1	100	0	100
MANDATORY COURSE											
10.	22MC2094	தமிழரும்தொழில்நுட்பமும்	MC	2	0	0	1	2	100	0	100
	22MC2095	TAMILS AND TECHNOLOGY									
11.	22MC2093	NCC */NSS / YRC / Sports / Clubs / Society Service - Enrollment	MC	All students shall enroll, on admission, in anyone of the personality and character development programmes and undergo training for about 80 hours							
TOTAL CREDITS				**18**	**1**	**12**	**23**	**29**	**630**	**370**	**1000**

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SEMESTER III

S. NO	COURSE CODE	COURSE TITLE	COURSE CATEGORY	L	T	P	C	TCP	CIA	ESE	TOTAL
THEORY											
1.	22MA3109	LAPLACE TRANSFORM, FOURIER SERIES AND TRANSFORMS	BSC	3	1	0	4	4	40	60	100
2.	22AG3201	SOIL TECHNOLOGY	PCC	3	0	0	3	3	40	60	100
3.	22AG3202	FLUID MECHANICS AND PUMPS	PCC	3	1	0	4	4	40	60	100
4.	22AG3203	ENGINEERING THERMODYNAMICS	PCC	3	0	0	3	3	40	60	100
THEORY WITH LAB COMPONENT											
5.	22AG3251	UNIT OPERATIONS IN AGRICULTURAL PROCESSING	PCC	2	0	2	3	4	50	50	100
6.	22AG3252	SURVEYING AND LEVELLING	PCC	2	0	2	3	4	50	50	100
PRACTICAL											
7.	22AG3001	SOIL TECHNOLOGY LABORATORY	PCC	0	0	4	2	4	60	40	100
EEC Courses (SE/AE)											
8	22HE3071	SOFT SKILLS -2	SEC	1	0	0	1	1	100	0	100
9	22AG3072	BASIC ELECTRICAL, ELECTRONICS AND INSTRUMENTATION ENGINEERING	AE	2	0	0	2	2	40	60	100
TOTAL CREDITS				**19**	**2**	**8**	**25**	**29**	**460**	**440**	**900**

SEMESTER IV

S. NO	COURSE CODE	COURSE TITLE	COURSE CATEGORY	L	T	P	C	TCP	CIA	ESE	TOTAL
THEORY											
1.	22HE4101	IPR AND START-UPS	HSC	2	0	0	2	2	40	60	100
2.	22MA4101	APPLIED PROBABILITY AND STATISTICS FOR AGRICULTURAL ENGINEERING	BSC	2	1	0	3	4	40	60	100
3.	22AG4201	FARM EQUIPMENT AND MACHINERY	PCC	3	0	0	3	3	40	60	100
4.	22AG4202	THEORY OF MACHINES	PCC	3	0	0	3	3	40	60	100
5.	22AG4203	HYDROLOGY AND WATER RESOURCES ENGINEERING	PCC	3	1	0	3	4	40	60	100
THEORY WITH LAB COMPONENT											
6.	22AG4251	SOIL AND WATER CONSERVATION ENGINEERING	PCC	2	0	2	3	4	50	50	100
7.	22AG4252	STRENGTH OF MATERIALS FOR AGRICULTURAL ENGINEERING	PCC	2	0	2	3	4	50	50	100
PRACTICAL											
8.	22AG4001	OPERATION AND MAINTENANCES OF FARM MACHINERY AND ENGINES LABORATORY	PCC	0	0	4	2	4	60	40	100
EEC COURSES (SE/AE)											
9.	22HE4071	SOFT SKILLS -3	SEC	1	0	0	1	1	100	0	100
TOTAL CREDITS				**18**	**2**	**8**	**23**	**29**	**460**	**440**	**900**

* Two weeks internship carries 1 credit and it will be done during Semester III summer vacation and same will be evaluated in Semester IV.
If students unable to undergo in semester III then the Internship I offered in the Semester IV can be clubbed with Internship II(Total: 4 weeks-2 credits)

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SEMESTER V

S. NO	COURSE CODE	COURSE TITLE	COURSE CATEGORY	L	T	P	C	TCP	CIA	ESE	TOTAL
THEORY											
1.	22AG5201	TRACTORS AND ENGINE SYSTEMS	PCC	3	1	0	4	4	40	60	100
2.	22AG53XX	PROFESSIONAL ELECTIVE-1	PEC	3	0	0	3	3	40	60	100
3.	22AG53XX	PROFESSIONAL ELECTIVE-2	PEC	3	0	0	3	3	40	60	100
4.	22AG53XX	PROFESSIONAL ELECTIVE-3	PEC	3	0	0	3	3	40	60	100
THEORY WITH LAB COMPONENT											
5.	22AG5251	IRRIGATION AND DRAINAGE ENGINEERING	PCC	2	0	2	3	4	50	50	100
6.	22AG5252	FOOD AND DAIRY ENGINEERING	PCC	2	0	2	3	4	50	50	100
PRACTICAL											
7.	22AG5001	RENEWABLE ENERGY LABORATORY	PCC	0	0	4	2	4	60	40	100
EEC COURSES (SE/AE)											
8.	22HE5071	SOFT SKILLS -4 /FOREIGN LANGUAGES	SEC	1	0	0	1	1	100	0	100
TOTAL CREDITS				**17**	**1**	**8**	**22**	**26**	**420**	**380**	**800**

SEMESTER VI

S. NO	COURSE CODE	COURSE TITLE	COURSE CATEGORY	L	T	P	C	TCP	CIA	ESE	TOTAL
THEORY											
1.	22AG6201	REMOTE SENSING AND GEOGRAPHICAL INFORMATION SYSTEM	PCC	3	0	0	3	3	40	60	100
2.	22AG6202	PROFESSIONAL ETHICS	HSC	3	0	0	3	3	40	60	100
3.	22AG63XX	PROFESSIONAL ELECTIVE-4	PEC	3	0	0	3	3	40	60	100
4.	22AG63XX	PROFESSIONAL ELECTIVE-5	PEC	3	0	0	3	3	40	60	100
5.	22XX64XX	OPEN ELECTIVE – 1*	OEC	3	0	0	3	3	40	60	100
6.	22XX64XX	OPEN ELECTIVE – 2*	OEC	3	0	0	3	3	40	60	100
PRACTICAL											
7.	22AG6001	CAD FOR AGRICULTURAL ENGINEERING LABORATORY	PCC	0	0	4	2	4	60	40	100
8.	22AG6002	POST HARVEST TECHNOLOGY	ESC	0	0	4	2	4	60	40	100
EEC COURSES (SE/AE)											
9.	22HE6701	SOFT SKILLS - 5	SEC	2	0	0	2	2	100	0	100
TOTAL CREDITS				**20**	**0**	**8**	**24**	**28**	**460**	**440**	**900**

SEMESTER VII

S. NO	COURSE CODE	COURSE TITLE	COURSE CATEGORY	L	T	P	C	TCP	CIA	ESE	TOTAL
THEORY											
1.	22AG7201	MECHANICS OF TILLAGE AND TRACTION	PCC	3	0	0	3	3	40	60	100
2.	22AG7202	WASTE AND BY PRODUCT	PCC	3	1	0	4	4	40	60	100

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		UTILIZATION									
3.	22AG73XX	PROFESSIONAL ELECTIVE-6	PEC	3	0	0	3	3	40	60	100
4.	22XX74XX	OPEN ELECTIVE – 3*	OEC	3	0	0	3	3	40	60	100
5.	22XX74XX	OPEN ELECTIVE – 4*	OEC	3	0	0	3	3	40	60	100
PRACTICAL											
6.	22AG7001	REMOTE SENSING AND GIS LABORATORY	PCC	0	0	4	2	4	60	40	100
EEC COURSES (SE/AE)											
7.	22AG7701	INTERNSHIP	SEC	-	-	-	2	2	100	0	100
TOTAL CREDITS				**15**	**1**	**4**	**20**	**22**	**360**	**340**	**700**
Two weeks internship carries 1 credit and it will be done during Semester VI summer vacation/placement training and same will be evaluated in Semester VII.											

SEMESTER VIII

S. NO	COURSE CODE	COURSE TITLE	COURSE CATEGORY	L	T	P	C	TCP	CIA	ESE	TOTAL
EEC Courses (SE/AE)											
1.	22AG8901	PROJECT WORK	SEC	0	0	20	10	20	100	100	200
TOTAL CREDITS				**0**	**0**	**20**	**10**	**20**	**100**	**100**	**200**

Note:

1. As per the AICTE guideline, in Semester I, II, III & IV NCC one credit subject is added as Value Added Course with Extra Credit. Further the students' who enrolled his/her name in HICET NCC and Air Wing are eligible to undergo this subject. The earned extra credits printed in the Consolidated Mark sheet as per the regulation.
2. NCC course level 1 & Level 2 will be added in the list of open elective subjects in the appropriate semester. Further, the students' who have opted NCC subjects in Semester I, II, III & IV are eligible to undergo NCC Open Elective Subjects.
3. The above-mentioned NCC Courses will be offered to the students who are going to be admitted in the Academic Year 2021 – 22.

SEMESTER WISE CREDIT DISTRIBUTION

B.E. / B.TECH. PROGRAMMES									
S.No.	Course Area	Credits per Semester							Total Credits
		I	II	III	IV	V	VI	VII	VIII
1.	HSC	3	3	-	2	-	3	-	-	11
2.	BSC	7	9	4	3	-	-	-	-	23
3.	ESC	6	4	-	-	-	2	-	-	12
4.	PCC	-	3	18	17	12	5	9	-	64
5.	PEC	-	-	-	-	9	6	3	-	18
6.	OEC	-	-	-	-	-	6	6	-	12
7.	EEC	1	3	3	1	1	2	2	10	23
8.	MC	1	1							2
	Total	18	23	25	23	22	24	20	10	165

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OPEN ELECTIVE I AND II
(EMERGING TECHNOLOGIES)

To be offered for students other than CSE, IT, AI&ML, ECE & BIOMEDICAL

S. NO	COURSE CODE	COURSE TITLE	COURSE CATEGORY	L	T	P	C	TCP	CIA	ESE	TOTAL
1.	22AI6451	ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING FUNDAMENTALS	OEC	2	0	0	3	4	40	60	100
2.	22CS6451	BLOCKCHAIN TECHNOLOGY	OEC	2	0	0	3	4	40	60	100
3.	22EC6451	CYBER SECURITY	OEC	2	0	0	3	4	40	60	100
4.	22EC6452	IOT CONCEPTS AND APPLICATIONS	OEC	2	0	0	3	4	40	60	100
5.	22IT6451	DATA SCIENCE AND ANALYTICS	OEC	2	0	0	3	4	40	60	100
6.	22BM6451	AUGMENTED AND VIRTUAL REALITY	OEC	2	0	0	3	4	40	60	100

OPEN ELECTIVES I AND II

To be offered for students other than AUTO, AERO, AGRI, MECH, MCTS, CIVIL, EEE, CHEMICAL, FOOD TECH, E&I

S. NO	COURSE CODE	COURSE TITLE	COURSE CATEGORY	L	T	P	C	TCP	CIA	ESE	TOTAL
1.	22AE6401	SPACE SCIENCE	OEC	3	0	0	3	3	40	60	100
2.	22MT6401	INTRODUCTION TO INDUSTRIAL ENGINEERING	OEC	3	0	0	3	3	40	60	100
3.	22MT6402	INDUSTRIAL SAFETY AND ENVIRONMENT	OEC	3	0	0	3	3	40	60	100
4.	22CE6401	CLIMATE CHANGE AND ITS IMPACT	OEC	3	0	0	3	3	40	60	100
5.	22CE6402	ENVIRONMENT AND SOCIAL IMPACT ASSESSMENT	OEC	3	0	0	3	3	40	60	100
6.	22ME6401	RENEWABLE ENERGY SYSTEM	OEC	3	0	0	3	3	40	60	100
7.	22ME6402	ADDITIVE MANUFACTURING SYSTEMS	OEC	3	0	0	3	3	40	60	100
8.	22EI6401	INTRODUCTION TO INDUSTRIAL INSTRUMENTATION AND CONTROL	OEC	3	0	0	3	3	40	60	100
9.	22EI6402	GRAPHICAL PROGRAMMING USING VIRTUAL INSTRUMENTATION	OEC	3	0	0	3	3	40	60	100
10.	22AU6401	FUNDAMENTALS OF AUTOMOBILE ENGINEERING	OEC	3	0	0	3	3	40	60	100
11.	22AU6402	AUTOMOTIVE VEHICLE SAFETY	OEC	3	0	0	3	3	40	60	100
12.	22EE6401	DIGITAL MARKETING	OEC	3	0	0	3	3	40	60	100
13.	22EE6402	RESEARCH METHODOLOGY	OEC	3	0	0	3	3	40	60	100
14.	22FT6401	TRADITIONAL FOODS	OEC	3	0	0	3	3	40	60	100
15.	22CH6401	BIOMASS AND BIOREFINERY	OEC	3	0	0	3	3	40	60	100
16.	22AG6401	URBAN AGRICULTURE AND ORGANIC FARMING	OEC	3	0	0	3	3	40	60	100

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OPEN ELECTIVE III

Students shall choose any one of the open elective courses such that the course content or title does not belong to their own programme. (Note: Each programme in our institution is expected to provide one course only)

1.	22AG7401	MODERN AGRICULTURAL TECHNOLOGIES	OEC	3	0	0	3	3	40	60	100

OPEN ELECTIVE IV

S. NO	COURSE CODE	COURSE TITLE	COURSE CATEGORY	L	T	P	C	TCP	CIA	ESE	TOTAL
1.	22LS7401	GENERAL STUDIES FOR COMPETITIVE EXAMINATIONS	OEC	3	0	0	3	3	40	60	100
2.	22LS7402	HUMAN RIGHTS, WOMEN RIGHTS AND GENDER EQUITY	OEC	3	0	0	3	3	40	60	100
3.	22LS7403	INDIAN ETHOS AND HUMAN VALUES	OEC	3	0	0	3	3	40	60	100
4.	22LS7404	FINANCIAL INDEPENDENCE AND MANAGEMENT	OEC	3	0	0	3	3	40	60	100
5.	22LS7405	YOGA FOR HUMAN EXCELLENCE	OEC	3	0	0	3	3	40	60	100
6.	22LS7406	DEMOCRACY AND GOOD GOVERNANCE	OEC	3	0	0	3	3	40	60	100
7.	22LS7407	NCC LEVEL - II	OEC	3	0	0	3	3	40	60	100

PROFESSIONAL ELECTIVE COURSES: VERTICALS

VERTICAL I Farm Machinery and Power	VERTICAL II Water Management and Protected cultivation	VERTICAL III Renewable Energy Engineering	VERTICAL IV Food Processing	VERTICAL V IT and Agricultural Business management	VERTICAL VI Advances in Agricultural Engineering
22AG5301 Farm Power & Machinery Management	**22AG5304** Watershed planning and Management	**22AG5307** Biomass Management for Fodder & Energy	**22AG5310** Heat and Mass Transfer for Agricultural Engineering	**22AG5313** Integrated Farming System	**22AG5316** Automation in Agriculture
22AG5302 Tractor Systems and Controls	**22AG5305** Groundwater and Well Engineering	**22AG5308** Renewable Energy Sources	**22AG5311** Food Process Equipment and Design	**22AG5314** Agri Business Management	**22AG5317** Electric and Hybrid Vehicle
22AG5303 Tractor Design and Testing	**22AG5306** Design of Micro-irrigationsystem	**22AG5309** Renewable Energy Technology	**22AG5312** Food Plant Design andManagement	**22AG5315** Sustainable Agriculture and Food Security	**22AG5318** Foundation of Robotics and Drone
22AG6301 Hydraulic Control system and design	**22AG6303** Protected Cultivation	**22AG6305** Solar and Wind energysystem	**22AG6307** Storage and Packaging Technology	**22AG6309** Systems Analysis in Agricultural Engineering	**22AG6311** Applications of RS & GIS in Resource Management
22AG6302 Testing and evaluation of farm machinery and equipment	**22AG6304** On-farm water management	**22AG6306** Biochemical and Thermochemical conversion of biomass	**22AG6308** Refrigeration and cold Storage	**22AG6310** IT in Agricultural System	**22AG6312** Fundamentals of Nano Technology in Agriculture
22AG7301 Human Engineering and Safety in Farm Machinery Operations	**22AG7302** Irrigation Water Quality andWaste Water Management	**22AG7303** Energy Audit	**22AG7304** Emerging Technologies in FoodProcessing	**22AG7305** Design and Maintenance of Green House	**22AG7306** Gender and Integrated water Resource Management

Note: Students are permitted to choose all professional electives from any of the verticals.

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PROFESSIONAL ELECTIVE -I

S. NO	COURSE CODE	COURSE TITLE	COURSE CATEGORY	L	T	P	C	TCP	CIA	ESE	TOTAL
1.	22AG5301	FARM POWER & MACHINERY MANAGEMENT	PEC	3	0	0	3	3	40	60	100
2.	22AG5302	TRACTOR SYSTEMS AND CONTROLS	PEC	3	0	0	3	3	40	60	100
3.	22AG5303	TRACTOR DESIGN AND TESTING	PEC	3	0	0	3	3	40	60	100
4.	22AG6301	HYDRAULIC CONTROL SYSTEM AND DESIGN	PEC	3	0	0	3	3	40	60	100
5.	22AG6302	TESTING AND EVALUATION OF FARM MACHINERY AND EQUIPMENT	PEC	3	0	0	3	3	40	60	100
6.	22AG7301	HUMAN ENGINEERING AND SAFETY IN FARM MACHINERY OPERATIONS	PEC	3	0	0	3	3	40	60	100

PROFESSIONAL ELECTIVE -II

S. NO	COURSE CODE	COURSE TITLE	COURSE CATEGORY	L	T	P	C	TCP	CIA	ESE	TOTAL
1.	22AG5304	WATERSHED PLANNING AND MANAGEMENT	PEC	3	0	0	3	3	40	60	100
2.	22AG5305	GROUNDWATER AND WELL ENGINEERING	PEC	3	0	0	3	3	40	60	100
3.	22AG5306	DESIGN OF MICRO-IRRIGATION SYSTEM	PEC	3	0	0	3	3	40	60	100
4.	22AG6303	PROTECTED CULTIVATION	PEC	3	0	0	3	3	40	60	100
5.	22AG6304	ON-FARM WATER MANAGEMENT	PEC	3	0	0	3	3	40	60	100
6.	22AG7302	IRRIGATION WATER QUALITY AND WASTE WATER MANAGEMENT	PEC	3	0	0	3	3	40	60	100

PROFESSIONAL ELECTIVE -III

S. NO	COURSE CODE	COURSE TITLE	COURSE CATEGORY	L	T	P	C	TCP	CIA	ESE	TOTAL
1.	22AG5307	BIOMASS MANAGEMENT FOR FODDER & ENERGY	PEC	3	0	0	3	3	40	60	100
2.	22AG5308	RENEWABLE ENERGY SOURCES	PEC	3	0	0	3	3	40	60	100
3.	22AG5309	RENEWABLE ENERGY TECHNOLOGY	PEC	3	0	0	3	3	40	60	100
4.	22AG6305	SOLAR AND WIND ENERGY SYSTEM	PEC	3	0	0	3	3	40	60	100
5.	22AG6306	BIOCHEMICAL AND THERMOCHEMICAL CONVERSION OF BIOMASS	PEC	3	0	0	3	3	40	60	100
6.	22AG7303	ENERGY AUDIT	PEC	3	0	0	3	3	40	60	100

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PROFESSIONAL ELECTIVE -IV

S. NO	COURSE CODE	COURSE TITLE	COURSE CATEGORY	L	T	P	C	TCP	CIA	ESE	TOTAL
1.	22AG5310	HEAT AND MASS TRANSFER FOR AGRICULTURAL ENGINEERING	PEC	3	0	0	3	3	40	60	100
2.	22AG5311	FOOD PROCESS EQUIPMENT AND DESIGN	PEC	3	0	0	3	3	40	60	100
3.	22AG5312	FOOD PLANT DESIGN AND MANAGEMENT	PEC	3	0	0	3	3	40	60	100
4.	22AG6307	STORAGE AND PACKAGING TECHNOLOGY	PEC	3	0	0	3	3	40	60	100
5.	22AG6308	REFRIGERATION AND COLD STORAGE	PEC	3	0	0	3	3	40	60	100
6.	22AG7304	EMERGING TECHNOLOGIES IN FOODPROCESSING	PEC	3	0	0	3	3	40	60	100

PROFESSIONAL ELECTIVE -V

S. NO	COURSE CODE	COURSE TITLE	COURSE CATEGORY	L	T	P	C	TCP	CIA	ESE	TOTAL
1.	22AG5313	INTEGRATED FARMING SYSTEM	PEC	3	0	0	3	3	40	60	100
2.	22AG5314	AGRI BUSINESS MANAGEMENT	PEC	3	0	0	3	3	40	60	100
3.	22AG5315	SUSTAINABLE AGRICULTURE AND FOOD SECURITY	PEC	3	0	0	3	3	40	60	100
4.	22AG6309	SYSTEMS ANALYSIS IN AGRICULTURALENGINEERING	PEC	3	0	0	3	3	40	60	100
5.	22AG6310	IT IN AGRICULTURAL SYSTEM	PEC	3	0	0	3	3	40	60	100
6.	22AG7305	DESIGN AND MAINTENANCE OF GREEN HOUSE	PEC	3	0	0	3	3	40	60	100

PROFESSIONAL ELECTIVE -VI

S. NO	COURSE CODE	COURSE TITLE	COURSE CATEGORY	L	T	P	C	TCP	CIA	ESE	TOTAL
1.	22AG5316	AUTOMATION IN AGRICULTURE	PEC	3	0	0	3	3	40	60	100
2.	22AG5317	ELECTRIC AND HYBRID VEHICLE	PEC	3	0	0	3	3	40	60	100
3.	22AG5318	FOUNDATION OF ROBOTICS AND DRONE	PEC	3	0	0	3	3	40	60	100
4.	22AG6311	APPLICATIONS OF RS & GIS IN RESOURCE MANAGEMENT	PEC	3	0	0	3	3	40	60	100
5.	22AG6312	FUNDAMENTALS OF NANO TECHNOLOGY IN AGRICULTURE	PEC	3	0	0	3	3	40	60	100
6.	22AG7306	GENDER AND INTEGRATED WATER RESOURCE MANAGEMENT	PEC	3	0	0	3	3	40	60	100

ENROLLMENT FOR B.E. / B. TECH. (HONOURS) / MINOR DEGREE (OPTIONAL)

A student can also optionally register for additional courses (18 credits) and become eligible for the award of B.E. / B. Tech. (Honours) or Minor Degree. For B.E. / B. Tech. (Honours), a student shall register for the additional courses (18 credits) from semester V onwards. These courses shall be from the same vertical or a combination of different verticals of the same programme of study only. For minor degree, a student shall register for the additional courses (18 credits) from semester V onwards. All these courses have to be in a particular vertical from any one of the other programmes.

Clause 4.10 of Regulation 2022 is applicable for the Enrolment of B.E. / B. TECH. (HONOURS) / Minor Degree (Optional)

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Chairman

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CREDIT DISTRIBUTION – R 2022

Semester	I	II	III	IV	V	VI	VII	VIII	Total
Credits	18	23	25	23	22	24	20	10	165

BoS Chairman

Chairman - BoS
AGRI - HiCET

Dean (Academics)

Dean (Academics)
HiCET

Principal

PRINCIPAL
Hindusthan College Of Engineering & Technology
COIMBATORE - 641 032.

Programme/ Sem	Course Code	Name of the Course	L	T	P	C
B.Tech/ II	22MA2101	DIFFERENTIAL EQUATIONS AND COMPLEX ANALYSIS	3	1	0	4

Course Objective

The learner should be able to

1. Describe some methods to solve different types of first order differential equations.
2. Understand the various approach to find general solution of the ordinary differential equations
3. Evaluate the various types of Partial differential equations and methods to find solution.
4. Introduction to analytic functions and its properties.
5. Understand Cauchy's theorem and its applications in evaluation of integral.

Unit	Description	Instructional Hours
I	**ORDINARY DIFFERENTIAL EQUATIONS OF FIRST ORDER** Basic concepts, separable differential equations, exact differential equations, integrating factors, linear differential equations, Bernoulli equation.	12
II	**LINEAR DIFFERENTIAL EQUATIONS OF SECOND ORDER** Second order linear differential equations with constant with RHS of the form e^{ax}, x^n , sinax, cosax, – Cauchy's linear equations– Method of variation of parameters.	12
III	**PARTIAL DIFFERENTIAL EQUATIONS** Formation of partial differential equations by eliminating arbitrary constants and functions – Solution of first order partial differential equations of the form f(p,q)=0, Clairaut's equation – Lagrange's equation.	12
IV	**COMPLEX DIFFERENTIATION** Functions of complex variables – Analytic functions – Cauchy's – Riemann equations and sufficient conditions (excluding proof) – Construction of analytic functions – Milne –Thomson's method – Conformal mapping w = A+z , Az, 1/z and bilinear transformations.	12
V	**COMPLEX INTEGRATION** Cauchy's integral theorem (Problems only) – Cauchy's integral formula –Taylor's and Laurent's series (statement only) –Residues - Cauchy's Residue theorem - Contour Integration with unit circle only.	12
	Total Instructional Hours	60

Course Outcome

At the end of the course, the learner will be able to

CO1: Apply few methods to solve different types of first order differential equations.

CO2: Evaluate the solutions of higher order ordinary differential equations and its properties.

CO3: Compute the solution of first order partial differential equations.

CO4: Understand the concept of analytic functions and discuss its properties.

CO5: Evaluate various integrals by using Cauchy's residue theorem and classify singularities and derive Laurent series expansion

TEXT BOOKS:

T1 – Erwin Kreyszig, Advanced Engineering Mathematics, John Wiley & Sons, 2019.

T2 - William E. Boyce, Richard C. DiPrima, Douglas B. Meade, Elementary Differential Equations and Boundary Value Problems, Wiley, 2017.

T3 - Veerarajan T, "Engineering Mathematics ", McGraw Hill Education(India) Pvt Ltd, New Delhi, 2016.

REFERENCE BOOKS:

R1 - James Ward Brown, Ruel Vance Churchill, Complex Variables and Applications, McGraw-Hill Higher Education, 2004

R2 - Dennis Zill, Warren S. Wright, Michael R. Cullen, Advanced Engineering Mathematics, Jones & Bartlett Learning, 2011

R3 - Ian N. Sneddon, Elements of Partial Differential Equations, Courier Corporation, 2013

PO& PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	2	2	1	1	-	-	1	-	2	2	2
CO2	3	3	3	2	2	1	1	-	-	1	-	2	2	2
CO3	3	3	3	3	3	1	-	-	-	1	-	2	2	2
CO4	3	3	3	2	2	1	-	-	-	1	-	2	2	2
CO5	3	3	3	3	3	1	-	-	-	1	-	2	2	2
AVG	3	3	3	2.4	2.4	1	1	-	-	1	-	2	2	2

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Programme/ Sem	Course Code	Name of the Course	L	T	P	C
B.Tech/ II	22CY2101	ENVIRONMENTAL STUDIES	2	0	0	2

Course Objective

The learner should be able to

1. Grasp the importance and issues related to ecosystem and biodiversity and their protection.
2. Acquire knowledge about environmental pollution – sources, effects and control measures of environmental pollution.
3. Identify the various natural resources, exploitation and its conservation
4. Gain knowledge on the scientific, technological, economic and political solutions to environmental problems.
5. Become aware on the national and international concern for environment and its protection

Unit	Description	Instructional Hours
I	**ENVIRONMENT, ECOSYSTEMS AND BIODIVERSITY** Main objectives and scope of environmental studies-Importance of environment – need for public awareness - concept of an ecosystem – structure and function of an ecosystem – food chain, food web and ecological pyramids - energy flow in the ecosystem – ecological succession processes - Introduction, types, characteristic features, structure and function of the forest and ponds ecosystem – Introduction to biodiversity definition: types and value of biodiversity – hot-spots of biodiversity – threats to biodiversity– endangered and endemic species of India – conservation of biodiversity: In-situ and ex-situ conservation of biodiversity.	9
II	**NATURAL RESOURCES** Renewable and Non renewable resources - Forest resources: Use and over-exploitation, deforestation, timber extraction, mining, dams and their effects on forests and tribal people - Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture – Energy resources: Renewable and non renewable energy sources – Solar energy and wind energy - role of an individual in conservation of natural resources.	9
III	**ENVIRONMENTAL POLLUTION** Definition – causes, effects and control measures of: Air pollution- Water pollution – Water quality parameters- Soil pollution - Noise pollution- Nuclear hazards – role of an individual in prevention of pollution.	9
IV	**SOCIAL ISSUES AND THE ENVIRONMENT** From unsustainable to sustainable development – urban problems related to energy- environmental ethics: Issues and possible solutions – 12 Principles of green chemistry- Municipal solid waste management. Global issues – Climatic change, acid rain, greenhouse effect and ozone layer depletion – Disaster Management – Tsunami and cyclones.	9
V	**HUMAN POPULATION AND THE ENVIRONMENT** Population growth, variation among nations – population explosion – family welfare programme – environment and human health – effect of heavy metals – human rights – value education – HIV / AIDS – women and child welfare –Environmental impact analysis (EIA)- GIS-remote sensing-role of information technology in environment and human health.	9
	Total Instructional Hours	**45**

Course Outcome

At the end of the course, the learner will be able to

CO1: Discuss the importance of ecosystem and biodiversity for maintaining ecological balance.
CO2: Identify the causes of environmental pollution and hazards due to manmade activities.
CO3: Develop an understanding of different natural resources including renewable resources.
CO4: Demonstrate an appreciation for need for sustainable development and understand the various social issues and solutions to solve the issues.
CO5: Describe about the importance of women and child education, existing technology to protect environment.

TEXT BOOKS:

T1 – S.Annadurai and P.N. Magudeswaran, "Environmental studies", Cengage Learning India Pvt.Ltd, Delhi, 2020

T2 - Anubha Kaushik and C. P. Kaushik, "Perspectives in Environmental studies", Sixth edition, New Age International Publishers,
New Delhi, 2019.

REFERENCE BOOKS:

R1 - ErachBharucha, "Textbook of environmental studies" University Press (I) Pvt.ltd, Hyderabad, 2015

R2 - G.Tyler Miller, Jr and Scott E. Spoolman"Environmental Science" Thirteenth Edition, Cengage Learning, 2010.

R3 – Gilbert M. Masters and Wendell P. Ela "Introduction to Environmental Engineering and Science", 3rd edition, Pearson Education, 2013.

PO& PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2	-	2	1	1	-	-	-	-	1	2	1
CO2	3	2	2	-	2	1	-	-	-	-	-	1	1	2
CO3	3	2	2	-	2	1	1	-	-	-	-	1	2	2
CO4	3	2	2	2	2	1	-	-	-	-	-	1	1	2
CO5	3	2	2	-	2	1	-	-	-	-	-	1	1	2
Avg	3	2	2	2	2	1	1	-	-	-	-	1	1	2

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Programme/ Sem	Course Code	Name of the Course	L	T	P	C
B.Tech/ II	22PH2101	BASICS OF MATERIAL SCIENCE	2	0	0	2

Course Objective

The student should be able to

1.Gain knowledge about Crystal systems and crystal structures
2. Understand the knowledge about electrical properties of materials
3. Enhance the fundamental knowledge in semiconducting materials.
4. Gain knowledge about magnetic materials
5. Acquire fundamental knowledge new engineering materials which is related to the engineering program

Unit	Description	Instructional Hours
I	**CRYSTAL PHYSICS** Crystal systems - Bravais lattice - Lattice planes - Miller indices – Inter planar spacing in cubic lattice - Atomic radius, Coordination number and Packing factor for SC, BCC and FCC crystal structures.	6
II	**ELECTRICAL PROPERTIES OF MATERIALS** Classical free electron theory - Expression for electrical conductivity – Thermal conductivity, expression – Widemann - Franz law – Success and failures - – Fermi- Dirac statistics – Density of energy states .	6
III	**SEMICONDUCTING MATERIALS** Introduction – Compound and elemental semiconductor - direct and indirect band gap of semiconductors. Intrinsic semiconductor — electrical conductivity – band gap determination. - Extrinsic semiconductor – n type and p type semiconductor – Light Emitting Diode.	6
IV	**MAGNETIC MATERIALS** Origin of magnetic moment – Bohr magnetron – comparison of Dia, Para and Ferro magnetism – Domain theory – Hysteresis – soft and hard magnetic materials – anti ferromagnetic materials – Ferrites and its applications.	6
V	**NEW ENGINEERING MATERIALS** Metallic glasses: melt spinning process, Preparation and applications - shape memory alloys: phases, shape memory effect - Characteristics of SMA : Pseudoelastic effect, Super elasticity and Hystersis. Applications of SMA. Nanomaterials preparation (bottom up and top down approaches) – various techniques - pulsed laser deposition - Chemical vapor deposition	6
	Total Instructional Hours	30

Course Outcome

After completion of the course the learner will be able to

CO1: Understand the Crystal systems and crystal structures in the field of Engineering
CO2: Illustrate the fundamental of electrical properties of materials
CO3: Discuss concept of acceptor or donor levels and the band gap of a semiconducting materials
CO4: Develop the technology of the magnetic materials and its applications in engineering field
CO5: Understand the advanced technology of new engineering materials in the field of Engineering

TEXT BOOKS:

T1 - Rajendran V, "Materials Science", Tata McGraw Hill Publishing Company Limited, New Delhi, 2017.
T2- M.N Avadhanulu and PG Kshirsagar "A Text Book of Engineering physics" S. Chand and Company ltd., New Delhi 2022

REFERENCE BOOKS:

R1 – Charles Kittel "Introduction to Solid State Physics". Wiley., New Delhi 2017
R2 - Dr. M.Arumugam "Materials Science " Anuradha publications., 2019

PO& PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	1	1	1	1	1	-	1	-	2	3	1	2
CO2	3	3	1	1	2	-	-	-	1	-	2	2	1	2
CO3	3	2	1	2	2	-	-	-	1	-	1	2	1	2
CO4	3	3	1	2	2	1	-	-	1	-	1	2	1	2
CO5	3	2	2	3	2	1	2	-	1	-	2	2	1	2
Avg	3	2.4	1.2	1.8	1.8	1	1.5	-	1	-	2	3	1	2

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Programme/sem	Course Code	Name of the Course	L	T	P	C
B.E/ II	22CY2151	CHEMISTRY FOR ENGINEERS	2	0	2	3

Course Objective

The learner should be able to

1. Acquire knowledge on the concepts of chemistry involved in day today life.
2. Identify the water related problems and water treatment techniques.
3. Enhance the fundamental knowledge on electrochemistry and the mechanism of corrosion and its control.
4. Acquire knowledge on various thermos dynamical laws and its importance in engineering applications.
5. Extend the knowledge on the concepts of spectroscopy and its applications.

Unit	Description	Instructional Hours
I	**CHEMISTRY IN EVERYDAY LIFE** Chemicals in food – Food colors – Artificial sweeteners – Food preservatives. Soaps and Detergents – Soaps – Types of Soap – Detergents – Types of detergents. Drugs – Classification of drugs - Therapeutic Action of Different Classes of Drugs. Chemicals in Cosmetics – Creams – Talcum powders- Deodorants – Perfumes. Plastics – Thermoplastics- Preparation, properties and uses of PVC, Teflon and Thermosetting plastics - Preparation, properties and uses of Polyester and Polyurethane.	6
II	**WATER TECHNOLOGY** Impurities in Water, Hardness of Water, Boiler feed Water – Boiler troubles -Sludge and scale formation, Caustic embrittlement, priming and foaming, boiler corrosion- -Softening Methods (Zeolite & Ion-Exchange Methods)- Desalination of Brackish Water - Reverse Osmosis, Potable water and treatment. **Estimation of total, permanent and temporary hardness of water by EDTA Determination of Dissolved Oxygen in sewage water by Winkler's method. Estimation of alkalinity of water sample by indicator method.**	6
III	**ELECTROCHEMISTRY AND CORROSION** Electrochemical cells – reversible and irreversible cells - EMF- Single electrode potential – Nernst equation (derivation only) – Conductometric titrations. Chemical corrosion – Pilling – Bedworth rule – electrochemical corrosion – different types –galvanic corrosion – differential aeration corrosion – corrosion control – sacrificial anode and impressed cathodic current methods. **Conductometric titration of strong acid vs strong base (HCl vs NaOH). Estimation of Ferrous iron by Potentiometry.**	6
IV	**CHEMICAL THERMODYNAMICS** Terminology of thermodynamics - Second law: Entropy - entropy change for an ideal gas, reversible and irreversible processes; entropy of phase transitions; Clausius inequality. Free energy and work function: Helmholtz and Gibbs free energy functions; Criteria of spontaneity; Gibbs Helmholtz equation- Clausius-Clapeyron equation; Maxwell relations – Van't Hoff isotherm and isochore.	6
V	**SPECTROSCOPY** Beer-Lambert's law – UV-visible spectroscopy and IR spectroscopy – principles – instrumentation (block diagram only) - applications – flame photometry – principle – instrumentation (block diagram only) – estimation of sodium by flame photometry – atomic absorption spectroscopy – principles – instrumentation (block diagram only) – Estimation of nickel by atomic absorption spectroscopy.	6
	Total Instructional Hours	**30**
	Total Lab Instructional Hours	**30**

Course Outcome

At the end of the course, the learner will be able to

CO1: List out the chemicals used in food, soaps and detergents, drugs, cosmetics and plastics

CO2: Differentiate hard and soft water and solve the related problems on water purification in domestic as well as in industries.

CO3: Develop knowledge on the basic principles of electrochemistry and understand the causes of corrosion, its consequences to minimize corrosion to improve industrial design

CO4: Develop sound knowledge on second law of thermodynamics and second law based derivations and its importance in engineering applications in all disciplines.

CO5: List out the applications of spectroscopic techniques in various engineering fields.

TEXT BOOKS

T1 - P.C. Jain & Monica Jain, "Engineering Chemistry" Dhanpat Rai Pub, Co., New Delhi (2018).

T2 - O.G. Palanna, "Engineering chemistry" McGraw Hill Education India (2017).

REFERENCE BOOKS

R1 – Shikha Agarwal "Engineering Chemistry - Fundamentals and Applications, Cambridge University Press, Delhi, 2019

R2 - S.S. Dara "A Text book of Engineering Chemistry" S. Chand & Co. Ltd., New Delhi (2018).

PO& PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	3	3	1	1	1	1	-	1	-	1	2	1	2
CO2	2	3	2	1	1	1	1	-	1	-	1	2	1	1
CO3	2	2	2	2	1	1	1	-	1	-	1	2	1	2
CO4	2	2	3	1	2	1	1	-	1	-	2	2	1	1
CO5	2	3	3	2	2	1	1	-	1	-	1	2	1	2
Avg	2	2.6	2.6	1.4	1.4	1	1	-	1	-	1.2	2	1	1.6

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Programme	Course Code	Name of the Course	L	T	P	C
B.Tech	22AG2252R	PRINCIPLES AND PRACTICES OF CROP PRODUCTION	2	0	2	3

Course Objective

- To introduce the students to agricultural and horticulturalcrops
- To understand the production practices of crops and usage of farming equipment's from land preparation to harvesting of the crops
- To acquire adequate knowledge on fertilizer, weeds, pest and diseases and their management

Unit	Description	Instructional Hours
I	**AGRICULTURE AND CROP PRODUCTION** Introduction to agriculture-sectors - field crop production and horticulture - Factors affecting crop growth and production: genetic (internal) and environmental (external) factors - Crop management through environmental modification and adaptation of crops to the existing environment through crop cultural Practices – cropping system and cropping pattern Lab 1: Field Preparation – Tillage- Primary And Secondary Tillage Implements Lab 2: Visit to Tamil Nadu Agricultural University and Private agricultural farms	9
II	**CROP SELECTION AND ESTABLISHMENT** Regional and seasonal selection of crops - Systems of crop production; Competition among crop plants - Spacing and arrangement of crop plants; Field preparation for crops including systems of tillage - selection and treatment of seed - nursery preparation – main field preparation Lab 3: Identification of seeds, manures and fertilizers Lab 4: Seeds – Sowing - Spacing & Arrangement – Types & Methods Of Sowing - Nursery Preparation	9
III	**CROP MANAGEMENT** Crop water Management - irrigation- types – irrigation scheduling – crop water requirement - Crop nutrition management - organic and inorganic nutrients, sources, generalized recommendations, methods and timing ofapplication Crop protectionincluding management of weeds, pests and pathogens - Integrated management of water, nutrients and plant protection Lab 5: Water Management – Irrigation Methods – Crop Water Requirement Lab 6: Nutrient Management - Organic & Inorganic Fertilizers – Integrated Nutrient Management – Application Methods	9
IV	**PRODUCTION PRACTICES OFAGRICULTURAL CROPS** Generalized management and cultivation practices for important groups of field crops in Tamil Nadu - cereal crops, grain legumes, oil seed crops, sugarcane, and fiber crops, and special purpose crops from land preparation to harvesting Lab 7: Plant Protection Measures – Organic And Inorganic Fertilizers – IPM	9
V	**PRODUCTION PRACTICES OF HORTICULTURAL CROPS** Important groups of horticultural crops in Tamil Nadu such as vegetable crops, fruit crops, flower crop - Cultivation practices of representatives of each group - Special features of production of horticultural crops - green house cultivation. Lab 8: Harvesting – Types & Methods – Maturity Indices	9
	Total Instruction Hours	**45**

Course Outcome

CO1: Students completing this course would have acquired knowledge on agriculture and crop product

CO2: The students will have the required knowledge in the area of production and productivity of agricultural and horticultural crops

CO3: Understanding the important of Crop water Management and Crop nutrition management in crop cultivation.

CO4: To acquire knowledge on the field crop production practices in TamilNadu and India.

CO5: To get knowledge on the role of greenhouse cultivation in future production technology.

TEXT BOOKS:

T1 S S Rajendra Prasad, Text Book of Field Crop Production. Directorate of Information and Publication, Krishi Anusandhan Bhavan, Pusa, New Delhi, 2015.

T2 Reddy T. Sankara G.H. Yellamanda Reddi, Principles of Agronomy, Kalyani Publishers, New Delhi, 2005.

T3 Handbook of Agriculture. ICAR Publications, New Delhi, 2011

REFERENCE BOOKS:

R1 Bose T. K. and L.P.Yadav. Commercial Flowers, Naya Prakash, Calcutta.1989.

R2 Crop Production Guide, Tamil Nadu Agricultural University Publication, Coimbatore,2005

R3 Kumar, N., Abdul Khader, M. Rangaswami, P. and Irulappan, I. Introduction to spices, plantation crops, medicinal and aromatic plants. Rajalakshmi Publications, Nagercoil. 1993.

R4 Kumar, N.,"Introduction to Horticulture", Rajalakshmi Publications. Nagercoil, 7th edition, 2015.

R5 Shanmugavel, K.G. Production Technology of Vegetable Crops. Oxford India Publications, New Delhi. 1989

PO & PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	1	-	1	2	1	2	1	1	1	1	2	3	2
CO2	1	1	2	2	2	1	2	-	1	2	-	2	2	2
CO3	2	2	2	1	2	2	2	1	2	1	1	2	2	2
CO4	2	1	1	2	2	1	2	1	1	2	-	1	2	2
CO5	3	2	3	2	3	2	2	1	2	2	2	2	2	2
Avg	2	2	3	2	2	2	2	1	1	2	1	2	2	2

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Programme / Sem B.Tech/	Course Code	Name of the Course	L	T	P	C
II	22HE2151	EFFECTIVE TECHNICAL COMMUNICATION	2	0	2	3

Course Objective

The student should be able to

1. To improve essential business communication skills.
2. To enrich employability knowledge.
3. To acquire the crucial organizing ability in official forum.
4. To impart important business writings.
5. To make effective presentation with essential etiquette.

Unit	Description	Instructional Hours
I	Language Proficiency: Types of sentences in English according to structure Writing: writing definitions, Describing product, work place and service (purpose, appearance, function) Vocabulary – words on nature **Practical Component: Listening- Watching and interpreting advertisements/short films Speaking- Extempore speech.**	9
II	Language Proficiency: Direct and Indirect speech. Writing: Formal memos, Job application and resume preparation Vocabulary - words on offense and ethics **Practical Component: Listening- Comprehensions based on telephonic conversation Speaking- Vote of thanks& welcome address**	9
III	Language Proficiency: Homophones and Homonyms, Writing: Preparing a detail plan for an official visit, schedule and Itinerary, reading comprehension, Vocabulary– words on society **Practical Component: Listening- Listening- paraphrasing the listened content Speaking- Group Discussion with preparation**	9
IV	Language Proficiency: Idioms Writing: Report writing (marketing, investigating) Vocabulary-words involved in business **Practical Component: Listening- Watching technical discussions and preparing MoM Speaking- On the spot Group Discussion**	9
V	Language Proficiency: spotting errors Writing: making /interpreting chart, sequencing of sentences Vocabulary- words involved in finance **Practical Component: Listening- Comprehensions based on announcements Speaking- Presentation on a technical topic with ppt.**	9
	Total Instructional Hours	**45**

Course Outcome

After completion of the course the learner will be able

CO1: To the business procedure and promotion skills.
CO2: To make oral and written presentation in corporate forum.
CO3: To schedule official events and participate in official discussions without reluctance.
CO4: To take an effective role and manage in an organizational sector.
CO5:To prepare and demonstrate a professional presentation

TEXT BOOKS:

T1 - NormanWhitby, "Business Benchmark-Pre-intermediate to Intermediate",Cambridge University Press, 2016.

T2- Ian Wood and Anne Willams. "Pass Cambridge BEC Preliminary", Cengage Learning press 2015

REFERENCE BOOKS:

R1 – Michael Mc Carthy, "Grammar for Business", Cambridge University Press, 2009

R2 - Bill Mascull, "Business Vocabulary in use: Advanced 2nd Edition", Cambridge University Press, 2009.

R3 - Frederick T. Wood, "Remedial English Grammar For Foreign Students", Macmillan publishers, 2001.

PO & PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PSO 1	PSO 2
CO1	1	-	2	-	-	1	-	1	3	-	1	2	1
CO2	2	1	-	-	-	2	2	2	3	-	2	1	1
CO3	2	-	1	-	-	2	-	1	3	-	2	1	1
CO4	1	2	-	-	-	1	-	1	3	-	1	1	1
CO5	1	-	-	2	-	1	-	1	3	-	2	1	1
Avg	1.4	1.5	1.5	1	-	1.4	1	1.2	3	1.6	1.6	1.2	1

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Programme	Course Code	Name of the Course	L	T	P	C
B.Tech	22ME2001	ENGINEERING PRACTICES	0	0	4	2

Course Objective: To provide exposure to the students with hands on experience on various basic engineering practices in Civil, Mechanical and Electrical Engineering.

Unit **Description of the Experiments**

GROUP A (CIVIL AND MECHANICAL)

1. Preparation of Single pipe line and Double pipe line connection by using valves, taps, couplings, unions, reducers and elbows.
2. Arrangement of bricks using English Bond for one brick thick wall for right angle corner junction and T- junction
3. Arrangement of bricks using English Bond for one and a half brick thick wall for right angle corner and T- junction
4. Preparation of arc welding of Butt joints, Lap joints and Tee joints.
5. Practice on sheet metal Models– Trays and funnels
6. Hands-on-exercise in wood work, joints by sawing, planning and cutting.
7. Practice on simple step turning, taper turning and drilling.
8. Demonstration on Smithy operation.
9. Demonstration on Foundry operation.
10. Demonstration on Power tools.

GROUP B (ELECTRICAL ENGINEERING)

1. Residential house wiring using switches, fuse, indicator, lamp and energy meter.
2. Fluorescent lamp wiring.
3. Stair case wiring.
4. Measurement of Electrical quantities – voltage, current, power & power factor in single phase circuits.
5. Measurement of energy using single phase energy meter.
6. Soldering practice using general purpose PCB.
7. Measurement of Time, Frequency and Peak Value of an Alternating Quantity using CRO and Function Generator.
8. Study of Energy Efficient Equipment's and Measuring Instruments.

Total Instructional Hours **45**

Course Outcome

- Fabricate wooden components and pipe connections including plumbing works.
- Fabricate simple weld joints.
- Fabricate different electrical wiring circuits and understand the AC Circuits.

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Programme / Sem	Course Code	Name of the Course	L	T	P	C
B.TECH/ II	22HE2071	DESIGN THINKING	2	0	0	2

The student should be able to

Course Objective

1. To expose students to the design process
2. To develop and test innovative ideas through a rapid iteration cycle.
3. To provide an authentic opportunity for students to develop teamwork and leadership skills

Unit	Description	Instructional Hours
I	**DESIGN ABILITY** Asking Designers about what they Do – Deconstructing what Designers Do – Watching what Designers Do – Thinking about what Designers Do – The Natural Intelligence of Design Sources	6
II	**DESIGNING TO WIN** Formula One Designing – Radical Innovations – City Car Design – Learning From Failures – Design Process and Working Methods	5
III	**DESIGN TO PLEASE AND DESIGNING TOGETHER** Background – Product Innovations – Teamwork versus Individual work – Roles and Responsibilities – Avoiding and Resolving Conflicts.	6
IV	**DESIGN EXPERTISE** Design Process – Creative Design - Design Intelligence – Development of Expertise – Novice to Expert. Critical Thinking – Case studies: Brief history of Albert Einstein, Isaac Newton and Nikola Tesla	6
V	**DESIGN THINKING TOOLS AND METHODS** Purposeful Use of Tools and Alignment with Process - Journey Mapping - Value Chain Analysis - Mind Mapping – Brainstorming - Design Thinking Application: Design Thinking Applied to Product Development	7
	Total Instructional Hours	**30**

Course Outcome

After completion of the course the learner will be able to

CO1: Develop a strong understanding of the Design Process
CO2: Learn to develop and test innovative ideas through a rapid iteration cycle.
CO3: Develop teamwork and leadership skills

TEXT BOOKS:

T1 - 1. Nigel Cross, "Design Thinking", Kindle Edition.

REFERENCE BOOKS:

R1 - Tom Kelley, "Creative Confidence", 2013.
R2 - 3. Tim Brown, "Change by Design", 2009.

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Programme /Sem	Course Code	Name of the Course	L	T	P	C
B.TECH/ II	22HE2072	SOFT SKILLS AND APTITUDE	1	0	0	1

Course Objective

The student should be able to

1. To develop and nurture the soft skills of the students through instruction, knowledge acquisition demonstration and practice.
2. To enhance the students ability to deal with numerical and quantitative skills.
3. To identify the core skills associated with critical thinking.
4. To develop and integrate the use of English language skills

Unit	Description	Instructional Hours
I	**Lessons on excellence** Skill introspection, Skill acquisition, consistent practice	2
II	**Logical Reasoning** Problem Solving - Critical Thinking- Lateral Thinking - Coding and Decoding – Series – Analogy - Odd Man Out - Visual Reasoning - Sudoku puzzles - Attention to detail	11
III	**Quantitative Aptitude** Addition and Subtraction of bigger numbers - Square and square roots - Cubes and cube roots - Vedic maths techniques - Multiplication Shortcuts - Multiplication of 3 and higher digit numbers – Simplifications - Comparing fractions - Shortcuts to find HCF and LCM - Divisibility tests shortcuts - Algebra and functions	11
IV	**Recruitment Essentials** Resume Building - Impression Management	4
V	**Verbal Ability** Nouns and Pronouns – Verbs - Subject-Verb Agreement - Pronoun-Antecedent – Agreement - Punctuations	4
	Total Instructional Hours	**30**

Course Outcome

After completion of the course the learner will be able to

CO1: Students will analyze interpersonal communication skills. public speaking skills.
CO2: Students will exemplify tautology, contradiction and contingency by logical thinking.
CO3: Students will be able to develop an appropriate integral form to solve all sorts of quantitative problems.
CO4:Students can produce a resume that describes their education, skills, experiences and measurable achievements with proper grammar, format and brevity
CO5: Students will be developed to acquire the ability to use English language with an error while making optimum use of grammar

REFERENCE BOOKS:

R1 - Quantitative Aptitude – Dr. R S Agarwal
R2 -Speed Mathematics: Secret Skills for Quick Calculation - Bill Handley
R3 -Verbal and Non – Verbal Reasoning – Dr. R S Agarwal
R4- Objective General English – S.P.Bakshi

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டம்/செம்	பாடநெறி குறியீடு	பாடத்தின் பெயர்	L	T	P	C
பி.இ/ க	22MC2094/2095	தமிழரும்தொழில்நுட்பமும் (முதலாம் ஆண்டு பி.இ பொது பாடப்பிரிவு)	2	0	0	1

கற்றவர்இயலவேண்டும்

பாடத்தின்நோக்கம்

1. சங்க காலத்தில் தொழில்துறை பற்றிய அறிவைப் பெறுதல்.
2. சங்க காலத்தில் வீட்டின் பொருள் ,சிற்பங்கள் மற்றும் கோவில்கள் வடிவமைப்பு பற்றி கூட்டு கற்றல்
3. வரலாறு மற்றும் தொல்லியல் சான்றுகளின் ஆதாரமாக உலோகவியல் ஆய்வுகளில் அறிவை வளர்த்துக் கொள்ளுங்கள்.
4. வேளாண்மை மற்றும் வேளாண் செயலாக்கத்தில் பயன்படுத்தப்படும் பண்டைய நுட்பங்களைப் பற்றிய அறிவைப் பெறுதல்.
5. தமிழ் மொழியின் மென்பொருள் பற்றி அறிதல்

அலகு	விளக்கம்	பயிற்சிநேரம்
I	**நெசவுமற்றும்பானைத்தொழில்நுட்பம்** சங்க காலத்தில் நெசவுத் தொழில் - பானைத் தொழில்நுட்பம்-கருப்பு சிவப்பு பாண்டங்கள் - பாண்டங்களில் கீறல் குறியீடுகள்.	3
II	**வடிவமைப்புமற்றும்கட்டிடத்தொழில்நுட்பம்** சங்க இலக்கியத்தில் வடிவமைப்பு மற்றும் கட்டுமானங்கள் மற்றும்சங்க காலத்தில் வீட்டுப் பொருட்களில் வடிவமைப்பு -சங்க காலத்தில் கட்டுமான பொருட்களும் நடுகல்லும்- சிலப்பதிகாரத்தில் மேடை அமைப்பு பற்றிய விவரங்கள் - மாமல்லபுரச் சிற்பங்களும், கோவில்களும் - சோழர் காலத்துப் பெருங்கோயில்கள் மற்றும் பிற வழிப்பாடுத் தளங்கள் - நாயக்கர் காலக் கோயில்கள் - மாதிரி கட்டமைப்புகள் பற்றி அறிதல், மதுரை மீனாட்சி அம்மன் ஆலயம் மற்றும் திருமலை நாயக்கர் மஹால் - செட்டி நாட்டு வீடுகள் - பிரிட்டிஷ் காலத்தில் சென்னையில் இந்தோ-சாரோச்செனிக் கட்டிடக் கலை.	3
III	**உற்பத்தி தொழில்நுட்பம்** கப்பல் கட்டும் கலை- உலோகவியல் - இரும்புத் தொழிற்சாலை - இரும்பை உருகுதல் எஃகு - வரலாற்றுசாலை சான்றுகளாக செம்பு மற்றும் தங்க நாணயங்கள் - நாணயங்கள் அச்சடித்தல் - மணி உருவாக்கும் தொழிற்சாலைகள் - கல்மணிகள் , கண்ணாடிமணிகள் - சுடுமண் மணிகள் - சங்கு மணிகள் - எலும்புத்துண்டுகள் - தொல்லியல் சான்றுகள் - சிலப்பதிகாரத்தில் மணிகளின்வகைகள்.	3
IV	**வேளாண்மைமற்றும்நீர்பாசனத்தொழில்நுட்பம்** அணை, ஏரி, குளங்கள், மதகு - சோழர்காலக் குமுழித் தூம்பின் முக்கியத்துவம் - கால்நடை பராமரிப்பு - கால்நடைகளுக்காக வடிவமைக்க பட்ட கிணறுகள் - வேளாண்மை மற்றும் வேளாண்மை சார்ந்த செயல்பாடுகள் - கடல்சார் அறிவு - மீன்வளம் - முத்து மற்றும் முத்துக்குளித்தல் - பெருங்கடல் குறித்த பண்டைய அறிவு - அறிவுசார் சமூகம்.	3
V	**அறிவியல்தமிழ்மற்றும்கணித்தமிழ்** அறிவியல் தமிழின் வளர்ச்சி - கணித்தமிழ் வளர்ச்சி - தமிழ் நூல்களை மின்பதிப்பு செய்தல் - தமிழ் மென்பொருட்கள் உருவாக்கம் - தமிழ் இணைய கல்விக்கழகம் - தமிழ் மின் நூலகம் - இணையத்தில் தமிழ் அகராதிகள் - சொற்குவைத் திட்டம்.	3
	மொத்தபயிற்றுவிக்கும்நேரம்	**15**

பாடநெறியின்முடிவில்கற்றவர்கற்றபின்

பாடத்தின்முடிவு

பா மு1: பண்டைய தொழில்நுப்பதை அடையாளம் கொள்ள தெரியும்

பா மு2: சங்க கால கட்டுமானப் பொருட்கள்- சிற்ப வகைகளை வேறுபடுத்த முடியும்

பா மு3: வரலாறு மற்றும் தொல்லியல் சான்றுகளின் ஆதாரமாக உலோகவியல் ஆய்வுகளில் பட்டியலிட்டு அடையாளம் காண முடியும்

பா மு4: விவசாயம் மற்றும் வேளாண் செயலாக்கத்தில் பயன்படுத்தப்படும் பழங்கால நுட்பங்களைப் பற்றி

விளக்கத்துடன் நிரூபிக்க முடியும்

பா மு5: தமிழ் மொழியின் புதிய மென்பொருள் பற்றி உருவாக்கக் கூடிய திறன் மேம்படுத்துதல்.

உரைபுத்தகங்கள்

உ1- தமிழக வரலாறு - மக்களும் பண்பாடும் - கே .கே பிள்ளை (வெளியீடு தமிழ்நாடு பாடநூல் மற்றும் கல்வியியல் பணிகள் கழகம்)

உ2- எஸ்.கே. சிங், இடைக்கால இந்தியாவின் வரலாறு. புது தில்லி: ஆக்சிஸ் புக்ஸ் பிரைவேட் லிமிடெட், 2013.

குறிப்புகள்

கு1- கணிதத்தமிழ் -முனைவர் இல. சுந்தரம் .(விகடன் பிரசுரம்)

கு2- கீழடி வைகை நதிக்கரையில் சங்ககால நகர நாகரிகம் (தொல்லியல் துறை வெளியீடு.

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Dean (Academics)
HiCET

Programme	Course Code	Name of the Course	L	T	P	C
B.E.	22MC2094/2095	TAMILS AND TECHNOLOGY	2	0	0	1

Course Course Objectives:

The student should be able to

1. Acquiring knowledge of industry during the Sangam Period.
2. Collaborat learning about house design, sculpture and temples during Sangam Period
3. Develop Knowledge in metallurgical studies as a source of historical and archaeological evidence.
4. Acquiring knowledge about ancient techniques used in agriculture and agro processing
5. Knowledge of Tamil language literature.

UNIT I WEAVING AND CERAMIC TECHNOLOGY

Weaving Industry during Sangam Age – Ceramic technology – Black and Red Ware Potteries (BRW) – Graffiti on Potteries.

UNIT II DESIGN AND CONSTRUCTION TECHNOLOGY

Designing and Structural construction House & Designs in household materials during Sangam Age – Building materials and Hero stones of Sangam age – Details of Stage Constructions in Silappathikaram – Sculptures and Temples of Mamallapuram – Great Temples of Cholas and other worship places – Temples of Nayaka Period – Type study (Madurai Meenakshi Temple)- Thirumalai Nayakar Mahal – Chetti Nadu Houses, Indo – Saracenic architecture at Madras during British Period.

UNIT III MANUFACTURING TECHNOLOGY

Art of Ship Building – Metallurgical studies – Iron industry – Iron smelting, steel -Copper and goldCoins as source of history – Minting of Coins – Beads making-industries Stone beads -Glass beads – Terracotta beads - Shell beads/ bone beats – Archeological evidences – Gem stone types described in Silappathikaram.

UNIT IV AGRICULTURE AND IRRIGATION TECHNOLOGY

Dam, Tank, ponds, Sluice, Significance of Kumizhi Thoompu of Chola Period, Animal Husbandry – Wells designed for cattle use – Agriculture and Agro Processing – Knowledge of Sea – Fisheries – Pearl – Conche diving – Ancient Knowledge of Ocean – Knowledge Specific Society.

UNIT V SCIENTIFIC TAMIL & TAMIL COMPUTING

Development of Scientific Tamil – Tamil computing – Digitalization of Tamil Books – Development of Tamil Software – Tamil Virtual Academy – Tamil Digital Library – Online Tamil Dictionaries – Sorkuvai Project.

Course Outcome:

After completion of the course the learner will be able to

CO1:Recognize ancient business
CO2: Distinguish Sangam period building material and types of sculpture.
CO3: Identify the source of historical and archaeological
CO4: Demonstrate the techniques used in agriculture and agro processing.
CO5:Understand the new software of Tamil language.

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Programme	Course Code	Course Title	L	T	P	C
B.TECH	22MC2093	SOCIAL SERVICES AND COMMUNITY DEVELOPMENT	1	0	0	1

Course Objectives:

The student should be able to

1. Acquire the knowledge and active participate in social service and community development activities.
2. Understand the concept of disaster management and role of NCC cadets in disaster management..
3. Understand the concept thinking and reasoning process..
4. Understand about maps and use of bearing and service protector
5. Know about the principles of flight and Aero foil structure and ATC procedures.

Unit	Description	Instructional Hours
I	**SOCIAL SERVICES AND COMMUNITY DEVELOPMENT** Basics of social services and its need - Rural development programs - Contribution of youth towards social welfare - NGOs in social services SwachbharathAbhiyan - Social evils - Mission Indradanush - BetibachoBetipado - Digital awareness - Constitution day.	3
II	**DISASTER MANAGEMENT** Organization of Disaster management -Types of emergencies - Natural and manmade disasters - fire service and fire fighting - prevention of fire.	3
III	**PERSONALITY DEVELOPMENT** Introduction to personality development - public speaking Intra and Inter personal skills -self awareness - critical thinking - Decision making and problem solving.	3
IV	**MAP READING** Types of maps - conventional signs - scales and Grid system - relief and contour gradient - cardinal points - Types of North - types of bearing and use of service protector - Prismatic compass and its uses - setting of map - finding North and own position.	3
V	**PRINCIPLES OF FLIGHT AND AIRMANSHIP** Introduction to principle of flight - Forces acting on the aircraft - Angle of attack - Angle of incidence - Newton's - law of motion - Bernauli's theorem and Venturi effect - Aerofoil - Airfield layout - ATC (Air Traffic Control) - circuit procedures - Aviation medicine.	3
	Total Instructional Hours	15

Course Outcome:

After completion of the course the learner will be able to

CO1:Perform the social services on various occasions for better community and social life
CO2:Appreciate the need and requirement for disaster management and NCC role in disaster management activities.
CO3: Define thinking, reasoning, critical thinking and creative thinking
CO4:Use of bearing and service protector and locate the places and objects on the ground.
CO5:Understand the principles of flight and Aerofoil structure

Reference:

1. UGC and AICTE circulated syllabus.

Text Books :

1. NCC cadet Guide (SD/SW) Army
2. NCC cadet Guide (SD/SW) Airforce.
3. ANOs Guide (SD/SW) by DG NCC, Ministry of Defence, New Delhi
4. Digital Forum App 1.0 & 2.0, by DG NCC DG NCC, Ministry of Defence, New Delhi

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COLLEGE OF ENGINEERING AND TECHNOLOGY

(An Autonomous Institution)

Coimbatore– 641032

DEPARTMENT OF AGRICULTURAL ENGINEERING

Revised Curriculum and Syllabus for the

Batch 2022 – 2026 (Even SEMESTER)

(Academic Council Meeting Held on 26.12.2023)

2022 REGULATIONS

(For the students admitted during the academic year 2022-2023 and onwards)

SEMESTER I

S. NO	COURSE CODE	COURSE TITLE	COURSE CATEGORY	L	T	P	C	TCP	CIA	ESE	TOTAL
THEORY											
1.	22MA1101	MATRICES AND CALCULUS	BSC	3	1	0	4	4	40	60	100
2.	22ME1201	ENGINEERING DRAWING	ESC	1	4	0	3	5	40	60	100
THEORY WITH LAB COMPONENT											
3.	22PH1151	PHYSICS FOR NON-CIRCUIT ENGINEERING	BSC	2	0	2	3	4	50	50	100
4.	22HE1151	ENGLISH FOR ENGINEERS	HSC	2	0	2	3	4	50	50	100
5.	22IT1151	PYTHON PROGRAMMING AND PRACTICES	ESC	2	0	2	3	4	50	50	100
EEC COURSES (SE/AE)											
6.	22HE1071	UHV	AEC	2	0	0	2	3	40	60	100
7.	22HE1072	ENTREPRENEURSHIP & INNOVATION	AEC	1	0	0	1	1	100	0	100
MANDATORY COURSE											
8.	22MC1091	அறிவியல் தமிழ்	MC	2	0	0	0	2	100	0	100
	22MC1092	INDIAN CONSTITUTION									
TOTAL CREDITS				**17**	**5**	**6**	**19**	**29**	**470**	**330**	**800**

SEMESTER II

S. NO	COURSE CODE	COURSE TITLE	COURSE CATEGORY	L	T	P	C	TCP	CIA	ESE	TOTAL
THEORY											
1.	22MA2102	DIFFERENTIAL EQUATIONS AND COMPLEX ANALYSIS.	BSC	3	1	0	4	4	40	60	100
2.	22CY2101	ENVIRONMENTAL STUDIES	ESC	2	0	0	2	3	40	60	100
3.	22PH2101	BASICS OF MATERIAL SCIENCE	BSC	2	0	0	2	3	40	60	100
THEORY WITH LAB COMPONENT											
4.	22CY2151	CHEMISTRY FOR ENGINEERS	BSC	2	0	2	3	4	50	50	100
5.	22AG2252	PRINCIPLES AND PRACTICES OF CROP PRODUCTION	PCC	2	0	2	3	4	50	50	100
6.	22HE2151	EFFECTIVE TECHNICAL COMMUNICATION	HSC	2	0	2	3	4	50	50	100
PRACTICAL											
7.	22ME2001	ENGINEERING PRACTICES	ESC	0	0	4	2	2	60	40	100
EEC COURSES (SE/AE)											
8.	22HE2071	DESIGN THINKING	AEC	1	0	2	2	2	100	0	100
9.	22HE2072	SOFT SKILLS AND APTITUDE	SEC	1	0	0	1	1	100	0	100
MANDATORY COURSE											
10.	22MC2091	தமிழர் மரபு	MC	2	0	0	0	2	100	0	100
	22MC2092	HERITAGE OF TAMIL									
11.	22MC2093	NCC */NSS / YRC / Sports / Clubs / Society Service - Enrollment		All students shall enroll, on admission, in anyone of the personality and character development programmes and undergo training for about 80 hours							
TOTAL CREDITS				17	1	12	22	29	630	370	1000

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SEMESTER III

S. NO	COURSE CODE	COURSE TITLE	COURSE CATEGORY	L	T	P	C	TCP	CIA	ESE	TOTAL
THEORY											
1.	22MA3109	LAPLACE TRANSFORM, FOURIER SERIES AND TRANSFORMS	BSC	3	1	0	4	4	40	60	100
2.	22AG3201	SOIL TECHNOLOGY	PCC	3	0	0	3	3	40	60	100
3.	22AG3202	FLUID MECHANICS AND PUMPS	PCC	3	1	0	4	4	40	60	100
4.	22AG3203	ENGINEERING THERMODYNAMICS	PCC	3	0	0	3	3	40	60	100
THEORY WITH LAB COMPONENT											
5.	22AG3251	UNIT OPERATIONS IN AGRICULTURAL PROCESSING	PCC	2	0	2	3	4	50	50	100
6.	22AG3252	SURVEYING AND LEVELLING	PCC	2	0	2	3	4	50	50	100
PRACTICAL											
7.	22AG3001	SOIL TECHNOLOGY LABORATORY	PCC	0	0	4	2	4	60	40	100
EEC Courses (SE/AE)											
8	22HE3071	SOFT SKILLS AND APTITUDE II	SEC	1	0	0	1	1	100	0	100
9	22AG3072	BASIC ELECTRICAL, ELECTRONICS AND INSTRUMENTATION ENGINEERING	AE	2	0	0	2	2	40	60	100
TOTAL CREDITS				**19**	**2**	**8**	**25**	**29**	**460**	**440**	**900**

SEMESTER IV

S. NO	COURSE CODE	COURSE TITLE	COURSE CATEGORY	L	T	P	C	TCP	CIA	ESE	TOTAL
THEORY											
1.	22HE4101	IPR AND START-UPS	HSC	2	0	0	2	2	40	60	100
2.	22MA4101	APPLIED PROBABILITY AND STATISTICS FOR AGRICULTURAL ENGINEERING	BSC	2	1	0	3	4	40	60	100
3.	22AG4201	FARM EQUIPMENT AND MACHINERY	PCC	3	0	0	3	3	40	60	100
4.	22AG4202	THEORY OF MACHINES	PCC	3	0	0	3	3	40	60	100
5.	22AG4203	HYDROLOGY AND WATER RESOURCES ENGINEERING	PCC	3	1	0	3	4	40	60	100
THEORY WITH LAB COMPONENT											
6.	22AG4251	SOIL AND WATER CONSERVATION ENGINEERING	PCC	2	0	2	3	4	50	50	100
7.	22AG4252	STRENGTH OF MATERIALS FOR AGRICULTURAL ENGINEERING	PCC	2	0	2	3	4	50	50	100
PRACTICAL											
8.	22AG4001	OPERATION AND MAINTENANCES OF FARM MACHINERY AND ENGINES LABORATORY	PCC	0	0	4	2	4	60	40	100
EEC COURSES (SE/AE)											
9.	22HE4072	SOFT SKILLS AND APTITUDE III	SEC	1	0	0	1	1	100	0	100
TOTAL CREDITS				**18**	**2**	**8**	**23**	**29**	**460**	**440**	**900**

* Two weeks internship carries 1 credit and it will be done during Semester II summer vacation and same will be evaluated in Semester IV. If students unable to undergo in semester III then the Internship I offered in the semester IV can be clubbed with Internship II(Total: 4 weeks-2 credits)

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SEMESTER V

S. NO	COURSE CODE	COURSE TITLE	COURSE CATEGORY	L	T	P	C	TCP	CIA	ESE	TOTAL
THEORY											
1.	22AG5201	TRACTORS AND ENGINE SYSTEMS	PCC	3	1	0	4	4	40	60	100
2.	22AG53XX	PROFESSIONAL ELECTIVE-1	PEC	3	0	0	3	3	40	60	100
3.	22AG53XX	PROFESSIONAL ELECTIVE-2	PEC	3	0	0	3	3	40	60	100
4.	22AG53XX	PROFESSIONAL ELECTIVE-3	PEC	3	0	0	3	3	40	60	100
THEORY WITH LAB COMPONENT											
5.	22AG5251	IRRIGATION AND DRAINAGE ENGINEERING	PCC	2	0	2	3	4	50	50	100
6.	22AG5252	FOOD AND DAIRY ENGINEERING	PCC	2	0	2	3	4	50	50	100
PRACTICAL											
7.	22AG5001	RENEWABLE ENERGY LABORATORY	PCC	0	0	4	2	4	60	40	100
EEC COURSES (SE/AE)											
8.	22HE5071	SOFT SKILLS -4 /FOREIGN LANGUAGES	SEC	1	0	0	1	1	100	0	100
TOTAL CREDITS				**17**	**1**	**8**	**22**	**26**	**420**	**380**	**800**

SEMESTER VI

S. NO	COURSE CODE	COURSE TITLE	COURSE CATEGORY	L	T	P	C	TCP	CIA	ESE	TOTAL
THEORY											
1.	22AG6201	REMOTE SENSING AND GEOGRAPHICAL INFORMATION SYSTEM	PCC	3	0	0	3	3	40	60	100
2.	22AG6202	PROFESSIONAL ETHICS	HSC	3	0	0	3	3	40	60	100
3.	22AG63XX	PROFESSIONAL ELECTIVE-4	PEC	3	0	0	3	3	40	60	100
4.	22AG63XX	PROFESSIONAL ELECTIVE-5	PEC	3	0	0	3	3	40	60	100
5.	22XX64XX	OPEN ELECTIVE – 1*	OEC	3	0	0	3	3	40	60	100
6.	22XX64XX	OPEN ELECTIVE – 2*	OEC	3	0	0	3	3	40	60	100
PRACTICAL											
7.	22AG6001	CAD FOR AGRICULTURAL ENGINEERING LABORATORY	PCC	0	0	4	2	4	60	40	100
8.	22AG6002	POST HARVEST TECHNOLOGY	ESC	0	0	4	2	4	60	40	100
EEC COURSES (SE/AE)											
9.	22HE6701	SOFT SKILLS - 5	SEC	2	0	0	2	2	100	0	100
TOTAL CREDITS				**20**	**0**	**8**	**24**	**28**	**460**	**440**	**900**

SEMESTER VII

S. NO	COURSE CODE	COURSE TITLE	COURSE CATEGORY	L	T	P	C	TCP	CIA	ESE	TOTAL
THEORY											
1.	22AG7201	MECHANICS OF TILLAGE AND TRACTION	PCC	3	0	0	3	3	40	60	100
2.	22AG7202	WASTE AND BY PRODUCT	PCC	3	1	0	4	4	40	60	100

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		UTILIZATION									
3.	22AG73XX	PROFESSIONAL ELECTIVE-6	PEC	3	0	0	3	3	40	60	100
4.	22XX74XX	OPEN ELECTIVE – 3*	OEC	3	0	0	3	3	40	60	100
5.	22XX74XX	OPEN ELECTIVE – 4*	OEC	3	0	0	3	3	40	60	100
PRACTICAL											
6.	22AG7001	REMOTE SENSING AND GIS LABORATORY	PCC	0	0	4	2	4	60	40	100
EEC COURSES (SE/AE)											
7.	22AG7701	INTERNSHIP	SEC	-	-	-	2	2	100	0	100
TOTAL CREDITS				**15**	**1**	**4**	**20**	**22**	**360**	**340**	**700**
Two weeks internship carries 1 credit and it will be done during Semester VI summer vacation/placement training and same will be evaluated in Semester VII.											

SEMESTER VIII

S. NO	COURSE CODE	COURSE TITLE	COURSE CATEGORY	L	T	P	C	TCP	CIA	ESE	TOTAL
EEC Courses (SE/AE)											
1.	22AG8901	PROJECT WORK	SEC	0	0	20	10	20	100	100	200
TOTAL CREDITS				**0**	**0**	**20**	**10**	**20**	**100**	**100**	**200**

Note:

1. As per the AICTE guideline, in Semester I, II, III & IV NCC one credit subject is added as Value Added Course with Extra Credit. Further, the students' who enrolled his/her name in HICET NCC and Air Wing are eligible to undergo this subject. The earned extra credits printed in the Consolidated Mark sheet as per the regulation.
2. NCC course level 1 & Level 2 will be added in the list of open elective subjects in the appropriate semester. Further, the students' who have opted NCC subjects in Semester I, II, III & IV are eligible to undergo NCC Open Elective Subjects.
3. The above-mentioned NCC Courses will be offered to the students who are going to be admitted in the Academic Year 2021 – 22.

SEMESTER WISE CREDIT DISTRIBUTION

B.E. / B.TECH. PROGRAMMES									
S.No.	Course Area	Credits per Semester							Total Credits
		I	II	III	IV	V	VI	VII	VIII	
1.	HSC	3	3	-	2	-	3	-	-	**11**
2.	BSC	7	9	4	3	-	-	-	-	**23**
3.	ESC	6	4	3	-	-	2	-	-	**15**
4.	PCC	-	3	15	17	12	5	9	-	**61**
5.	PEC	-	-	-	-	9	6	3	-	**18**
6.	OEC	-	-	-	-	-	6	6	-	**12**
7.	EEC	3	3	3	1	1	2	2	10	**25**
8.	MC									
Total		**19**	**22**	**25**	**23**	**22**	**24**	**20**	10	**165**

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OPEN ELECTIVE I AND II
(EMERGING TECHNOLOGIES)

To be offered for students other than CSE, IT, AI&ML, ECE & BIOMEDICAL

S. NO	COURSE CODE	COURSE TITLE	COURSE CATEGORY	L	T	P	C	TCP	CIA	ESE	TOTAL
1.	22AI6451	ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING FUNDAMENTALS	OEC	2	0	0	3	4	40	60	100
2.	22CS6451	BLOCKCHAIN TECHNOLOGY	OEC	2	0	0	3	4	40	60	100
3.	22EC6451	CYBER SECURITY	OEC	2	0	0	3	4	40	60	100
4.	22EC6452	IOT CONCEPTS AND APPLICATIONS	OEC	2	0	0	3	4	40	60	100
5.	22IT6451	DATA SCIENCE AND ANALYTICS	OEC	2	0	0	3	4	40	60	100
6.	22BM6451	AUGMENTED AND VIRTUAL REALITY	OEC	2	0	0	3	4	40	60	100

OPEN ELECTIVES I AND II

To be offered for students other than AUTO, AERO, AGRI, MECH, MCTS, CIVIL, EEE, CHEMICAL, FOOD TECH, E&I

S. NO	COURSE CODE	COURSE TITLE	COURSE CATEGORY	L	T	P	C	TCP	CIA	ESE	TOTAL
1.	22AE6401	SPACE SCIENCE	OEC	3	0	0	3	3	40	60	100
2.	22MT6401	INTRODUCTION TO INDUSTRIAL ENGINEERING	OEC	3	0	0	3	3	40	60	100
3.	22MT6402	INDUSTRIAL SAFETY AND ENVIRONMENT	OEC	3	0	0	3	3	40	60	100
4.	22CE6401	CLIMATE CHANGE AND ITS IMPACT	OEC	3	0	0	3	3	40	60	100
5.	22CE6402	ENVIRONMENT AND SOCIAL IMPACT ASSESSMENT	OEC	3	0	0	3	3	40	60	100
6.	22ME6401	RENEWABLE ENERGY SYSTEM	OEC	3	0	0	3	3	40	60	100
7.	22ME6402	ADDITIVE MANUFACTURING SYSTEMS	OEC	3	0	0	3	3	40	60	100
8.	22EI6401	INTRODUCTION TO INDUSTRIAL INSTRUMENTATION AND CONTROL	OEC	3	0	0	3	3	40	60	100
9.	22EI6402	GRAPHICAL PROGRAMMING USING VIRTUAL INSTRUMENTATION	OEC	3	0	0	3	3	40	60	100
10.	22AU6401	FUNDAMENTALS OF AUTOMOBILE ENGINEERING	OEC	3	0	0	3	3	40	60	100
11.	22AU6402	AUTOMOTIVE VEHICLE SAFETY	OEC	3	0	0	3	3	40	60	100
12.	22EE6401	DIGITAL MARKETING	OEC	3	0	0	3	3	40	60	100
13.	22EE6402	RESEARCH METHODOLOGY	OEC	3	0	0	3	3	40	60	100
14.	22FT6401	TRADITIONAL FOODS	OEC	3	0	0	3	3	40	60	100
15.	22CH6401	BIOMASS AND BIOREFINERY	OEC	3	0	0	3	3	40	60	100
16.	22AG6401	URBAN AGRICULTURE AND ORGANIC FARMING	OEC	3	0	0	3	3	40	60	100

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OPEN ELECTIVE III

Students shall choose any one of the open elective courses such that the course content or title does not belong to their own programme. (Note: Each programme in our institution is expected to provide one course only)

1.	22AG7401	MODERN AGRICULTURAL TECHNOLOGIES	OEC	3	0	0	3	3	40	60	100

OPEN ELECTIVE IV

S. NO	COURSE CODE	COURSE TITLE	COURSE CATEGORY	L	T	P	C	TCP	CIA	ESE	TOTAL
1.	22LS7401	GENERAL STUDIES FOR COMPETITIVE EXAMINATIONS	OEC	3	0	0	3	3	40	60	100
2.	22LS7402	HUMAN RIGHTS, WOMEN RIGHTS AND GENDER EQUITY	OEC	3	0	0	3	3	40	60	100
3.	22LS7403	INDIAN ETHOS AND HUMAN VALUES	OEC	3	0	0	3	3	40	60	100
4.	22LS7404	FINANCIAL INDEPENDENCE AND MANAGEMENT	OEC	3	0	0	3	3	40	60	100
5.	22LS7405	YOGA FOR HUMAN EXCELLENCE	OEC	3	0	0	3	3	40	60	100
6.	22LS7406	DEMOCRACY AND GOOD GOVERNANCE	OEC	3	0	0	3	3	40	60	100
7.	22LS7407	NCC LEVEL - II	OEC	3	0	0	3	3	40	60	100

PROFESSIONAL ELECTIVE COURSES: VERTICALS

VERTICAL I Farm Machinery and Power	VERTICAL II Water Management and Protected cultivation	VERTICAL III Renewable Energy Engineering	VERTICAL IV Food Processing	VERTICAL V IT and Agricultural Business management	VERTICAL VI Advances in Agricultural Engineering
22AG5301 Farm Power & Machinery Management	**22AG5304** Watershed planning and Management	**22AG5307** Biomass Management for Fodder & Energy	**22AG5310** Heat and Mass Transfer for Agricultural Engineering	**22AG5313** Integrated Farming System	**22AG5316** Automation in Agriculture
22AG5302 Tractor Systems and Controls	**22AG5305** Groundwater and Well Engineering	**22AG5308** Renewable Energy Sources	**22AG5311** Food Process Equipment and Design	**22AG5314** Agri Business Management	**22AG5317** Electric and Hybrid Vehicle
22AG5303 Tractor Design and Testing	**22AG5306** Design of Micro-irrigationsystem	**22AG5309** Renewable Energy Technology	**22AG5312** Food Plant Design andManagement	**22AG5315** Sustainable Agriculture and Food Security	**22AG5318** Foundation of Robotics and Drone
22AG6301 Hydraulic Control system and design	**22AG6303** Protected Cultivation	**22AG6305** Solar and Wind energysystem	**22AG6307** Storage and Packaging Technology	**22AG6309** Systems Analysis in Agricultural Engineering	**22AG6311** Applications of RS & GIS in Resource Management
22AG6302 Testing and evaluation of farm machinery and equipment	**22AG6304** On-farm water management	**22AG6306** Biochemical and Thermochemical conversion of biomass	**22AG6308** Refrigeration and cold Storage	**22AG6310** IT in Agricultural System	**22AG6312** Fundamentals of Nano Technology in Agriculture
22AG7301 Human Engineering and Safety in Farm Machinery Operations	**22AG7302** Irrigation Water Quality andWaste Water Management	**22AG7303** Energy Audit	**22AG7304** Emerging Technologies in FoodProcessing	**22AG7305** Design and Maintenance of Green House	**22AG7306** Gender and Integrated water Resource Management

Note: Students are permitted to choose all professional electives from any of the verticals.

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PROFESSIONAL ELECTIVE -I

S. NO	COURSE CODE	COURSE TITLE	COURSE CATEGORY	L	T	P	C	TCP	CIA	ESE	TOTAL
1.	22AG5301	FARM POWER & MACHINERY MANAGEMENT	PEC	3	0	0	3	3	40	60	100
2.	22AG5302	TRACTOR SYSTEMS AND CONTROLS	PEC	3	0	0	3	3	40	60	100
3.	22AG5303	TRACTOR DESIGN AND TESTING	PEC	3	0	0	3	3	40	60	100
4.	22AG6301	HYDRAULIC CONTROL SYSTEM AND DESIGN	PEC	3	0	0	3	3	40	60	100
5.	22AG6302	TESTING AND EVALUATION OF FARM MACHINERY AND EQUIPMENT	PEC	3	0	0	3	3	40	60	100
6.	22AG7301	HUMAN ENGINEERING AND SAFETY IN FARM MACHINERY OPERATIONS	PEC	3	0	0	3	3	40	60	100

PROFESSIONAL ELECTIVE -II

S. NO	COURSE CODE	COURSE TITLE	COURSE CATEGORY	L	T	P	C	TCP	CIA	ESE	TOTAL
1.	22AG5304	WATERSHED PLANNING AND MANAGEMENT	PEC	3	0	0	3	3	40	60	100
2.	22AG5305	GROUNDWATER AND WELL ENGINEERING	PEC	3	0	0	3	3	40	60	100
3.	22AG5306	DESIGN OF MICRO-IRRIGATION SYSTEM	PEC	3	0	0	3	3	40	60	100
4.	22AG6303	PROTECTED CULTIVATION	PEC	3	0	0	3	3	40	60	100
5.	22AG6304	ON-FARM WATER MANAGEMENT	PEC	3	0	0	3	3	40	60	100
6.	22AG7302	IRRIGATION WATER QUALITY AND WASTE WATER MANAGEMENT	PEC	3	0	0	3	3	40	60	100

PROFESSIONAL ELECTIVE -III

S. NO	COURSE CODE	COURSE TITLE	COURSE CATEGORY	L	T	P	C	TCP	CIA	ESE	TOTAL
1.	22AG5307	BIOMASS MANAGEMENT FOR FODDER & ENERGY	PEC	3	0	0	3	3	40	60	100
2.	22AG5308	RENEWABLE ENERGY SOURCES	PEC	3	0	0	3	3	40	60	100
3.	22AG5309	RENEWABLE ENERGY TECHNOLOGY	PEC	3	0	0	3	3	40	60	100
4.	22AG6305	SOLAR AND WIND ENERGY SYSTEM	PEC	3	0	0	3	3	40	60	100
5.	22AG6306	BIOCHEMICAL AND THERMOCHEMICAL CONVERSION OF BIOMASS	PEC	3	0	0	3	3	40	60	100
6.	22AG7303	ENERGY AUDIT	PEC	3	0	0	3	3	40	60	100

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PROFESSIONAL ELECTIVE -IV

S. NO	COURSE CODE	COURSE TITLE	COURSE CATEGORY	L	T	P	C	TCP	CIA	ESE	TOTAL
1.	22AG5310	HEAT AND MASS TRANSFER FOR AGRICULTURAL ENGINEERING	PEC	3	0	0	3	3	40	60	100
2.	22AG5311	FOOD PROCESS EQUIPMENT AND DESIGN	PEC	3	0	0	3	3	40	60	100
3.	22AG5312	FOOD PLANT DESIGN AND MANAGEMENT	PEC	3	0	0	3	3	40	60	100
4.	22AG6307	STORAGE AND PACKAGING TECHNOLOGY	PEC	3	0	0	3	3	40	60	100
5.	22AG6308	REFRIGERATION AND COLD STORAGE	PEC	3	0	0	3	3	40	60	100
6.	22AG7304	EMERGING TECHNOLOGIES IN FOODPROCESSING	PEC	3	0	0	3	3	40	60	100

PROFESSIONAL ELECTIVE -V

S. NO	COURSE CODE	COURSE TITLE	COURSE CATEGORY	L	T	P	C	TCP	CIA	ESE	TOTAL
1.	22AG5313	INTEGRATED FARMING SYSTEM	PEC	3	0	0	3	3	40	60	100
2.	22AG5314	AGRI BUSINESS MANAGEMENT	PEC	3	0	0	3	3	40	60	100
3.	22AG5315	SUSTAINABLE AGRICULTURE AND FOOD SECURITY	PEC	3	0	0	3	3	40	60	100
4.	22AG6309	SYSTEMS ANALYSIS IN AGRICULTURALENGINEERING	PEC	3	0	0	3	3	40	60	100
5.	22AG6310	IT IN AGRICULTURAL SYSTEM	PEC	3	0	0	3	3	40	60	100
6.	22AG7305	DESIGN AND MAINTENANCE OF GREEN HOUSE	PEC	3	0	0	3	3	40	60	100

PROFESSIONAL ELECTIVE -VI

S. NO	COURSE CODE	COURSE TITLE	COURSE CATEGORY	L	T	P	C	TCP	CIA	ESE	TOTAL
1.	22AG5316	AUTOMATION IN AGRICULTURE	PEC	3	0	0	3	3	40	60	100
2.	22AG5317	ELECTRIC AND HYBRID VEHICLE	PEC	3	0	0	3	3	40	60	100
3.	22AG5318	FOUNDATION OF ROBOTICS AND DRONE	PEC	3	0	0	3	3	40	60	100
4.	22AG6311	APPLICATIONS OF RS & GIS IN RESOURCE MANAGEMENT	PEC	3	0	0	3	3	40	60	100
5.	22AG6312	FUNDAMENTALS OF NANO TECHNOLOGY IN AGRICULTURE	PEC	3	0	0	3	3	40	60	100
6.	22AG7306	GENDER AND INTEGRATED WATER RESOURCE MANAGEMENT	PEC	3	0	0	3	3	40	60	100

ENROLLMENT FOR B.E. / B. TECH. (HONOURS) / MINOR DEGREE (OPTIONAL)

A student can also optionally register for additional courses (18 credits) and become eligible for the award of B.E. / B. Tech. (Honours) or Minor Degree. For B.E. / B. Tech. (Honours), a student shall register for the additional courses (18 credits) from semester V onwards. These courses shall be from the same vertical or a combination of different verticals of the same programme of study only. For minor degree, a student shall register for the additional courses (18 credits) from semester V onwards. All these courses have to be in a particular vertical from any one of the other programmes.

Clause 4.10 of Regulation 2022 is applicable for the Enrolment of B.E. / B. TECH. (HONOURS) / Minor Degree (Optional)

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CREDIT DISTRIBUTION – R 2022

Semester	I	II	III	IV	V	VI	VII	VIII	Total
Credits	19	22	25	23	22	24	20	10	165

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Programme	Course code	Name of the course	L	T	P	C
B.E.	22HE4101	IPR AND START-UPS	2	0	0	2

The student should be able

Course Objective

1. The main objective of the IPR is to make the students aware of their rights for the protection of their invention done in their project work.
2. To get registration in our country and foreign countries of their invention, designs and thesis or theory written by the students during their project work and for this they must have knowledge of patents, copy right,
3. To learn about the trademarks and geographical indications (GI) in our country and foreign countries of their invention.
4. To gain the knowledge about designs and layout design Act-2000.
5. To learn about the technology transfer to product and Start-up knowledge.

Unit	Description	Instructional Hours
I	**INTRODUCTION TO IPR** Meaning of property, Origin, Nature, Meaning of Intellectual Property Rights Introduction to Trade-Related of Intellectual Property Rights (TRIPS) and World Trade Organization (WTO). - Kinds of Intellectual property rights—Copy Right, Patent, Trade Mark, Trade Secret and trade dress, Design, Layout Design, Geographical Indication, Plant Varieties and Traditional Knowledge.	6
II	**PATENT RIGHTS AND COPY RIGHTS** Origin, Meaning of Patent, Types, Procedure to follow the methods of IP agents, Inventions, which are not patentable, Registration Procedure, Rights and Duties of Patentee, Assignment and licence, Restoration of lapsed Patents, Surrender and Revocation of Patents, Infringement, Remedies & Penalties, IT Act- introduction. COPY RIGHT- Origin, Definition &Types of Copy Right, Patent Ethics, Registration procedure, Assignment & licence, Terms of Copy Right, Piracy, Infringement, Remedies,	6
III	**TRADE MARKS AND GEOGRAPHICAL INDICATION** Origin, Meaning & Nature of Trade Marks, Types, Registration of Trade Marks, Infringement & Remedies, Offences relating to Trade Marks, Passing off, Penalties. GEOGRAPHICAL INDICATION – International Protection, plant varieties, Infringement of GI, licencing, legal issues.	6
IV	**DESIGN** Meaning, Definition, Object, Registration of Design, Cancellation of Registration, International convention on design, functions of Design. Semiconductor Integrated circuits and layout design Act-2000.	6
V	**START-UPS** Process of Innovation, Monetizing Ideas, Technology transfer to product, Funding Options for Start-up, Start-up Models, Preparation of Project Report, Start up to MNC, Start-up Audit.	6
	Total Instructional Hours	**30**

Course Outcome

Upon completion of the course, the students will be able to:

CO1: Understand IPR and aware the invention rights.

CO2: Get awareness of acquiring the patent for their project ideas

CO3: Learn obtaining copyright for their innovative works

CO4: Understand the designs and layout design Act-2000.

CO5: Understand the concept of start-ups, identify the required strategic resources.

TEXT BOOK:

T1. Intellectual Property Rights (IPR) by M.K Bhandari 2021

T2. Law relating to Intellectual Property Rights, by V.K Ahuja 2017

T3. Intellectual Property Rights (IPR) for Start-ups by Vinay Vaish 2016

T4. Intellectual Property - Patents, Copyright, Trade Marks and Allied Rights (South Asian Edition) by W Cornish and D Llewelyn and T Pain 8th South Asian Edition, 2016.

T5 Peter Thiel & Blake Masters, Zero to One: Notes on Start Ups, or How to Build the Future, Random House, 2014.

Course Code & Name: **22HE4101 IPR AND START-UPS**

PO & PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	-	3	-	-	3	-	-	-	-	-	3	2	2
CO2	3	-	3	-	-	3	-	-	-	-	-	3	2	2
CO3	3	-	3	-	-	3	-	-	-	-	-	3	2	2
CO4	3	-	3	-	-	3	-	-	-	-	-	3	2	2
CO5	3	-	3	-	-	3	-	-	-	-	-	3	2	2
Avg.	3	-	3	-	-	3	-	-	-	-	-	3	2	2

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Programme	Course Code	Name of the Course	L	T	P	C
B.Tech	22MA4101	APPLIED PROBABILITY AND STATISTICS FOR AGRICULTURAL ENGINEERING	2	1	0	3

Course Objective

1. To construct a well-defined knowledge of Probability.
2. To interpret measures of central tendency, dispersion, and association.
3. To Introduce Correlation concepts to understand the relation between two random variables.
4. To describe some basic concepts of statistical methods for testing the hypothesis.
5. To educate the design of experiment techniques to solve various engineering problems.

Unit	Description	Instructional Hours
I	**PROBABILITY** Definition – Axioms of Probability – Conditional Probability – Total Probability – Baye's Theorem (without proof).	9
II	**DESCRIPTIVE STATISTICS** Measures of Central Tendency - Mean – Median –Mode, Measures of Dispersion - Range – Quartile Deviation – Standard Deviation – Coefficient of Variation.	9
III	**CORRELATION AND REGRESSION** Correlation – Karl Pearson's correlation coefficient – Spearman's Rank Correlation – Regression lines (problems based on Raw data only).	9
IV	**HYPOTHESIS TESTING** Large sample test - Test of significance for single mean and difference of means -Small sample test – t test for single mean and difference of mean - F test for variance, Chi – Square test for independence of attributes – Goodness of fit.	9
V	**ANALYSIS OF VARIANCE** Introduction- Assumptions of Analysis of Variance- Completely Randomized Design-Randomized Block Design - Latin Square Design.	9
	Total Instructional Hours	45

Course Outcome

CO1: Understand the concepts of probability.
CO2: Understand the concepts of Descriptive Statistics.
CO3: Compute correlation and predict unknown values using regression.
CO4: Acquire the knowledge of statistical methods for testing the hypothesis.
CO5: Apply Design of Experiment techniques to solve various engineering problems.

TEXT BOOKS:

T1 Veerarajan, T., Probability, Statistics and Random Processes, Tata McGraw-Hill, 2nd Edition, New Delhi, April 19,2017

T2 Gupta S C and kapoor V.K, Fundamentals of Mathematical Statistics, Sultan Chand & Sons, 2020.

REFERENCE BOOKS :

R1- O.C. Ibe, "Fundamentals of Applied Probability and Random Processes", Elsevier, First Indian Reprint, 2010.

R2 - Walpole. R.E., Myers. R.H., Myers. S.L., and Ye. K., "Probability and Statistics for Engineers and Scientists", 10th Edition, Pearson Education, Asia, 2011.

PO& PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	3	3	-	-	-	-	-	2	3	3	3
CO2	3	3	3	3	3	-	-	-	-	-	2	3	3	3
CO3	3	3	3	3	3	3	-	-	-	-	3	3	3	3
CO4	3	3	3	3	3	3	-	-	-	-	3	3	3	3
CO5	3	3	3	3	3	3	-	-	-	-	2	3	3	3
Avg	3	3	3	3	3	3	-	-	-	-	2.4	3	3	3

Chairman - BoS
AGRI - HICET

Dean (Academics)
HICET

Programme	Course Code	Name of the Course	L	T	P	C
B.Tech.	22AG4201	FARM MACHINERY AND EQUIPMENT	3	0	0	3

Course Objective

1. To introduce the students to the working principles of farm machinery tillage implements.
2. To get thorough knowledge about the feasibility of primary and secondary tillage implements.
3. To gain knowledge about the sowing and fertilizer application methodologies
4. To acquire basic knowledge in the field of Weeding and Harvesting.
5. To expose the students to farm mechanization prospects and constraints alongside cooperative farming for shared usage of machinery.

Unit	Description	Instructional Hours
I	**FARM MECHANIZATION** Farm mechanization – objectives and level of mechanization in India- Materials of construction and Heat Treatment of farm equipment's- Selection of Farm Machines- Types of farm implements – trailed, mounted and self-propelled. Field capacity, efficiency, economics of machinery use with numerical / problems.	5
II	**PRIMARY TILLAGE IMPLEMENTS** Tillage - objectives - methods and terminology – classification of primary & secondary tillage equipment. Primary Tillage: objective- types – Mould board plough-accessories, adjustments, operation and material of construction. Disc plough-standard and vertical -principle of operation, adjustments and accessories. Sub-soiler and chisel plough: types, working and construction. Earth moving equipment-Bulldozer, Trencher, Elevator.	10
III	**SECONDARY AND MISCELLANEOUS TILLAGE IMPLEMENTS** Secondary tillage: objective- types -Construction and working of Disc harrows, Spike-tooth and spring-tine harrows- cultivator –Levelers-Ridger-Bund former. Miscellaneous tillage tools: rotary tillage tools, rotavators, stirring plough, auger plough, rotary hoes, Oscillating tools - Forces acting upon tillage tool/ implement – Hitching System	10
IV	**SOWING, FERTILIZING APPLICATION, WEEDING AND PLANT PROTECTION EQUIPMENT** Methods of Crop planting/sowing – Types of seed drills and planters – calibration-fertilizer metering devices - seed cum fertilizer drills – paddy trans planters – nursery tray machines. Weeding equipment – dry land star weeder – wet land cono weeder and rotary weeder –Power Operated weeder: Engine/tractor/Battery- Sprayers –types-classification – methods of atomization, spray application rate, droplet size determination –drift control.	10
V	**HARVESTING TOOLS AND MACHINERY** Harvesting and Threshing Terminology- Principals and Type of Cutting Mechanism-	10

Types of Harvesting Machinery: Mowers and Windrowers- Grain Combines and Straw Combines- Root Crop Harvesting Equipment - Fruit and Vegetable Harvesting Tools and Machines.

Total Instructional Hours 45

Course Outcome

CO1: The students will be able to perceive the role and significance of mechanization in sustaining agricultural production

CO2: The students will get acquainted the contextual usage of various equipment used in the farm for different field operations.

CO3: The students will able to understand the working principle of every equipment's used from sowing to harvesting.

CO4: The students will equip with technical knowledge and skills required for the operation, maintenance and evaluation of Tillage, Sowing and intercultural operational machinery needed for agricultural farms.

CO5: The students will be able to know the harvesting and threshing mechanism of grains, fruits and vegetable.

TEXT BOOKS

T1 Jagdishwar Sahay. Elements of Agricultural Engineering. Standard Publishers Distributors

T2 Jain S. C. and Grace Philip. 2012. Farm Machinery – An Approach. Standard Publishers Distributors., New Delhi

T3 Ojha, T. P. and Michael, A. M. 2011. Principles of Agricultural Engineering Vol. I. Jain Brothers, New Delhi

T4 Yadav, R., and Solanki, H. B. 2009.Numericals and Short Questions in Farm Machinery, Power and Energy in Agriculture.New India Publishing Agency, New Delhi.

T5 Liljedahl, J. B., Turnquist, P. K., Smith, D. W., and Hokey, M. 2004. Tractors and Their Power Units. CBS Publishers and Distributers Pvt. Ltd, New Delhi

REFERENCE BOOKS

R1 Kepner, R.A., et al. Principles of farm machinery. CBS Publishers and Distributers, Delhi. 99, 1997.

R2 Harris Pearson Smith et al. Farm machinery and equipment. Tata McGraw-Hill pub., New Delhi.,1996.

R3 Srivastava, A.C. Elements of Farm Machinery. Oxford and IBH Pub. Co., New Delhi, 1990

R4 Singh, S., and Verma, S. R. 2009.Farm Machinery Maintenance and Management. Indian Council of Agricultural Research, New Delhi

R5 Kirpal Singh. 2013. Automobile Engineering Vol. I. Standard Publishers Distributors, Delhi

PO&PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	1	2	2	2	1	3	2	-	-	1	3	3	3
CO2	2	2	3	3	-	1	2	-	-	-	-	3	2	3
CO3	2	2	3	3	-	1	2	-	-	-	-	3	2	3
CO4	2	2	3	3	-	1	2	-	-	-	-	3	2	3
CO5	2	2	3	3	1	1	2	-	-	-	-	3	2	3
Avg	1.8	1.8	2.8	2.8	1.5	1	2.2	2	0	0	1	3	2.2	3

Chairman - BoS
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ACADEMIC COUNCIL
Chairman

Dean (Academics)
HiCET

Programme	Course Code	Name of the Course	L	T	P	C
B.Tech.	22AG4202	THEORY OF MACHINES	3	0	0	3

Course Objective

- To understand the purpose of kinematics, Kinematic joint and mechanism.
- To understand the theories and applications of cams and Flywheels.
- To understand applications of different types of gears and gear profiles and its efficiency and gear trains.
- To understand the concept of friction and friction drives
- To know principles and function of different types governors.

Unit	Description	Instructional Hours
I	**BASICS OF MECHANISMS** Introduction - Links - Pairs - Chain - Mechanism - Machine structure - Degrees of freedom - Four bar chains - Planar, Spherical and Spatial Mechanisms - Grashoff's law - Kutzback criterion - Grubler's criterion for plane mechanism. Inversion of mechanisms - Four bar, single slider crank and double slider crank mechanisms.	9
II	**CAM AND FLYWHEEL** Cam-Cam terminology - Cam profiles construction for roller, flat faced and knife edge -Follower motion -SHM, Uniform Velocity, Uniform Acceleration & Retardation and Cycloidal Motion.– Flywheel-Flywheels of engines and punching press- Turning moment diagrams – Fluctuation of energy, speed.	9
III	**GEARS AND GEAR TRAINS** Functions of gear- Classification of gears - Gear nomenclature - Forms of teeth, cycloid profile and involute profile teeth- Simple, compound, reverted and epicyclic gear train-Simple problems on gear trains	9
IV	**FRICTION AND DRIVES** Types of Friction-limiting friction-law of friction –Friction in screw threads - Friction clutches and types- Friction aspects in Brakes-Belt-materials used in Belt types and selection of belt drive	9
V	**GOVERNORS** Governors - Types - Centrifugal governors – Porter & Proell governor, Hartnell, Hartung – Characteristics	9
	Total Instructional Hours	45

Course Outcome

CO1: To understand basic mechanism and machine structure
CO2: To develop cam profiles for various followers and turning moment diagram of flywheel.
CO3: To assess the transmission through Gears there mechanism and gear trains.
CO4: To understand the Friction, Friction aspect and drives.
CO5: To assess the function of governors and there types.

TEXT BOOKS:

T1 Rattan S B. 1993.Theory of Machines.Tata McGraw Hill Publishing Co. Ltd., 12/4 Asaf Ali Road, New Delhi

Delhi

T2 R.S.Khurmi, J.K.Gupta. 2016. Theory of Machines. S.Chand publishing,Ram Nagar,New Delhi.

REFERENCE BOOKS:

R1 Ghosh.A, and Mallick.A.K, "Theory of Mechanisms and Machines", Affiliated East-West Pvt Ltd., NewDelhi, 1988.

R2 Rao.J.S, and Dukkipati.R.V, " Mechanism and Machine Theory" , Wiley-Eastern Ltd., New Delhi, 1995

R3 Khurmi R.S., "Theory of Machines" Khanna Publishers, Delhi, 2006.

PO & PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	2									2	3	1
CO2	3	3	3	3			2		2	1	1	2	3	2
CO3	3	3	3	3			2		2	1	1	2	3	2
CO4	1		2	2								2	3	2
CO5	1											2	3	3
Avg	2	3	3	3			2		2	1	1	2	3	2

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Chairman

Dean (Academics)
HiCET

Programme	Course Code	Name of the Course	L	T	P	C
B.Tech.	22AG4203	HYDROLOGY AND WATER RESOURCES ENGINEERING	3	1	0	3

Course Objective

To inculcate the concept s of hydrological aspects of water availability to the student community and to design the requirements, quantity, control and regulate the water resources.

Unit	Description	Instructional Hours
I	**PRECIPITATION AND ABSTRACTIONS** Hydrological cycle- Meteorological measurements – Requirements, types and forms of precipitation - Rain gauges-Spatial analysis of rainfall data using Thiessen and Isohyetal methods-Interception - Evaporation. Horton's equation, pan evaporation measurements and evaporation suppression - Infiltration-Horton's equation - double ring infiltrometer, infiltration indices.	9
II	**RUNOFF AND HYDROGRAPH** Watershed, catchment and basin - Catchment characteristics - factors affecting runoff - Run off estimation using empirical - Strange's table and SCS methods – Stage discharge relationships flow measurements- Hydrograph – Unit Hydrograph – IUH	9
III	**FLOOD AND DROUGHT** Natural Disasters-Flood Estimation- Frequency analysis- Flood control- Definitions of droughts- Meteorological, hydrological and agricultural droughts- IMD method-NDVI analysis- Drought Prone Area Programme (DPAP)	9
IV	**RESERVOIRS** Classification of reservoirs - Single Purpose Conservation Reservoir-Single Purpose Flood Control Reservoir-Multipurpose Reservoir- General principles of design- site selection- spillways -elevation – area - capacity - storage estimation, sedimentation - life of reservoirs – rule curve.	9
V	**MANAGEMENT OF WATER RESOURCES** River Training and Riverbank Protection Works – Guide bunds or banks - Approach embankment- Groynes or Spurs- Marginal embankments- Drought and flood Management - drought and flood affected areas of India - Agricultural Drought - Indices for drought monitoring - Tackling drought through water management-Remote Sensing and GIS for water resource management.	9
	Total Instructional Hours	45

COURSE OUTCOMES

At the end of the study the student will have knowledge on

CO1:An understanding of the key drivers on water resources, hydrological processes and their integrated behavior in catchments.

CO2:Ability to construct and apply a range of hydrological models to surface water and groundwater problems including Hydrograph, Flood/Drought management, artificial recharge.

CO3:Ability to conduct Spatial analysis of rainfall data and design water storage reservoirs

CO4:Understand the concept and methods of water management

CO5: Ability to design and analyze the water resources during flood and drought using advanced technologies.

TEXT BOOKS

T1 Subramanya .K. "Engineering Hydrology"- Tata McGraw Hill, 2010

T2 Jayarami Reddy .P. "Hydrology", Tata McGraw Hill, 2008.

T3 Linsley, R.K. and Franzini, J.B. "Water Resources Engineering", McGraw Hill International Book Company, 1995.

REFERENCE BOOKS

R1 David Keith Todd. "Groundwater Hydrology", John Wiley & Sons, Inc. 2007

R2 Ven Te Chow, Maidment, D.R. and Mays, L.W. "Applied Hydrology", McGraw Hill International Book Company, 1998.

PO & PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	1	-	1	2	1	2	1	1	1	1	2	3	2
CO2	1	1	2	2	2	1	2	-	1	2	-	2	2	2
CO3	2	2	2	1	2	2	2	1	2	1	1	2	2	2
CO4	2	1	1	2	2	1	2	1	1	2	-	1	2	2
CO5	3	2	3	2	3	2	2	1	2	2	2	2	2	2
Avg	2	2	3	2	2	2	2	1	1	2	1	2	2	2

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ACADEMIC COUNCIL * TECH * ENGG * Chairman

Dean (Academics)
HiCET

Programme	Course Code	Name of the Course	L	T	P	C
B.Tech.	22AG4251	SOIL AND WATER CONSERVATION ENGINEERING	2	0	2	3

Course Objective

1. To impart a thorough knowledge and understanding of the basic concepts of soil erosion
2. To get a basic idea about the relevant mitigation strategies.
3. To enable the students to design appropriate watershed based soil conservation structures
4. To grab knowledge about the applicability of rainwater harvesting systems.
5. To study about design of sediment detention tanks

Unit	Description	Instructional Hours
I	**MECHANICS OF WATER AND WIND EROSION** Soil Erosion – Causes and Conservation status in India -Mechanics of water erosion – types of water erosion— Classification of Gully – Special forms of Erosion – Wind Erosion Mechanics of Wind Erosion -Sand Dunes and Desertification. **LAB:** Exp 1: Estimation of runoff calculation	5
II	**ESTIMATION OF SOIL LOSS** Rainfall and Runoff Erosivity – Soil Erodibility - Runoff computation for soil conservation: SCS-CN method –Rational Formula - Universal Soil Loss Equation (USLE) – standard plot – Modified Universal Soil Loss Equation (MUSLE) – Revised Universal Soil Loss Equation (RUSLE)- Tolerance limit (T Value) of soil loss– Land use capability classification - Wind drift losses. **LAB:** Exp 2: Design of bench	9
III	**WATERSHED BASED SOIL CONSERVATION** Agronomic practices: contour cultivation - strip cropping – tillage practices – Soil management practices – Mechanical Measures – Gully Control Structures: Drop Spillway, Drop Inlet, Chute Spillways – Contour, Graded and Compartmental Bunding – Bench Terracing for hill slopes – Broad based Terracing – Grassed waterways: Location, construction and maintenance — wind breaks and shelter belts-Landslide control measures – Afforestation **LAB:** Exp 3: Design of contour treches	13
IV	**RAINWATER HARVESTING** Rainfall Frequency Analysis In-situ soil moisture conservation : Micro catchments, - Continuous Contour Trenching – Staggered Trenching – Random Tie Ridging – Crescent bunds - Farm ponds- Hydrologic, Hydraulic and Structural designs – Construction and Protection – Check dams - Earthen dam – Retaining wall.	9

LAB:

Exp 4: Design of Spillway

SEDIMENT TRANSPORT

V	Sediment: Sources – Types of sediment load – Mechanics of sediment transport – Suspension, Saltation and surface Creep- Estimation of bed load – Sediment Graph - Reservoir sedimentation: Basics - Factors affecting sediment distribution pattern, Rates of reservoir sedimentation - Silt Detention Tanks	9

LAB:

Exp 5: Design of permanent structure for water conservation

Total Instructional Hours 45

Course Outcome

CO1: The students will be able to gain fundamental knowledge on the concepts of erosion.

CO2: Students will obtain the knowledge of estimating soil erosion.

CO3: They get enriched with knowledge on Hydrologic, Hydraulic and Structural designs of soil and water conservation measures

CO4: Students can able to design Rainwater harvesting systems.

CO5: Students will receive concepts of sedimentation and detention tanks.

TEXT BOOKS

T1 Suresh, R., "Soil and Water Conservation Engineering", Standard Publication, New Delhi, 2007.

T2 Ghanshyam Das, "Hydrology and Soil Conservation Engineering", Prentice Hall of India Private Limited, New Delhi, 2000.

T3 "Sedimentation Engineering", 2006, ASCE manual and Report on Engineering Practice No. 54, Edited by Vito A. Vanoni. ASCE publishing.

T4 Troeh FR, Hobbs JA, Donahue RL. Soil and water conservation for productivity and environmental protection. Prentice-Hall, Inc.; 1980.

T5 Pierce FJ. Advances in soil and water conservation. CRC Press; 1998 Feb 1.

REFERENCE BOOKS:

R1 Murthy, V.V.N., "Land and Water Management Engineering", Kalyani Publishers, Ludhiana, 1998.

R2 Gurmail Singh, "A Manual on Soil and Water Conservation", ICAR Publication, New Delhi, 1982.

R3 Mal, B.C., "Introduction to Soil and Water Conservation Engineering", Kalyani Publishers, New Delhi, 2002

R4 Sidle RC, Pearce AJ, O'Loughlin CL. Hillslope stability and land use. American geophysical union; 1985.

R5 Ohlig CP, editor. Integrated Land and Water Resources Management in History: Proceedings of the Special Session on History, May 16th, 2005. BoD–Books on Demand; 2005.

PO&PSO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	1	1	-	-	-	1	2	1	1	-	1	2	3	1
CO2	3	3	3	3	3	2	3	1	3	2	2	3	3	2
CO3	3	3	3	3	2	2	3	1	3	3	3	3	3	2
CO4	2	2	2	2	2	2	3	1	2	3	3	3	3	2
CO5	1	1	-	-	-	1	2	1	1	1	1	2	3	3
Avg	2	2	3	3	2	2	3	1	2	2	2	3	3	2

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Dean (Academics)
HiCET

Programme	Course Code	Name of the Course	L	T	P	C
B.Tech.	22AG4252	STRENGTH OF MATERIALS FOR AGRICULTURAL ENGINEERING	2	0	2	3

Course Objective

- To understand the stresses developed in bars, compound, bars, beams, shafts, cylinders and spheres.
- To introduce the concepts of analysis of plane trusses
- To train the students to explore in transverse loading and stresses in beam.

Unit	Description	Instructional Hours
I	**STRESS, STRAIN AND DEFORMATION OF SOLIDS** Rigid bodies and deformable solids – Tension, Compression and Shear Stresses – Deformation of simple and compound bars – Thermal stresses – Elastic constants – Volumetric strains – Thin shells - circumferential and longitudinal stresses in thin cylinders - deformation of thin cylinder **Lab:** Experiment 1. Tension test on steel rod Experiment 2. Compression test on wood Experiment 3. Double shear test on metal	9
II	**ANALYSIS OF PLANE TRUSSES** Determinate and indeterminate plane trusses – determination of member forces by method of joints, method of sections and method of tension coefficient **Lab:** Experiment 4. Hardness test on metals (Rockwell and Brinell Hardness Tests)	9
III	**TRANSVERSE LOADING AND STRESSES IN BEAM** Beams – types transverse loading on beams – Shear force and bending moment in beams –Cantilevers – Simply supported beams and over-hanging beams. Theory of simple bending–bending stress distribution – Shear stress distribution **Lab:** Experiment 5. Deflection test on metal beam	9
IV	**TORSION** Torsion formula - stresses and deformation in circular and hollows shafts – Stepped shafts– Deflection in shafts fixed at the both ends – Stresses in helical springs – Deflection of helical springs **Lab:** Experiment 6. Torsion test on mild steel rod Experiment 7. Compression test on helical spring	9
V	**DEFLECTION OF BEAMS** Computation of slopes and deflections in determinate beams - Double Integration	9

method –Macaulay"s method – Area moment method – Conjugate beam method.

Total Instructional Hours 45

Course Outcome

On completion of the course, the student is expected to

CO1 Find the stress distribution and strains in regular and composite structures subjected to axial loads.

CO2 Evaluate the stresses in plane trusses

CO3 Assess the shear force, bending moment and bending stresses in beams

CO4 Apply torsion equation in design of circular shafts and helical springs

CO5 Evaluate the slope and deflection of beams and buckling loads of columns under different boundary conditions

TEXT BOOKS:

T1 Bansal, R.K., "Strength of Materials", Laxmi Publications (P) Ltd., 2007

T2 Jindal U.C., "Strength of Materials", Asian Books Pvt. Ltd., New Delhi, 2007

REFERENCE BOOKS:

R1 1. Egor. P.Popov "Engineering Mechanics of Solids" Prentice Hall of India, New Delhi, 2001

R2 Subramanian R., "Strength of Materials", Oxford University Press, Oxford Higher education Series,2007

R3 Hibbeler, R.C., "Mechanics of Materials", Pearson Education, Low Price Edition, 2007

R4 Ferdinand P. Been, Russell Johnson, Jr. and John J. Dewole "Mechanics of Materials", Tata McGraw Hill Publishing „co. Ltd., New Delhi, 2005.

PO&PSO ⟶	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	2	2	1		1		1			1	2	3	3
CO2	3	3	2	1		2		1	1	1	1	1	3	2
CO3	3	3	2	2		2		2	1		1	1	3	2
CO4	3	2	2	1		2		2	1		1	1	3	2
CO5	3	2	2	2		2		2		1	1	1	3	2
Avg	3	2.4	2	1.4	0	1.8	0	1.6	0.6	0.4	1	2.2	3	2.2

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HiCET

Programme	Course Code	Name of the Course	L	T	P	C
B.Tech.	22AG4001	OPERATION AND MAINTENANCE OF FARM MACHINERY LABORATORY	0	0	4	2

Course Objective

The students will be introduced to the practice of different farm machinery in the field on

1. Tillage, sowing, plant protection, harvesting and threshing
2. Care and maintenance; lubrication
3. Fits and tolerances and replacements
4. Adjustments of farm machines
5. Dismantling and reassembling of a disc harrow, seed-cum fertilizer drill, and sprayer and engine pumps.

S.no	List of experiments	Instructional hours
1	Identification of major systems of a tractor and general guidelines on preliminary check measures.	2
2	Identification of components of power tiller and general guidelines on preliminary check measures	2
3	Hitching of agricultural implements and trailers	2
4	Operation of Primary tillage implements – adjustments and determination of field capacity	2
5	Experiment on Calibration of seed drills and planter	2
6	Field-testing of rocker arm sprayer, power sprayer and battery sprayer and their efficiency calculation	2
7	Operation and evaluation of dry land, wetland weeder and power operated weeder	2
8	Evaluation of land preparation implements and machinery	
8	Study on wetland preparation implements and machineries	2
9	Visit to farm machinery industry and its research center	2
10	Study of reaper cum binder and flail mowers	2
11	Determination of operational cost of farm implement	2

Course Outcome

During this course, students have an ability
CO1: To identify farm equipment
CO2: To calculate and predict the actual field problem during the operation.
CO3: To trained to do adjustments of farm implements and Hitching of agricultural implements and trailers.
CO4: To give care and maintenance to the farm machinery implements.
CO5: To dismantle and assemble various machineries used in agriculture.

TEXT BOOKS:

T1 Jagdishwar Sahay. Elements of Agricultural Engineering. Standard Publishers Distributors

T2 Jain S. C. and Grace Philip. 2012. Farm Machinery – An Approach. Standard Publishers Distributors., New Delhi

T3 Ojha, T. P. and Michael, A. M. 2011. Principles of Agricultural Engineering Vol. I. Jain Brothers, New Delhi

T4 Yadav, R., and Solanki, H. B. 2009.Numericals and Short Questions in Farm Machinery, Power and Energy in Agriculture.New India Publishing Agency, New Delhi

T5 Liljedahl, J. B., Turnquist, P. K., Smith, D. W., and Hokey, M. 2004. Tractors and Their Power Units. CBS Publishers and Distributers Pvt. Ltd, New Delhi

REFERENCE BOOKS:

R1 Jain, S.C. and C.R. Rai. Farm Tractor Maintenance and Repair. Standard publishers and Distributors, New Delhi, 1999.

R2 Herbert L.Nichols Sr., Moving the Earth, D. Van Nostrand company Inc. Princeton, 1959.

R3 John A Havers and Frank W Stubbs, Hand book of Heavy Construction, McGraw – Hill book Company, New York, 1971.

R4 Barger, E.L., J.B. Liljedahl and E.C. McKibben, Tractors and their Power Units. Wiley Eastern Pvt. Ltd., New Delhi, 1997.

R5 Kepner, R.A., et al. Principles of farm machinery. CBS Publishers and Distributers, Delhi. 99, 1997.

S.NO	LIST OF EQUIPMENTS	REQUIRED QUANTITY
1	Tractor	1
2	Power tiller	1
3	Disc plough	1
4	Disc harrow	1
5	Multi tyne cultivator	1
6	Seed drill	1
7	Sprayer	1
8	Weeder	1
9	Seed drill cum fertilizer	1
10	Rocker arm sprayer	1

PO & PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO
CO1	2	3	1	2	-	-	1	-	-	-	-	-	-	-
CO2	2	3	1	2	-	-	1	-	-	-	-	-	-	-
CO3	3	3	1	2	-	-	2	-	-	-	-	-	-	-
CO4	1	3	1	-	2	-	2	-	-	-	-	-	-	-
CO5	3	3	1	-	1	-	3	-	-	-	-	2	-	-
Avg	2	3	1	2	1	0	2	0	0	0	0	1	0	0

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Programme	Course Code	Course Title	L	T	P	C
BE/BTECH	22HE4072	Soft Skills and Aptitude III	0	0	0	1

Course Objectives:

1. Solve Logical Reasoning questions of easy to intermediate level
2. Solve Quantitative Aptitude questions of easy to intermediate level
3. Solve Verbal Ability questions of easy to intermediate level
4. Display good writing skills while dealing with essays

Unit	Description	Instructional Hours
I	**Logical Reasoning** Clocks - Calendars - Direction Sense - Cubes - Data Interpretation: Tables, Pie Chart, Bar Graph - Data Sufficiency - Syllogism	10
II	**Quantitative Aptitude** Time and work: Work with different efficiencies, Pipes and cisterns, Work equivalence, Division of wages - Time, Speed and Distance: Basics of time, speed and distance, Relative speed, Problems based on trains, Problems based on boats and streams, Problems based on races - Profit and loss, Partnerships and averages: Basic terminologies in profit and loss - Partnership - Averages - Weighted average Permutation, Combination: Fundamental Counting Principle, Permutation and Combination, Computation of Permutation, Circular Permutations, Computation of Combination - Probability	12
III	**Verbal Ability** Sentence Correction: Subject-Verb Agreement, Modifiers, Parallelism, Pronoun-Antecedent Agreement, Verb Time Sequences, Comparisons, - Sentence Completion and Para-jumbles- Critical Reasoning: Argument – Identifying the Different Parts (Premise, assumption, conclusion), Strengthening statement, Weakening statement, Mimic the pattern	6
IV	**Recruitment Essentials** Cracking interviews - demonstration through a few mocks - Sample mock interviews to demonstrate how to crack the: HR interview, MR interview, Technical interview - Cracking other kinds of interviews: Skype/ Telephonic interviews, Panel interviews, Stress interviews - Resume building – workshop: A workshop to make students write an accurate resume- Essay Writing	2
	Total Instructional Hours	30

Course Outcome:

CO1: Students will avoid the various fallacies that can arise through the misuse of logic.

CO2: Students would opt for alternate methods to solve the problems rather than conventional methods.

CO3: Students will heighten their awareness of correct usage of English grammar in writing and speaking

CO4: Students will be concise and clear, using professional language for placements.

REFERENCE BOOKS:

R1: A New Approach To Reasoning Verbal & Non-Verbal By B.S. Sijwali

R2: How to prepare for data interpretation for CAT by Arun Sharma.

R3: How to Crack TEST OF REASONING in all competitive examinations by Jaikishan and Premkishan.

R4: Quantitative Aptitude for Competitive Examinations - Dr. R.S. Aggarwal, S. Chand

R5: Word Power Made Easy by Norman Lewis

R:6 Six weeks to words of power by Wilfred Funk

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COLLEGE OF ENGINEERING AND TECHNOLOGY

(An Autonomous Institution)

Coimbatore– 641032

DEPARTMENT OF AGRICULTURAL ENGINEERING

Revised Curriculum and Syllabus for the

Batch 2021 – 2025 (Even SEMESTER)

(Academic Council Meeting Held on 26.12.2023)

2019 REGULATIONS WITH AMENDMENTS

(For the students admitted during the academic year 2021-2025 and onwards)

SEMESTER I

S.No.	Course Code	Course Title	Category	L	T	P	C	CI A	ESE	TOTAL
THEORY										
1	21HE1101	Technical English	HS	3	0	0	3	25	75	100
2	21HE1001	Language Competency Enhancement Course-I	HS	3	1	0	4	25	75	100
3	21MA1102	Calculus and Linear Algebra	BS	3	0	0	3	25	75	100
4	21ME1101	Basics of civil and Mechanical Engineering	HS	3	0	0	3	25	75	100
THEORY WITH LAB COMPONENT										
5	21PH1151	Applied Physics	BS	2	0	2	3	50	50	100
6	21CY1151	Chemistry for Engineers	BS	2	0	2	3	50	50	100
7	21CS1151	Python Programming and Practices	ES	2	0	2	3	50	50	100
MANDATORY COURSES										
9	21HE1072	**Career Guidance Level – I** Personality, Aptitude and Career Development	EEC	2	0	0	0	100	-	100
			Total :	**16**	**1**	**10**	**22**	**350**	**450**	**800**

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SEMESTER II

S.No.	Course Code	Course Title	Category	L	T	P	C	CI A	ESE	TOTAL
THEORY										
1	21HE2101	Business English for Engineers	HS	3	0	0	3	25	75	100
2	21HE2001	Language Competency Enhancement Course-II	HS	3	1	0	4	25	75	100
3	21MA2101	Differential Equations and Complex Variables	BS	3	0	0	3	25	75	100
4	21AG2104	Principles of Food Science	PC	3	0	0	3	25	75	100
THEORY WITH LAB COMPONENT										
5	21PH2151	Material Science	BS	2	0	2	3	50	50	100
6	21CY2151	Environmental Studies	BS	2	0	2	3	50	50	100
7	21IT2151	Programming in C	ES	2	0	2	3	50	50	100
PRACTICAL										
8	21ME2001	Engineering Practices	ES	0	0	4	2	50	50	100
MANDATORY COURSES										
9	21HE2072	**Career Guidance Level** – II Personality, Aptitude and Career Development	EEC	2	0	0	0	100	-	100
10	21HE1073	Entrepreneurship & Innovation	EEC	1	0	0	0	100	-	100
			Total :	**16**	**1**	**10**	**22**	**500**	**500**	**1000**

SEMESTER III

S.No	Course Code	Course Title	Category	L	T	P	C	CIA	ESE	TOTA L
THEORY										
1	21MA3102	Fourier Analysis and Transforms	BS	3	1	0	4	25	75	100
2	21AG3201	Soil Science and Engineering	PC	3	0	0	3	25	75	100
3	21AG3202	Fluid Mechanics and Hydraulics	PC	3	1	0	4	25	75	100
4	21AG3203	Principles and practices of Crop Production	PC	3	0	0	3	25	75	100
THEORY WITH LAB COMPONENT										
5	21AG3251	Unit Operations in Agricultural Processing	PC	2	0	2	3	50	50	100
PRACTICAL										
6	21AG3001	Field Crop Production Practical		0	0	3	1.5	50	50	100

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7	21AG3002	Soil Science Laboratory	PC	0	0	3	1.5	50	50	100
MANDATORY COURSES										
8	21MC3191	Indian Constitution	AC	2	0	0	0	100	0	100
9	21HE3072	**Career Guidance Level – III** Personality, Aptitude and Career Development	EEC	2	0	0	0	100	-	100
10	21HE3073	Leadership Management Skills	EEC	1	0	0	0	100	-	100
			Total	**16**	**2**	**8**	**20**	**550**	**450**	**1000**

SEMESTER IV

S.No	Course Code	Course Title	Category	L	T	P	C	CIA	ESE	TOTAL
THEORY										
1	21AG4201	Farm Tractors	PC	2	1	0	3	25	75	100
2	21AG4202	Thermodynamics	PC	3	0	0	3	25	75	100
3	21AG4203	Irrigation and Drainage Engineering	PC	3	0	0	3	25	75	100
THEORY WITH LAB COMPONENT										
4	21MA4152	Statistics and Numerical Methods	BS	3	0	2	4	50	50	100
5	21AG4251	Bio-Energy Resource Technology	PC	2	0	2	3	50	50	100
6	21AG4252	Surveying and Leveling	PC	2	0	2	3	50	50	100
PRACTICAL										
7	21AG4001	Irrigation Field Laboratory	PC	0	0	4	2	50	50	100
MANDATORY COURSES										
8	21AC4191	Essence of Indian tradition knowledge/Value Education	AC	2	0	0	0	100	0	100
9	21HE4072	**Career Guidance Level – IV** Personality, Aptitude and Career Development	EEC	2	0	0	0	100	-	100
10	21HE4073	Ideation Skills	EEC	1	0	0	0	100	-	100
			Total	**17**	**0**	**10**	**21**	**575**	**425**	**1000**

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SEMESTER V

S.No.	Course Code	Course Title	Category	L	T	P	C	CIA	ESE	TOTAL
THEORY										
1	21AG5201	Farm Machinery and Equipment	PC	3	0	0	3	25	75	100
2	21AG5202	Refrigeration and Cold Chain Management	PC	3	1	0	4	25	75	100
3	21AG5203	Theory of Machines	PC	3	0	0	3	25	75	100
4	21AG53XX	Professional Elective-I	PE	3	0	0	3	25	75	100
THEORY WITH LAB COMPONENT										
5	21AG5251	Groundwater and Well Engineering	PC	2	0	2	3	50	50	100
6	21AG5252	Soil and Water Conservation Engineering	PC	2	0	2	3	50	50	100
PRACTICALS										
7	21AG5001	Operation and Maintenance of Farm Machinery Laboratory	PC	0	0	3	1.5	50	50	100
8	21AG5002	CAD for Agricultural Engineering	PC	0	0	3	1.5	50	50	100
MANDATORY COURSES										
9	21HE5071	Soft Skills - I	EEC	1	0	0	1	25	75	100
10	21HE5072	Design Thinking	EEC	1	0	0	1	25	75	100
			Total	**16**	**1**	**10**	**22**	**350**	**650**	**1000**

SEMESTER VI

S.No.	Course Code	Course Title	Category	L	T	P	C	CIA	ESE	TOTAL
THEORY										
1	21AG6201	Hydrology and Water Resources Engineering	PC	3	0	0	3	25	75	100
2	21AG6202	Solar and Wind Energy Engineering	PC	3	1	0	4	25	75	100
3	21AG6181	Professional Ethics	HS	3	0	0	3	25	75	100
4	21AG63XX	Professional Elective-II	PE	3	0	0	3	25	75	100
5	21XX64XX	Open Elective-I	OE	3	0	0	3	25	75	100
THEORY WITH LAB COMPONENTS										

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6	21AG6251	Food and Dairy Engineering	PC	2	0	2	3	50	50	100
PRACTICALS										
7	21AG6252	ICT in Agricultural Engineering	PC	0	0	4	2	50	50	100
MANDATORY COURSES										
8	21AG6701	Industrial Training	EEC	0	0	0	1	0	100	100
9	21HE6071	Soft Skills - II	EEC	1	0	0	1	25	75	100
10	21HE6072	Intellectual Property Rights (IPR)	EEC	1	0	0	1	25	75	100
			Total	**17**	**1**	**6**	**22**	**275**	**725**	**1000**

SEMESTER VII

S.No.	Course Code	Course Title	Category	L	T	P	C	CIA	ESE	TOTAL
THEORY										
1	21AG7201	Agricultural Extension	PC	3	0	0	3	25	75	100
2	21AG7202	Remote Sensing and Geographical Information System	PC	3	0	0	3	25	75	100
3	21AG73XX	Professional Elective-III	PE	3	0	0	3	25	75	100
4	21XX74XX	Open Elective-II	OE	3	0	0	3	25	75	100
THEORY WITH LAB COMPONENTS										
5	21AG7251	Precision Farming and Protected Cultivation	PC	2	0	2	3	50	50	100
PRACTICALS										
6	21AG7001	Renewable Energy Laboratory	PC	0	0	3	1.5	50	50	100
7	21AG7002	GIS Laboratory for Agricultural Engineers	PC	0	0	3	1.5	50	50	100
INNOVATION PROJECT										
8	21AG7901	Innovative Project	EEC	0	0	4	2	50	50	100
			Total	**14**	**0**	**12**	**20**	**300**	**500**	**800**

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SEMESTER VIII

S.No.	Course Code	Course Title	Category	L	T	P	C	CIA	ESE	TOTAL
THEORY										
1	21AG83XX	Professional Elective-IV	PE	3	0	0	3	25	75	100
2	21AG83XX	Professional Elective-V	PE	3	0	0	3	25	75	100
PROJECT WORK										
3	21AG8901	Project work	EEC	0	0	16	8	100	100	200
			Total	**6**	**0**	**16**	**14**	**150**	**250**	**400**

TOTAL NUMBER OF CREDITS: 165

LIST OF PROFESSIONAL ELECTIVES

S.No.	Course Code	Course Title	Category	L	T	P	C	CIA	ESE	TOTAL
PROFESSIONAL ELECTIVE I										
1	21AG5301	Systems Analysis and Soft Computing in Agricultural Engineering	PC	3	0	0	3	25	75	100
2	21AG5302	Sustainable Agriculture and Food Security	PC	3	0	0	3	25	75	100
3	21AG5303	CDM and Carbon Trading Technology	PC	3	0	0	3	25	75	100
4	21AG5304	IOT in Agricultural Systems	PC	3	0	0	3	25	75	100
5	21AG5305	Ergonomics and Safety in Agricultural Engineering	PC	3	0	0	3	25	75	100
PROFESSIONAL ELECTIVE II										
1	21AG6301	Climate change and adaptation	PC	3	0	0	3	25	75	100
2	21AG6302	Heat and Mass Transfers for Agricultural Engineers	PC	3	0	0	3	25	75	100
3	21AG6303	Disaster Management	PC	3	0	0	3	25	75	100
4	21AG6304	Horticultural Crop Processing	PC	3	0	0	3	25	75	100
5	21AG6305	Organic Farming Technologies	PC	3	0	0	3	25	75	100

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PROFESSIONAL ELECTIVE III										
1	21AG7301	Post-Harvest Technology	PC	3	0	0	3	25	75	100
2	21AG7302	Dairy Process Technology	PC	3	0	0	3	25	75	100
3	21AG7303	Storage and Packaging Technology	PC	3	0	0	3	25	75	100
4	21AG7304	Process Engineering of Fruits and Vegetables	PC	3	0	0	3	25	75	100
5	21AG7305	Fat and Oil Processing	PC	3	0	0	3	25	75	100
PROFESSIONAL ELECTIVE IV										
1	21AG8301	Agricultural Business Management and Entrepreneurship	PC	3	0	0	3	25	75	100
2	21AG8302	On-Farm Water Management	PC	3	0	0	3	25	75	100
3	21AG8303	Application of Drone and robotics Technology in Agriculture	PC	3	0	0	3	25	75	100
4	21AG8304	Agricultural Waste Management	PC	3	0	0	3	25	75	100
5	21AG8305	Energy Conservation in Agro based Industry	PC	3	0	0	3	25	75	100
PROFESSIONAL ELECTIVE V										
1	21AG8306	Special Farm Equipment's	PC	3	0	0	3	25	75	100
2	21AG8307	Mechanics of Tillage and Traction	PC	3	0	0	3	25	75	100
3	21AG8308	Watershed Hydrology and Management	PC	3	0	0	3	25	75	100
4	21AG8309	Micro Irrigation System	PC	3	0	0	3	25	75	100
5	21AG8310	Agriculture Economics and Farm Management	PC	3	0	0	3	25	75	100

LIST OF OPEN ELECTIVES										
AGRICULTURE ENGINEERING										
S.No.	**Course Code**	**Course Title**	**Category**	**L**	**T**	**P**	**C**	**CIA**	**ESE**	**TOTAL**
1	21AG6401	Research Methodology	OE	3	0	0	3	25	75	100

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2	21AG7401	Urban Agriculture and organic farming	OE	3	0	0	3	25	75	100
LIFE SKILL COURSES										
3	21LSZ401	General Studies for Competitive Examinations	OE	3	0	0	3	25	75	100
4	21LSZ402	Human Rights, Women's Rights and Gender Equality	OE	3	0	0	3	25	75	100
5	21LSZ403	Indian Ethos and Human Values	OE	3	0	0	3	25	75	100
6	21LSZ404	Indian Constitution and Political System	OE	3	0	0	3	25	75	100
7	21LSZ405	Yoga for Human Excellence	OE	3	0	0	3	25	75	100
NCC COURSES (Only for the students' who have opted NCC subjects in Semester I, II, III & IV are eligible)										
9	21HEZ401	NCC Course level -1	OE	3	0	0	3	25	75	100
10	21HEZ401	NCC Course level -2	OE	3	0	0	3	25	75	100

ADDITIONAL CREDIT COURSE FOR NCC CADETS

S.No.	Course Code	Course Title	Type	L	T	P	C	CIA	ESE	TOTAL
1	21HE1074	NCC General and National Integration	VA	1	0	0	1	100	-	100
2	21HE2074	Social services and community development	VA	1	0	0	1	100	-	100
3	21HE3074	Leadership Qualities and camp activities	VA	1	0	0	1	100	-	100
4	21HE4074	General awareness, communication and Aero engines	VA	1	0	0	1	100	-	100

(Note: Z Stands for semester, students can't choose twice the course)

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CREDIT DISTRIBUTION

Semester	I	II	III	IV	V	VI	VII	VIII	Total
Credits	20	22	20	21	22	22	20	18	165

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COIMBATORE - 641 032.

Programme	Course Code	Name of the Course	L	T	P	C
B.E.	21AG6201	HYDROLOGY AND WATER RESOURCES ENGINEERING	3	0	0	3

Course Objective

To inculcate the concept s of hydrological aspects of water availability to the student community and to design the requirements, quantity, control and regulate the water resources.

Unit	Description	Instructional Hours
I	**PRECIPITATION AND ABSTRACTIONS** Hydrological cycle- Meteorological measurements – Requirements, types and forms of precipitation - Rain gauges-Spatial analysis of rainfall data using Thiessen and Isohyetal methods-Interception - Evaporation. Horton's equation, pan evaporation measurements and evaporation suppression - Infiltration-Horton's equation - double ring infiltrometer, infiltration indices.	9
II	**RUNOFF AND HYDROGRAPH** Watershed, catchment and basin - Catchment characteristics - factors affecting runoff - Run off estimation using empirical - Strange's table and SCS methods – Stage discharge relationships flow measurements- Hydrograph – Unit Hydrograph – IUH	9
III	**FLOOD AND DROUGHT** Natural Disasters-Flood Estimation- Frequency analysis- Flood control- Definitions of droughts- Meteorological, hydrological and agricultural droughts- IMD method-NDVI analysis- Drought Prone Area Programme (DPAP)	9
IV	**RESERVOIRS** Classification of reservoirs - Single Purpose Conservation Reservoir-Single Purpose Flood Control Reservoir-Multipurpose Reservoir- General principles of design- site selection- spillways -elevation – area - capacity - storage estimation, sedimentation - life of reservoirs – rule curve.	9
V	**MANAGEMENT OF WATER RESOURCES** River Training and Riverbank Protection Works – Guide bunds or banks - Approach embankment- Groynes or Spurs- Marginal embankments- Drought and flood Management - drought and flood affected areas of India - Agricultural Drought - Indices for drought monitoring - Tackling drought through water management- Remote Sensing and GIS for water resource management.	9
	Total Instructional Hours	45

COURSE OUTCOMES

At the end of the study the student will have knowledge on

CO1:An understanding of the key drivers on water resources, hydrological processes and their integrated behavior in catchments.

CO2:Ability to construct and apply a range of hydrological models to surface water and groundwater problems including Hydrograph, Flood/Drought management, artificial recharge.

CO3:Ability to conduct Spatial analysis of rainfall data and design water storage reservoirs

CO4:Understand the concept and methods of water management

CO5: Ability to design and analyze the water resources during flood and drought using advanced technologies.

TEXT BOOKS

T1 Subramanya .K. "Engineering Hydrology"- Tata McGraw Hill, 2010

T2 Jayarami Reddy .P. "Hydrology", Tata McGraw Hill, 2008.

T3 Linsley, R.K. and Franzini, J.B. "Water Resources Engineering", McGraw Hill International Book Company, 1995.

REFERENCE BOOKS

R1 David Keith Todd. "Groundwater Hydrology", John Wiley & Sons, Inc. 2007

R2 Ven Te Chow, Maidment, D.R. and Mays, L.W. "Applied Hydrology", McGraw Hill International Book Company, 1998.

PO & PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	1	-	1	2	1	2	1	1	1	1	2	3	2
CO2	1	1	2	2	2	1	2	-	1	2	-	2	2	2
CO3	2	2	2	1	2	2	2	1	2	1	1	2	2	2
CO4	2	1	1	2	2	1	2	1	1	2	-	1	2	2
CO5	3	2	3	2	3	2	2	1	2	2	2	2	2	2
Avg	2	2	3	2	2	2	2	1	1	2	1	2	2	2

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	21AG6202	SOLAR AND WIND ENERGY ENGINEERING	3	1	0	4

Course Objective

To visualizes the solar and wind energy available in nature.

Learn the fundamental concepts about solar and wind energy systems.

To illustrate Design parameters of wind mill and solar PV system.

To know about applications of solar and wind energy for water pumping and electricity generation.

Unit	Description	Instructional Hours
I	**SOLAR ENERGY** Introduction-Solar constant- solar radiation measurements -Solar collectors and classification- -Applications of Solar Energy- solar water heater- Solar Cooker - Solar dryer- Solar distillation –Solar stills - Solar pond -solar greenhouse - PV powered water pumping – Hybrid system -Solar refrigeration.	9
II	**CONCENTRATING COLLECTORS DESIGN** Solar Thermal Energy Storage- Sensible storage- Latent heat storage-Thermo-chemical storage – Design and performance parameters of concentrating collector - tracking systems- Compound parabolic concentrators, parabolic trough concentrators, Concentrators with point focus, Heliostats.	9
III	**SOLAR PV TECHNOLOGY** Solar photovoltaic technology –introduction – solar cell basics – Types of solar cells and modules– Design of solar PV system- Fabrication technology for solar Cells.	9
IV	**WIND ENERGY** Introduction- The nature of wind- power in the wind- Forces on the Blades -Site Selection considerations-Basic components of a wind energy conversion system (WECS)- Economics of Wind energy Utilization- Wind energy Programm in India.	9
V	**WIND MILL TYPES AND APPLICATIONS** Wind turbines (Wind mill) -Horizontal Axis wind mill-Vertical Axis wind mill-Water pumping - Hybrid systems –Design parameters of wind mill- Wind mill safety and environmental aspects.	9
	Total Instructional Hours	45

COURSE OUTCOMES

At the end of the study the student will have knowledge on

CO1: Understand the need of energy conversion and the various methods of energy storage

CO2: student able to explain the field applications of solar energy

CO3: understanding Winds energy as alternate form of energy and to know how it can be tapped

CO4: Illustrate the concepts of Direct Energy Conversion systems & their applications.

CO5: Select engineering approach to problem solving when implementing the projects on renewable sources.

TEXT BOOKS:

T1 Rai., G.D. "Solar Energy Utilization" Khanna publishers, New Delhi, 2002

T2 More, H.S and R.C. Maheshwari, "Wind Energy Utilization in India" CIAE Publication – Bhopal, 1982

T3 Rao. S and B.B. Parulekar. Energy Technology – Non conventional, Renewable and Conventional. Khanna Publishers, Delhi, 2000.

REFERENCE BOOKS:

R1 Mathew Buresch, Photovoltaics Energy Systems. McGraw-Hill Book Company, London, 1986.

R2 Jui Sheng Hsieh. Solar Energy Engineering, Prentice Hall, London, 1986.

R3 Tany Burtar, Hand book of wind energy. John Wiley and Sons, 2001,

R4 J.G.Mc Gowan, Manwell, J.F. and A.L.Rogers. Wind Energy Explained – Theory Design and Application, John Wiley and Sons Ltd, 2004.

R5 Rai. G.D. "Non-Conventional Sources of Energy", Khanna Publishers, New Delhi, 2002.

PO&PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	1	-	-	-	1	2	1	1	-	1	2	3	1
CO2	3	3	3	3	3	2	3	1	3	2	2	3	3	2
CO3	3	3	3	3	2	2	3	1	3	3	3	3	3	2
CO4	2	2	2	2	2	2	3	1	2	3	3	3	3	2
CO5	1	1	-	-	-	1	2	1	1	1	1	2	3	3
Avg	2	2	3	3	2	2	3	1	2	2	2	3	3	2

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	21AG6181	PROFESSIONAL ETHICS	3	0	0	3

Course Objective

- To enable the students' minds to get an awareness on Engineering Ethics and Human Values
- To instill Moral and to uphold Social Values in appreciation to the on par rights of others.

Unit	Description	Instructional Hours
I	**HUMAN VALUES** Morals, values and Ethics – Integrity – Work ethic – Service learning – Civic virtue – Respect for others – Living peacefully – Caring – Sharing – Honesty – Courage – Valuing time – Cooperation – Commitment – Empathy – Self confidence – Character – Spirituality – Introduction to Yoga and meditation for professional excellence and stress management. Maintain physical health in yoga.	9
II	**ENGINEERING ETHICS** Senses of 'Engineering Ethics' – Variety of moral issues – Types of inquiry – Moral dilemmas – Moral Autonomy – Kohlberg's theory – Gilligan's theory – Consensus and Controversy – Models of professional roles - Theories about right action – Self-interest – Customs and Religion .	9
III	**SOCIAL EXPERIMENTATION** Engineering with societal Experimentation – Engineers as responsible Experimenters – Calibration Codes of Engineering Ethics – A Balanced Outlook on Law.	9
IV	**SAFETY, RESPONSIBILITY AND RIGHTS ISSUES** Safety and Risk – Assessment of Safety and Risk – Risk Benefit Analysis and Reducing Risk - Respect for Authority – Collective Bargaining – Confidentiality – Conflicts of Interest – Occupational Crime – Professional Rights – Employee Rights – Intellectual Property Rights (IPR) – Discrimination.	9
V	**GLOBAL ISSUES** Multinational Corporations – Environmental Ethics – Computer Ethics – Weapons Development – Engineers as Managers – Consulting Engineers – Engineers as Expert Witnesses and Advisors – Moral Leadership –Code of Conduct – Corporate Social Responsibility.	9
	Total Instructional Hours	45

Course Outcome

CO1: Upon completion of the course, the student should be able to apply ethics in society, discuss the ethical issues related to engineering and realize the responsibilities and rights in the society.
CO2: To learn Calibration Codes of Engineering Ethics
CO3: Understand the Intellectual Property Rights (IPR) for new invention
CO4: Assessment of Safety and Risk in effective way.
CO5: Understand the importance of Corporate Social Responsibility.

TEXT BOOKS:

T1 Mike W. Martin and Roland Schinzinger, "Ethics in Engineering", Tata McGraw Hill, New Delhi, 2003.

T2 Govindarajan M, Natarajan S, Senthil Kumar V. S, "Engineering Ethics", Prentice Hall of India, New Delhi, 2004.

REFERENCE BOOKS:

R1 Charles B. Fleddermann, "Engineering Ethics", Pearson Prentice Hall, New Jersey, 2004.

R2 Charles E. Harris, Michael S. Pritchard and Michael J. Rabins, "Engineering Ethics – Concepts and Cases", Cengage Learning, 2009

PO & PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	3	1	2	-	-	3	-	-	-	2	3	2
CO2	3	3	3	2	1	-	-	3	-	-	-	3	2	2
CO3	3	3	3	1	1	-	-	3	-	-	-	2	2	2
CO4	3	3	3	3	3	-	-	3	-	-	-	2	2	2
CO5	3	3	3	3	3	-	-	3	-	-	-	2	2	2
Avg	3	2.8	3	2	2	-	-	3	-	-	-	2.2	2.2	2

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Programme	Course Code	Name of the Course	L	T	P	C
B.E	21AG6302	HEAT AND MASS TRANSFER FOR AGRICULTURAL ENGINEERS	3	0	0	3

Course Objective

- To impart the knowledge on heat transfer mechanisms in fluids and solids, and their applications in various heat transfer equipment
- To introduce non-dimensional numbers and their effects in governing various modes of mass transfer
- To analyze heat exchangers and methods of evaluating the performance

Unit	Description	Instructional Hours
I	**CONDUCTION** Basic concepts - Mechanism of Heat transfer. Conduction - Fourier's Law, General differential equation in Cartesian and cylindrical coordinates, one dimensional steady state heat conduction, conduction through plane wall, cylinders and spherical systems.	9
II	**CONVECTION** Basic Concepts - Heat transfer coefficients, boundary layer concept. Types of convection - Forced convection, dimensional analysis, non-dimensional numbers, external flow, flow over plates, cylinders and spheres, internal flow, laminar and turbulent flow, combined laminar and turbulent	9
III	**RADIATION** Radiation heat transfer - concept of black and grey body-Laws of Radiation - Stefan-Boltzmann Law, Kirchhoff's Law Black body radiation - Grey body radiation - Shape factor algebra - Radiation shields	9
IV	**HEAT EXCHANGERS** Heat exchangers - Types, heat exchanger analysis, fouling factor, LMTD (Logarithmic mean temperature difference) and Effectiveness-NTU (number of transfer units) Method - Overall Heat Transfer Coefficient	9
V	**MASS TRANSFER** Mass transfer- introduction - Fick law for molecular diffusion - molecular diffusion in gases - equimolar counters diffusion in gases- diffusion through a varying cross sectional area- diffusion coefficients for gases - molecular diffusion in liquids.	9
	Total Instructional Hours	45

Course Outcome After successful completion of this course students are expected to be able to:

CO1:Understand conduction, students will able to in different geometries

CO2:Asses the concepts and types of conversion in heat transfer mechanism

CO3:Recognize the radiation problems in various geometries

CO4:Analyze the performance of heat exchangers and evaporators

CO5:Analyze the various mass transfer methods and calculations

TEXT BOOKS:

T1 R. C. Sachdeva, Fundamentals of Engineering Heat and Mass Transfer, New AgeInternational private limited, New Delhi, 2010

T2 Yunus A. Cengel, Heat and Mass Transfer: a Practical Approach, Tata McGraw Hillpublishing Company private limited, New Delhi, 2007

REFERENCE BOOKS:

R1 J. P. Holman, Heat Transfer, Tata McGraw Hill publishing Company private limited, NewDelhi, 2009

R2 C. P. Kothandaraman and S. Subramanyan, Fundamentals of Heat and Mass Transfer, NewAge International private limited, New Delhi, 2014

R3 Heat and Mass Transfer, S Chand and Company, New Delhi, 2009

PO & PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO
CO1	3	2	3	1	2	-	1	-	-	-	-	2	3	2
CO2	3	3	3	2	1	-	-	-	-	-	-	3	2	2
CO3	3	3	3	1	1	2	-	-	-	-	-	2	2	2
CO4	3	3	3	3	3	3	2	-	-	-	-	2	2	2
CO5	3	3	3	3	3	2	-	-	-	-	-	2	2	2
Avg	3	3	3	2	2	1	1	-	-	-	-	2	2	2

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	21AG6401	MODERN AGRICULTURAL PRACTICES	3	0	0	3

Course Objective

- To understand the knowledge about the Modern farming system and it's important.
- To expose the students to farm mechanization prospects and constraints alongside Cooperative Farming for shared usage of agricultural implements.
- To contribute future invention and innovation in agriculture and allied sectors.

Unit	Description	Instructional Hours
	INTRODUCTIO N TO AGRICULTURE	
	History and importance of agriculture – ITK - Factors affecting crop production – definition and scope of agronomy – cropping pattern and system – IFS – components.	9
	FARM IMPLEMENTS	
II	Modern farming - Tillage – modern concepts – seed drills – sprayers – on farm sensors - VRT- smart farming- concepts – components – combine harvester.	9
	NEW AGE FARMING	
III	Modern techniques - automation – pressurized irrigation – central pivot system – weather & climate – weather modification – climate smart agriculture – GHG - Impact – control measures.	9
	AGRICULTURE AND ALLIED ACTIVITIES	
IV	Scope and importance – status – domestic bee keeping – indian bee – Italian bee – mulberry silkworm – oyster and button mushroom production – livestock - poultrty – concepts.	9
	CURRENT TECHNOLOGY IN AGRICULTURE	
V	Robotics and Drone usage in Agriculture – precision agriculture - GIS and RS for Crop Mapping and Surveying - Application -Research gape in agriculture and Improvement.	9
	Total **Instructional Hours**	45

Course Outcome

CO1: The students will be able to perceive the significance of agriculture and farming systems

CO2: The students will get acquainted the contextual usage and operation of various latest equipment used in the farm for different field operations.

CO3: The students will able to understand the concept and gain knowledge in current traits

CO4: The students will equip with technical knowledge and skills on agriculture allied activities

CO5: To develop skills in the students required to develop and modification of technology for sustainable food production.

TEXT BOOKS:

T1 Jagdishwar Sahay. Elements of Agricultural Engineering. Standard Publishers Distributors

T2 Jain S. C. and Grace Philip. 2012. Farm Machinery – An Approach. Standard Publishers Distributors., New Delhi

T3 Ojha, T. P. and Michael, A. M. 2011. Principles of Agricultural Engineering Vol. I. Jain Brothers, New Delhi

T4 Yadav, R., and Solanki, H. B. 2009.Numericals and Short Questions in Farm Machinery, Power and Energy in Agriculture.New India Publishing Agency, New Delhi.

T5 Liljedahl, J. B., Turnquist, P. K., Smith, D. W., and Hokey, M. 2004. Tractors and Their Power Units. CBS Publishers and Distributers Pvt. Ltd, New Delhi

REFERENCE BOOKS:

R1 Kepner, R.A., et al. Principles of farm machinery. CBS Publishers and Distributers, Delhi. 99, 1997.

R2 Harris Pearson Smith et al. Farm machinery and equipment. Tata McGraw-Hill pub., New Delhi.,1996.

R3 Srivastava, A.C. Elements of Farm Machinery. Oxford and IBH Pub. Co., New Delhi, 1990

R4 Singh, S., and Verma, S. R. 2009.Farm Machinery Maintenance and Management. Indian Council of Agricultural Research, New Delhi

R5 Kirpal Singh. 2013. Automobile Engineering Vol. I. Standard Publishers Distributors, Delhi

PO & PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO1	PSO2
CO1	2	2	3	1	2	1	2	1	1	1	2	2	3	2
CO2	2	2	3	2	1	2	1	-	1	2	-	1	2	2
CO3	3	3	3	1	2	2	2	1	-	1	1	2	2	2
CO4	3	3	3	3	2	2	1	-	-	2	-	1	2	2
CO5	2	3	3	3	3	1	2	1	2	2	1	2	2	2
Avg	3	3	3	2	2	2	2	1	1	2	1	2	2	2

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	21AG6251	FOOD AND DAIRY ENGINEERING	2	0	2	3

Course Objective

- To introduce the students to dairy industry, properties and processing of milk, manufacture of dairy products , sanitation and effluent treatment in dairy industry
- To expose the students to the fundamental knowledge of food, its properties and different methods of food processing.
- To train the students to explore different food properties and their reaction kinetics during the different process.
- To acquire better understanding of the food concentration and thermal processing of foods.

Unit	Description	Instructional Hours
I	**PROPERTIES AND PROCESSING OF MILK** Dairy Industry – importance and status – Milk Types – Composition and properties of milk - milk preservation - testing of milk- Processing –Staining - Filtering and Clarification - cream separation – Pasteurization – Homogenization - sterilization, UHT processing emulsification - Fortification. **Lab:** Experiment 1. Determination of specific gravity of milk Experiment 2. Determination of acidity of milk Experiment 3. Clot on boiling test of milk	9
II	**DAIRY PRODUCTS** Manufacture of Milk Powder - Processing of Milk Products - Condensed Milk – Skim milk – Buttermilk - Flavoured Milk, whey, casein, yoghurt and paneer – Manufacture of Butter – Cheese, Ghee, ice creams and frozen desserts - standards for milk and milk products - Packaging of Milk and Milk Products.	9
III	**FOOD AND ITS PROPERTIES, REACTION AND KINETICS** Constituents of food - thermal processing of foods - cooking, blanching, sterilization, pasteurization, canning - Interaction of heat energy on food components, reaction kinetics, Arrhenius equation, TDT curves - water activity, sorption behaviour of foods – isotherm models - monolayer value, BET and GAB model isotherms, Gordon–Taylor equation and WLF equation **Lab:** Experiment 4. Determination of size, true density, bulk density and porosity of food samples Experiment 5. Determination of consistency, viscosity and specific gravity of food samples	9
IV	**PROCESSING AND PRESERVATION OF FOODS** Concentration of foods, freeze concentration - osmotic and reverse osmotic concentration - drying and dehydration of food - Tray, tunnel, belt, vacuum and freeze dryers - rehydration of dehydrated foods - Fat and oil processing, sources, extraction, methods and equipment, refining of oils, hydrogenation- Food preservation methods - preservation by irradiation, microwave and dielectric heating of food.	9

Lab:

Experiment 6. Determination of moisture content of food samples by oven-dry method

Experiment 7. Determination of drying characteristics of fruits and vegetables

Experiment 8. Determination of oil content of given oil seeds using Soxhlet apparatus

V	**PACKAGING AND QUALITY CONTROL** Food packaging, importance, flexible pouches - retort pouches – aseptic packaging, granules, powder and liquid packaging machines - nanotechnology – principles - applications in food processing – food plant location - Quality control of processed food products - Factors affecting quality.	9
	Total Instructional Hours	**45**

Course Outcome

After successful completion of this course students are expected to be able to:

CO1: The students will gain knowledge about Dairy and Food process engineering

CO2: Understand the process of manufacturing of dairy products and thermal processing of food.

CO3: Explain physio-chemical properties of food material and select suitable thermal processing method based on their reaction kinetics.

CO4: Understand the importance of food processing and food preservation methods.

CO5: Assess different types of food packing material and their limitations and application of nanotechnology in food processing

TEXT BOOKS:

T1 Chandra Gopala Rao. Essentials of Food Process Engineering. B.S. Publications, Hyderabad, 2006

T2 Walstra. P., Jan T. M. Wouters., Tom J. Geurts "Dairy Science and Technology", CRC press, 2005

REFERENCE BOOKS:

R1 Dairy Science and Technology Handbook, Volumes 1-3, John Wiley & Sons, 1993.

R2 Toledo, R.T., "Fundamentals of Food Process Engineering", CBS Publishers and Distribution, New Delhi, 1997

R3 Subbulakshmi. G., and Shobha A. Udipi, Food Processing and Preservation, New Age International Publications, New Delhi, 2007

R4 Charm, S.E., "Fundamentals of Food Engineering", AVI Pub.Co.Inc, New York, 1997

PO&PSO →	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	2	2	1		1		2	1		1	2	3	3
CO2	3	2	2	1		2		2	2	2	1	2	3	2
CO3	3	3	2	2		2		2	2		1	2	3	3
CO4	3	3	2	2		2		2	2	2	1	2	3	2
CO5	3	3	2	2		2		2	2		1	2	3	2
Avg	3	2.6	2	1.6	0	1.8	0	2	1.8	0.4	1	2	3	2.2

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	21AG6252	ICT IN AGRICULTURAL ENGINEERING	0	0	4	2

Course Objective

- To gain practical knowledge on various technologies in information and communication for agricultural engineering applications.

S.NO	LIST OF EXPERIMENTS
1	Study on Open-Source Crop Simulation Model for Yield Estimation
2	Study on ICT Tool Used in Agriculture and Its Application
3	Study on use of Coding Language and Mobile Apps for Controlling and Triggering Agricultural System
4	Employing PLC for Controlling or Triggering Water Level in Irrigation Tank
5	Study on SCADA Systems
6	Experience With Solenoid Values for Irrigation Water Tank Filling
7	Using Labview for Agro-Meteorological Measurement-Temperature
8	Using PID SCADA Controller for Irrigation Water Flow Control
9	Using PID SCADA Controller For Irrigation Water Level Control
10	Exposing Cloud Resources For Agricultural Applications
11	Image Processing as Tool for Biotic and Abiotic Stress Identification
12	Using PID SCADA Controller for Irrigation Water Pressure Control
13	Using Labview for Agro-Meteorological Measurement-Humidity

Course Outcome

By the end of the course, the students will be able to

CO1: Gain practical knowledge on various technologies in information and communication for agriculture.

CO2: Learning the crop simulation models and coding language and mobile app usage in agriculture.

CO3: Gain practical knowledge on using LAB View and PID SCAD for controlling agricultural input and output.

CO4: Gain practical knowledge on using MATLAB for Image processing

CO5: Understand about cloud resources for agricultural applications .

S.NO	LIST OF EQUIPMENTS REQUIRED	REQUIRED QUANTITY
1	Timing devices and small pumps for simulations – required nos.	1
2	Solenoid valves and layout of drip or sprinkler system – required nos.	1
3	Time Domain Reflectometer (TDR)	1
4	Digital thermometer	1
5	Breadboards, relays etc.	1
6	MATLABORATORY software	1
7	Open source Crop simulation models – any one for demonstration	1
8	Other facilities for cloud resources, agro advisory systems etc.	1

REFERENCES

R1 Agu, M. N. (2013). Application of ICT in agricultural sector: Women's perspective. International Journal of Soft Computing and Engineering, 2(6), 58-60.

R2 De Silva, H. and Ratnadiwakara, D., 2008. Using ICT to reduce transaction costs in agriculture throughbetter communication: A case-study from Sri Lanka. LIRNEasia, Colombo, Sri Lanka, Nov

R3 Gelb, E. and Voet, H., 2009. ICT Adoption Trends in Agriculture: A summary of the EFITA ICT Adoption Questionnaires (1999-2009). Abrufbar unter: http://departments. agri. huji. ac. il/economics/voet-gelb. pdf.Letzter Zugriff, 20, p.2010.

R4 Tolulope Kehinde, K.A., Agwu, D. and Edwin, M., 2015. Application of ICT to Agriculture as a Panaceato Unemployment in Nigeria

R6 Taragola, N. and Gelb, E., 2005. Information and Communication Technology (ICT) adoption in horticulture: A comparison to the EFITA baseline. ICT in agriculture: Perspectives of technologicalinnovation.

PO&PSO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	2	1	3	-	-	-	-	-	-	-	-	1	2	3
CO2	3	2	2	2	1	2	1	-	1	1	2	3	2	2
CO3	3	2	1	2	1	2	3	-	1	2	1	3	1	2
CO4	1	-	2	1	2	1	-	-	-	-		1	2	1
CO5	1	-	-	-	-	-	-	-	-	-		2	2	12
Avg	2	2	2	2	1	2	2	-	1	2	2	2	2	2

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	21AG6701	INDUSTRIAL TRAINING	0	0	0	1

Course Objective

1. To train the students in field work by attaching to any industry / organization so as to have a firsthand knowledge of practical problems in Agricultural Engineering
2. The students individually undertake training in reputed engineering companies / Govt organisations / NGOs / Educational Institutions who work in the area of Agricultural Engineering for the specified duration.

Course Outcome

CO1: Understand the working culture in industries/NGO and human relationship.

CO2: Understand the variables involved in process sequence and optimization of process parameters.

CO3: To analyze the research problem and formulate methodology to find a solution.

CO4: Understanding the manufacturing processes and marketing strategies.

CO5: To get the exposure in testing and evaluation of tools, equipment and machinery and preparing a test report.

PO&PSO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	2	2	-	-	-	-	-	-	-	-	-	3	1
CO2	3	-	2	-	-	2	-	-	-	-	-	-	3	2
CO3	-	1	2	2	2	-	-	-	-	-	-	-	3	2
CO4	3	-	2	-	-	-	-	-	-	-	-	2	-	3
CO5	1	3	3	3	-	-	-	-	-	-	-	2	-	3
Avg	3	2	2	3	-	2	-	-	-	-	-	2	3	3

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Programme	Course Code	Course Title	L	T	P	C
BE/BTECH	21HE6071	Soft Skills - II	0	0	0	1

Course Objectives:

1. To make the students aware of the importance, the role and the content of soft skills throughinstruction, knowledge acquisition, demonstration and practice.
2. To learn everything from equations to probability with a completely different approach.
3. To make the students learn on an increased ability to explain the problem comprehensively.

Unit	Description	Instructional Hours
I	**Group Discussion & Presentation Skills:** GD skills – Understanding the objective and skills tested in a GD – General types of GDs – Roles in a GD – Do's & Don'ts – Mock GD& Feedback.- Presentation Skills – Stages involved in an effective presentation – selection of topic, content, aids – Engaging the audience – Time management – Mock Presentations & Feedback	7
II	**Interview Skills and Personality Skills:** Interview handling Skills – Self preparation checklist – Grooming tips: do's & don'ts – mock interview & feedback - Interpersonalskills-creative thinking-problem solving-analytical skills	5
III	**Business Etiquette & Ethics:** Etiquette – Telephone & E-mail etiquette – Dining etiquette – do's & Don'ts in a formal setting – how to impress. Ethics – Importance of Ethics and Values – Choices and Dilemmas faced – Discussions from news headlines.	6
IV	**Quantitative Aptitude:** Permutation, Combination - Probability - Logarithm - Quadratic Equations - Algebra - Progression - Geometry - Mensuration.	6
V	**Logical Reasoning:** Logical Connectives - Syllogisms - Venn Diagrams – Cubes - Codedinequalities - Conditions and Grouping	6

Course Outcome:

CO1: Students will have learnt to keep going according to plan, coping with theunfamiliar, managing disappointment and dealing with conflict.

CO2: Students will Actively participate meetings, Group Discussions / interviews and prepare& deliver presentations

CO3: Students will define professional behavior and suggest standards for appearance, actions and attitude in a Business environment

CO4: Students will be able to apply quantitative reasoning and mathematical analysismethodologies to understand and solve problems.

CO5: Students will excel in complex reasoning.

REFERENCE BOOKS:

R1: Bridging the Soft Skills Gap: How to Teach the Missing Basics to Todays Young Talent- Bruce Tulgan

R2: Quantitative Aptitude for Competitive Examinations (5th Edition) - Abhjit Guha

R3: How to crack test of Reasoning - Jaikishan and Premkishan

R4: The hand on guide to Analytical Reasoning and Logical Reasoning - Peeyush Bhardwaj

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Programme	Course code	Name of the course	L	T	P	C
B.E.	21HE6072	INTELLECTUAL PROPERTY RIGHTS (IPR)	1	0	0	1

Course Objective

The student should be able

1. To introduce fundamental aspects of Intellectual property Rights to students who are going to play a major role in development and management of innovative projects in industries.
2. To disseminate knowledge on patents, patent regime in India and abroad and registration aspects.
3. To disseminate knowledge on copyrights and its related rights and registration aspects.
4. To disseminate knowledge on trademarks and registration aspects.
5. To disseminate knowledge on Design, Geographical Indication (GI) and their registration aspects.

Unit	Description	Instructional Hours
I	**INTRODUCTION TO INTELLECTUAL PROPERTY** Introduction, Types of Intellectual Property, International Organizations, Agencies and Treaties, Importance of Intellectual Property Rights.	3
II	**PATENTS** Patents -Elements of Patentability: Novelty, Non-Obviousness (Inventive Steps), Industrial Application -Non - Patentable Subject Matter -Registration Procedure, Rights and Duties of Patentee, Assignment and license.	3
III	**COPYRIGHTS** Purpose And Function Of Trade Marks, Acquisition Of Trade Mark Rights, Protectable Matter, Selecting And Evaluating Trade Mark, Trade Mark Registration Processes.	3
IV	**TRADEMARKS** Concept of Trademarks -Different kinds of marks (brand names, logos, signatures, symbols, well known marks, certification marks and service marks) -Non-Registrable Trademarks -Registration of Trademarks.	3
V	**DESIGN AND GEOGRAPHICAL INDICATION** Design: meaning and concept of novel and original -Procedure for registration. Geographical indication: meaning, and difference between GI and trademarks - Procedure for registration.	3
	Total Instructional Hours	**45**

Course Outcome

Upon completion of the course, the students will be able to:

CO1: Identify different types of Intellectual Properties (IPs), the right of ownership, scope of protection as well as the ways to create and to extract value from IP.

CO2: Recognize the crucial role of IP in organizations of different industrial sectors for the purposes of product and technology development.

CO3: Identify, apply and assess ownership rights and marketing protection under intellectual property law as applicable to information, ideas, new products and product marketing.

CO4: Identify different types of trademarks and procedure for registration

CO5: Recognize the concept of design, geographical indication and procedure for registration.

TEXT BOOK:

T1 Neeraj, P., & Khusdeep, D. (2014). Intellectual Property Rights. India, IN: PHI learning Private Limited.
T2 Scople Vinod, Managing Intellectual Property, Prentice Hall of India pvt. Ltd, 2012.

REFERENCES:

R1 Ahuja, V K. (2017). Law relating to Intellectual Property Rights. India, IN: Lexis Nexis.
R2 Derek Bosworth and Elizabeth Webster, The Management of Intellectual Property, Edward Elgar Publishing Ltd., 2013.

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HINDUSTHAN

COLLEGE OF ENGINEERING AND TECHNOLOGY

(An Autonomous Institution)

Coimbatore– 641032

DEPARTMENT OF AGRICULTURAL ENGINEERING

Revised Curriculum and Syllabus for the

Batch 2020-2024 (Even SEMESTER)

(Academic Council Meeting Held on 26.12.2023)

2019 REGULATIONS

CBCS PATTERN

UNDERGRADUATE PROGRAMMES

B.E AGRICULTURE ENGINEERING (UG)

REGULATION-2019 (Revised on Feb 2022)

(For the students admitted during the academic year 2020-2024)

SEMESTER I

S.No.	Course Code	Course Title	Category	L	T	P	C	CIA	ESE	TOTAL
THEORY										
1	19HE1101	Technical English	HS	3	0	0	3	25	75	100
2	19MA1102	Calculus and Linear Algebra	BS	3	1	0	4	25	75	100
3	19ME1101	Basics of Civil and Mechanical Engineering	ES	3	0	0	3	25	75	100
THEORY WITH LAB COMPONENT										
4	19PH1151	Applied Physics	BS	2	0	2	3	50	50	100
5	19CY1151	Chemistry for Engineers	BS	2	0	2	3	50	50	100
6	19CS1151	Python programming and practices	ES	2	0	2	3	50	50	100
PRACTICAL										
7	19HE1001	Language competency enhancement course - I	HS	0	0	1	1	100	-	100
			Total :	**15**	**1**	**6**	**20**			**700**

As per AICTE 3 weeks Induction programme is Added in the First Semester as an Audit Course

SEMESTER II

S.No.	Course Code	Course Title	Category	L	T	P	C	CIA	ESE	TOTAL
THEORY										
1	19HE2101	Business English for Engineers	HS	3	0	0	3	25	75	100

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2	19MA2101	Differential Equations and Complex Variables	BS	3	1	0	4	25	75	100
3	19AG2104	Principles of Food Science	ES	3	0	0	3	25	75	100
THEORY WITH LAB COMPONENT										
4	19PH2151	Material Science	BS	2	0	2	3	50	50	100
5	19CY2151	Environmental studies	BS	2	0	2	3	50	50	100
6	19IT2151	Programming in C	ES	2	0	2	3	50	50	100
PRACTICAL										
7	19ME2001	Engineering Practices	ES	0	0	4	2	50	50	100
8	19HE2001	Language Competency Enhancement Course-II	HS	0	0	1	1	100	-	100
			Total :	**15**	**1**	**11**	**22**	**375**	**425**	**800**

SEMESTER III

S.No	Course Code	Course Title	Category	L	T	P	C	CIA	ESE	TOTAL
THEORY										
1	19MA3102	Fourier Analysis and Transforms	BS	3	1	0	4	25	75	100
2	19AG3201	Soil Science and Engineering	PC	3	0	0	3	25	75	100
3	19AG3202	Fluid Mechanics and Hydraulics	PC	3	1	0	4	25	75	100
4	19AG3203	Principles and practices of Crop Production	PC	3	0	0	3	25	75	100
THEORY WITH LAB COMPONENT										
5	19AG3251	Unit Operations in Agricultural Processing	PC	2	0	2	3	50	50	100
PRACTICAL										
6	19AG3001	Field Crop Production Practical	PC	0	0	3	1.5	50	50	100
7	19AG3002	Soil Science Laboratory	PC	0	0	3	1.5	50	50	100
MANDATORY COURSES										
8	19MC3191	Indian Constitution		2	0	0	0	100		100
			Total:	**16**	**2**	**8**	**20**	**350**	**450**	**800**

SEMESTER IV

S.No	Course Code	Course Title	Category	L	T	P	C	CIA	ESE	TOTAL
THEORY										
1	19AG4201	Farm Tractors	PC	2	1	0	3	25	75	100
2	19AG4202	Thermodynamics	PC	3	0	0	3	25	75	100
3	19AG4203	Irrigation and Drainage Engineering	PC	3	0	0	3	25	75	100
THEORY WITH LAB COMPONENT										
4	19MA4152	Statistics and Numerical	BS	3	0	2	4	50	50	100

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		Methods								
5	19AG4251	Bio-Energy Resource Technology	PC	2	0	2	3	50	50	100
6	19AG4252	Surveying and Leveling	PC	2	0	2	3	50	50	100
PRACTICAL										
7	19AG4001	Irrigation Field Laboratory	PC	0	0	4	2	50	50	100
MANDATORY COURSES										
8	19AC4191	Essence of Indian tradition knowledge/Value Education	AC	2	0	0	0	100		100
			Total	**17**	**1**	**10**	**21**	**375**	**425**	**800**

SEMESTER V

S.No.	Course Code	Course Title	Category	L	T	P	C	CIA	ESE	TOTAL
THEORY										
1	19AG5201	Farm Machinery and Equipment	PC	3	0	0	3	25	75	100
2	19AG5202	Refrigeration and Cold Chain Management	PC	3	1	0	4	25	75	100
3	19AG5203	Theory of Machines	PC	3	0	0	3	25	75	100
4	19AG53XX	Professional Elective-I	PE	3	0	0	3	25	75	100
THEORY WITH LAB COMPONENT										
5	19AG5251	Groundwater and Well Engineering	PC	2	0	2	3	50	50	100
6	19AG5252	Soil and Water Conservation Engineering	PC	2	0	2	3	50	50	100
PRACTICALS										
7	19AG5001	Operation and Maintenance of Farm Machinery Laboratory	PC	0	0	3	1.5	50	50	100
8	19AG5002	CAD for Agricultural Engineering	PC	0	0	3	1.5	50	50	100
MANDATORY COURSES										
9	19HE5071	Soft Skills - I	EEC	1	0	0	1	25	75	100
10	19HE5072	Design Thinking	EEC	1	0	0	1	25	75	100
			Total	**18**	**1**	**10**	**24**	**350**	**650**	**1000**

SEMESTER VI

S.No.	Course Code	Course Title	Category	L	T	P	C	CIA	ESE	TOTAL
THEORY										
1	19AG6201	Hydrology and Water Resources Engineering	PC	3	0	0	3	25	75	100

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2	19AG6202	Solar and Wind Energy Engineering	PC	3	1	0	4	25	75	100
3	19AG6181	Professional Ethics	HS	3	0	0	3	25	75	100
4	19AG63XX	Professional Elective-II	PE	3	0	0	3	25	75	100
5	19XX64XX	Open Elective-I	OE	3	0	0	3	25	75	100
THEORY WITH LAB COMPONENTS										
6	19AG6251	Food and Dairy Engineering	PC	2	0	2	3	50	50	100
PRACTICALS										
7	19AG6252	ICT in Agricultural Engineering	PC	0	0	4	2	50	50	100
8	19AG6701	Industrial Training	EEC	0	0	0	1	0	100	100
MANDATORY COURSES										
9	19HE6071	Soft Skills - II	EEC	1	0	0	1	25	75	100
10	19HE6072	Intellectual Property Rights (IPR)	EEC	1	0	0	1	25	75	100
		Total		**19**	**1**	**6**	**24**	**275**	**725**	**1000**

SEMESTER VII

S.No.	Course Code	Course Title	Category	L	T	P	C	CIA	ESE	TOTAL
THEORY										
1	19AG7201	Agricultural Extension	PC	3	0	0	3	25	75	100
2	19AG7202	Remote Sensing and Geographical Information System	PC	3	0	0	3	25	75	100
3	19AG73XX	Professional Elective-III	PE	3	0	0	3	25	75	100
4	19XX74XX	Open Elective-II	OE	3	0	0	3	25	75	100
THEORY WITH LAB COMPONENT										
5	19AG7251	Precision Farming and Protected Cultivation	PC	2	0	2	3	50	50	100
PRACTICALS										
6	19AG7001R	Renewable Energy Laboratory	PC	0	0	3	1.5	50	50	100
7	19AG7002R	Remote Sensing and GIS Laboratory for Agricultural Engineers	PC	0	0	3	1.5	50	50	100
PROJECT WORK										
8	19AG7901	Innovative Project	EEC	0	0	4	2	50	50	100
		Total		**14**	**0**	**12**	**20**	**300**	**500**	**800**

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SEMESTER VIII

S.No.	Course Code	Course Title	Category	L	T	P	C	CIA	ESE	TOTAL
THEORY										
1	19AG83XX	Professional Elective-IV	PE	3	0	0	3	25	75	100
2	19AG83XX	Professional Elective-V	PE	3	0	0	3	25	75	100
PROJECT WORK										
3	19AG8901	Project work	EEC	0	0	16	8	100	100	200
			Total	**6**	**0**	**16**	**14**	**150**	**250**	**400**

TOTAL NO OF CREDITS: 165

LIST OF PROFESSIONAL ELECTIVES

S.No.	Course Code	Course Title	Category	L	T	P	C	CIA	ESE	TOTAL
PROFESSIONAL ELECTIVE I										
1	19AG5301	Systems Analysis and Soft Computing in Agricultural Engineering	PC	3	0	0	3	25	75	100
2	19AG5302	Sustainable Agriculture and Food Security	PC	3	0	0	3	25	75	100
3	19AG5303	CDM and Carbon Trading Technology	PC	3	0	0	3	25	75	100
4	19AG5304	IOT in Agricultural Systems	PC	3	0	0	3	25	75	100
5	19AG5305	Ergonomics and Safety in Agricultural Engineering	PC	3	0	0	3	25	75	100
PROFESSIONAL ELECTIVE II										
1	19AG6301	Climate change and adaptation	PC	3	0	0	3	25	75	100
2	19AG6302	Heat and Mass Transfers for Agricultural Engineers	PC	3	0	0	3	25	75	100
3	19AG6303	Disaster Management	PC	3	0	0	3	25	75	100
4	19AG6304	Horticultural Crop Processing	PC	3	0	0	3	25	75	100
5	19AG6305	Organic Farming Technologies	PC	3	0	0	3	25	75	100
PROFESSIONAL ELECTIVE III										
1	19AG7301	Post-Harvest Technology	PC	3	0	0	3	25	75	100
2	19AG7302	Dairy Process Technology	PC	3	0	0	3	25	75	100
3	19AG7303	Storage and Packaging Technology	PC	3	0	0	3	25	75	100

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4	19AG7304R	Process Engineering of Fruits and Vegetables	PC	3	0	0	3	25	75	100
5	19AG7305	Fat and Oil Processing	PC	3	0	0	3	25	75	100
PROFESSIONAL ELECTIVE IV										
1	19AG8301	Agricultural Business Management and Entrepreneurship	PC	3	0	0	3	25	75	100
2	19AG8302	On-Farm Water Management	PC	3	0	0	3	25	75	100
3	19AG8303	Intellectual Property Rights	PC	3	0	0	3	25	75	100
4	19AG8304	Agricultural Waste Management	PC	3	0	0	3	25	75	100
5	19AG8305	Energy Conservation in Agro based Industry	PC	3	0	0	3	25	75	100
6	19AG8306	Cooling Technology: Why and How utilized in Food	MOOC (NPTEL)	3	0	0	3	25	75	100
7	19AG8307	Novel Technologies for Food Processing and Self life	MOOC (NPTEL)	3	0	0	3	25	75	100
8	19AG8308	Machine Learning for soil and crop management	MOOC (NPTEL)	3	0	0	3	25	75	100
PROFESSIONAL ELECTIVE V										
1	19AG8309	Special Farm Equipment's	PC	3	0	0	3	25	75	100
2	19AG8310	Mechanics of Tillage and Traction	PC	3	0	0	3	25	75	100
3	19AG8311	Watershed Hydrology and Management	PC	3	0	0	3	25	75	100
4	19AG8312	Micro Irrigation System	PC	3	0	0	3	25	75	100
5	19AG8313	Agriculture Economics and Farm Management	PC	3	0	0	3	25	75	100

LIST OF OPEN ELECTIVES										
AGRICULTURE ENGINEERING										
S.No.	**Course Code**	**Course Title**	**Category**	**L**	**T**	**P**	**C**	**CIA**	**ESE**	**TOTAL**
1	19AG6401	Modern Agricultural Practices	OE	3	0	0	3	25	75	100
AGRICULTURE ENGINEERING										
2	19AG7401	Urban Agriculture and organic farming	OE	3	0	0	3	25	75	100
LIFE SKILL COURSES										
3	19LSZ401	General Studies for Competitive Examinations	OE	3	0	0	3	25	75	100
4	19LSZ402	Human Rights, Women's Rights and Gender Equality	OE	3	0	0	3	25	75	100
5	19LSZ403	Indian Ethos and Human Values	OE	3	0	0	3	25	75	100

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6	19LSZ404	Indian Constitution and Political System	OE	3	0	0	3	25	75	100
7	19LSZ405	Yoga for Human Excellence	OE	3	0	0	3	25	75	100

CREDIT DISTRIBUTION

Category	SEM I	SEM II	SEM III	SEM IV	SEM V	SEM VI	SEM VII	SEM VIII	Total credit
Total	20	22	20	21	24	24	20	14	165

*** Student can earn extra credit 35 over and above the total credits**

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Professional Elective-IV

Programme	Course Code	Name of the Course	L	T	P	C
B.E.	19AG8309	MICRO IRRIGATION SYSTEMS	3	0	0	3

Course Objective

1. To expose the students to basic conceptual differences in the design of Pressure Irrigation systems viz., Drip, Sprinkler, Surge and Capillary modes
2. To impart technical confidence in the minds of students in designing and layout preparation for drip irrigation with cost economics.
3. To impart technical confidence in the minds of students in designing and layout preparation for sprinkler irrigation with cost economics.
4. To impart technical confidence in the minds of students in designing and layout preparation for surge irrigation with cost economics.
5. To impart technical confidence in the minds of students in designing and layout preparation for subsurface irrigation with cost economics.

Unit	Description	Instructional Hours
I	**CONCEPTS AND HYDRAULICS OF MICROIRRIGATION** Pressure Irrigation Concepts – Underground/Overground irrigation conveyance - Drip Irrigation – Sprinkler Irrigation –Perfospray Irrigation - Blind Pipe Hydraulics – Head Loss due Friction – Multi-outlet (Irrigation)/Multi-inlet (Drainage) Pipe flow Hydraulics – General Formula - Darcy-Weisbach theoretical and empirical formulae – Hazen-Williams Formula – Reduction Factor – Christiansen's Formula - Hydraulic Gradient - Slope gradient effects on friction losses - Surge Irrigation – Subsurface Capillary Diffusion – Pitcher Irrigation – Micro-sprinklers – Pop-up Sprinklers – Lawn and Landscape Irrigation layouts.	9
II	**DESIGN AND LAYOUT OF DRIP IRRIGATION** Basic Data and Information – Soil Compatibility – Crop Suitability – Row to Row and Plant to Plant Spacing – Per Hectare Square Layouts – Crop Population – Evapo-transpiration variations with Crop and Climate – Wetting Circles around Plants – Daily Water Requirements – Pump Discharge requirements – Emitter types – Daily Irrigation Duration – Permissible Friction Loss variations – Dripper Pressure Vs Discharge – Multi-outlet Lateral and Sub-main Pressures – Mainline Pressures (Blind pipes) – Horse-Power and Material Requirements –- Pipe size determinations Uniformity Coefficient– Catch-Can and Hydraulic Gradient techniques- Cost Economics – Operation and maintenance	12
III	**DESIGN AND LAYOUT OF SPRINKLER IRRIGATION** Basic Data and Information – Soil types and Infiltration rates –Bulk crop coverage – Water Requirement – Frequency of Irrigation - Materials required – Solid Systems – Portable systems – system components – sprinkler spacing along laterals - Lateral Spacing along sub-mains – Operational Pressure requirements – Horse Power of Pump – theoretical water distribution patterns – sprinkler spray circle overlapping - Perfospray sprinkling – High Pressure Spray Guns – determination of pipe sizes – calibration of sprinkler discharges with operating Pressures – catch-cans for Uniformity Coefficient evaluation – Operation and Maintenance aspects – cost economics.	9

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IV DESIGN AND LAYOUT OF SURFACE IRRIGATION

Surge Flow Furrow Irrigation – Hydraulics – ON-OFF flow cycling – Surge Cycle Ratio - infiltration variations – water front advance predictions – optimization of furrow inflow rates with length and spacing – Water Distribution Efficiency – soil and crop compatibility – semi-automation with lever systems – total automation with sensor system – limitations – cost economics. 9

V DESIGN AND LAYOUT OF SUB-SURFACE IRRIGATION

Sub-surface piping and wick networks – capillary diffusion mode – location of pipes and outlets – rootzone wetting patterns – Pitcher Pot Irrigation – Afforestation, Kitchen Gardening and Terrace cultivation prospects – surface mulching – automation with soil moisture deficit sensing – cost economics. 9

Total Instructional Hours **45**

Course Outcome

CO1: The students gain confidence with the exposure to different water saving micro-irrigation systems alongside the field-oriented designs and layouts
CO2: The students will be able to design cost effective drip irrigation layouts, benefitting the farmers for sustained productivity along with optimal water usage even under scarcity situations.
CO3: The students will be able to design cost effective Sprinkler irrigation layouts, benefitting the farmers for sustained productivity
CO4: The students will be able to design cost effective surge irrigation layouts, benefitting the farmers.
CO5: The students will be able to design cost effective sub-surface irrigation layouts.

TEXT BOOKS:

T1 Dilip Kumar Majumdar., "Irrigation Water Management", Prentice-Hall of India, New Delhi, 2008.

T2 Michael, A.M., "Irrigation Engineering", Vikas Publishers, New Delhi, 2008.

T3 Garg, S.K., "Irrigation Engineering," Laxmi Publications, New Delhi, 2008.

T4 Rydzewski 1987. Irrigation Development Planning. John Wiley & Sons.

T5 Ivan E Henk. 1951. Irrigation Engineering. Vol. I. John Wiley & Sons.

REFERENCE BOOKS:

R1 Basak, N.N., "Irrigation Engineering", Tata McGraw-Hill Publishing Co, New Delhi, 2008.

R2 Murthy, V.V.N. Land and water management, Kalyani publishing, New Delhi, 1998.

R3 Finkel HJ. 1983. Handbook of Irrigation Technology. Vols. I-II. CRC Press

R4 Karmeli D, Peri G & Todes M. 1985. Irrigation Systems: Design and Operation. Oxford Univ. Press

R5 Pillsbury AF. 1972. Sprinkler Irrigation. FAO Agricultural Development Paper No. 88, FAO.

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PO &PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2
CO1	1	1	2	2	2	1	3	2				3	3	3
CO2	2	2	3	3		1	2		2			3	2	3
CO3	2	2	3	3		1	2		2			3	2	3
CO4	2	2	3	3		1	3					3	2	3
CO5	2	2	3	3		1	2					3	2	3
AVG	2	2	3	3	2	1	2	2	2			3	2	3

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Professional Elective-V

Programme	Course Code	Name of the Course	L	T	P	C
B.E.	19AG8301	AGRICULTURAL BUSINESS MANAGEMENT AND ENTERPREUSHIP	3	0	0	3

Course Objective

- To introduce the importance and principles of Agri-business management.
- To teach various aspects of agribusiness management firms and its management functions.
- To impart knowledge on the functional areas of Agri-business like Marketing management, Product pricing methods and Market potential assessment.
- To apply the acquired knowledge and practical skills to run an agribusiness to develop a business plan.
- To expose the students become an entrepreneur in agricultural sector.

Unit	Description	Instructional Hours
I	**AGRIBUSINESS MANAGEMENT** Concept - components of agribusiness - forms of agribusiness firms. Management - concept - functions of management - managerial roles and skill (Mintzbergs) required at various levels of management.	9
II	**MANAGEMENT FUNCTIONS** Planning - steps and types of plans. Organizing - basics for Departmentation - Staffing - human resource planning process - Directing - techniques of direction. Coordination and control - types. Management approaches - Strength, Weakness, Opportunities and Threat (SWOT) Analysis.	9
III	**AGRICULTURAL MARKETING (FUNCTIONAL AREA – I)** Operations management - planning and scheduling - supply chain management in agribusiness -Human resource management - job analysis, recruitment and selection process	9
IV	**AGRICULTURAL MARKETING (FUNCTIONAL AREA – II)** Marketing Management - market segmentation, consumer buying behavior and marketing mix -Financial management - concept and financial planning for agribusinesses.	9
V	**ENTREPRENEURSHIP** Entrepreneur - entrepreneurship - types, characteristics and process - Innovation, businessincubation and financing entrepreneurs-Case study	9
	Total Instructional Hours	45

Course Outcome

CO1: The students will analyze agribusiness situations, formulate strategies, implement plans and manage strategic change.

CO2: The students will learn the concepts and process of planning and organizing

CO3: Students will understand the marketing principles, role of marketing and various Marketing channels in domestic and international market.

CO4: Students will be capable of problem-solving integrated in the agribusiness value chain to develop the business in the competitive marketing

CO5: Students will understand the systematic process to elect and ability to discern distinct entrepreneurial traits

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TEXT BOOKS:

T1 Himanshu, "Agri Business Management – Problems and prospects", Ritu Publications, Jaipur, 2005.

T2 Smita Diwase, "Indian Agriculture and Agribusiness Management", Krishi resource ManagementNetwork, Pune 2004.

T3 Beierlein, J.G., Schneeberger, K.C. and Osburn, D.D., "Principles of agribusiness management". WavelandPress, 2013.

T4 Sharangi, A. B., Acharya, S. K. and Somani, L. "Enterprise, Entrepreneurship & Agribusiness Management", 2015.

T5 Micheal, E. Newman, "Agribusiness Management and Entrepreneurship", Vero Media Inc;Teachers Guide edition, 1994.

REFERENCE BOOKS:

R1 Chandra Prasanna, "Projects: Preparation, Appraisal, Budgeting and Implementation", Tata McGraw HillPublications, New Delhi, 2001.

R2 Kotler, P., "Marketing Management. Analysis, Planning and Control", Prentice Hall Inc., New York, 2001.

R3 Rao, V.S.P., and Narayana, P.S., "Principles and Practices of Management", Konark Publishing PrivateLimited, New Delhi, 2001.

R4 Barnard, F.L., Foltz, J., Yeager, E.A. and Brewer, B., "Agribusiness management", Routledge, 2020

R5 "Agri-business Management Handbook", Technoserve, Washington DC, 2016.

PO & PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO1	PSO2
CO1	3	3	2	2	2	2	2	2	2	2	3	2	3	2
CO2	3	3	3	1	1	1	1	-	2	2	3	3	2	2
CO3	3	3	3	2	2	1	2	1	2	1	2	2	2	2
CO4	3	3	3	3	2	2	2	1	2	1	2	2	2	2
CO5	3	3	3	2	3	2	2	2	3	1	3	2	2	2
Avg	3	3	2	2	2	2	2	1	2	2	3	3	2	2

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	19AG8901	PROJECT WORK	0	0	16	8

Course Objective

1. To develop the communication and presentation skills
2. To develop the ability to solve a specific problem right from its identification and literature review till the successful solution of the same. To train the students in preparing project reports and to face reviews and viva voce examination
3. Students in a group of 3 or 4 shall work on a topic approved by the head of the department under the guidance of a faculty member and prepare a comprehensive project report after completing the work to the satisfaction of the supervisor.
4. The progress of the project is evaluated based on three reviews by the review committee constituted by the Head of the Department.
5. The project work is evaluated based on oral presentation and the final project report jointly by a team of examiners including one external examiner.

Course Outcome

On completion of the project work,

CO1: Students will be in a position to take up any challenging practical problem and find solution by formulating proper methodology.

CO2: Students will formulate a real world problem, identify the requirement and develop the design solutions

CO3: Students will utilize the new tools, algorithms, techniques that contribute to obtain the solution of the project

CO4: Students will be able to identify technical ideas, strategies and methodologies

CO5: Students will be in a position to test and validate through conformance of the developed prototype and analysis the cost effectiveness

PO&PSO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	1	2	1	-	-	-	-	-	-	-	-	1	1	1
CO2	1	2	1	-	1	1	-	1	1	1	1	1	1	1
CO3	1	1	1	-	2	1	-		2	1	1	1	1	2
CO4	1	-	1	-	1	1	-	1	-	-	-	2	1	1
CO5	1	-	-	-	-	-	-	-	-	-	-	2	2	2
Avg	1	2	1	-	-	1	-	1	1	1	1	1	1	22

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VERTICALS FOR MINOR DEGREE

AGRICULTURAL ENGINEERING OFFERING MINOR DEGREE

S. NO	COURSE CODE	COURSE TITLE	COURSE CATEGORY	L	T	P	C	TCP	CIA	ESE	TOTAL
1.	21AG5601	AGRICULTURE FOR ENGINEERS	MDC	3	0	0	3	3	40	60	100
2.	21AG6601	SOIL & WATER CONSERVATION ENGINEERING	MDC	3	0	0	3	3	40	60	100
3.	21AG6602	FARM MACHINERY AND EQUIPMENT'S	MDC	3	0	0	3	3	40	60	100
4.	21AG7601	FUNDAMENTALS OF FOOD PROCESS ENGINEERING	MDC	3	0	0	3	3	40	60	100
5.	21AG7602	NON-CONVENTIONAL ENERGY SOURCES	MDC	3	0	0	3	3	40	60	100
6.	21AG8601	INTEGRATED ON FARM MANAGEMENTS	MDC	3	0	0	3	3	40	60	100

*MDC – Minor Degree Course

In addition to the above the following additional courses for Minor Degree can also be given to the student's common to all the branches.

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Programme	Course Code	Name of the Course	L	T	P	C
B.Tech.	21AG6601	SOIL AND WATER CONSERVATION ENGINEERING	3	0	0	3

Course Objective

1. To impart a thorough knowledge and understanding of the basic concepts of soil erosion
2. To get a basic idea about the relevant mitigation strategies.
3. To enable the students to design appropriate watershed based soil conservation structures
4. To grab knowledge about the applicability of rainwater harvesting systems.
5. To study about design of sediment detention tanks

Unit	Description	Instructional Hours
I	**INTRODUCTION AND CONCEPT OF SOIL AND WATER EROSION** Soil Erosion –principles of soil erosion -Types of soil erosion – Agents of soil Erosion - mechanics of soil erosion – mechanics of water erosion – mechanics of soil erosion by water and glaciers– types of water erosion-Special forms of Erosion .	9
II	**WATER EROSION AND CONTROL** Erosion due to water – Agronomical measures for water erosion control – Terraces for water erosion control – Bunding methods for water erosion control – Gully Erosion – Drop spillway – Drop Inlet spillway – Chute spillway – Earthen Dam – Stream Bank erosion .	9
III	**WIND EROSION , ESTIMATION AND CONTROL** Erosion due to wind – Mechanics of wind Erosion : Inititation of movement , Transporttation , Deposition -Estimation of soil loss due to wind erosion - Wind Erosion control – Vegetative measures – Mechanical measures	9
IV	**SEDIMENTATION AND SEDIMENTATION YIELD ESTIMATION** Sedimentation of water resources - Mechanics of sediment transport – Sediment transport and measurements – stream sediment measurements – reservoir sedimentations -soil loss/ sediment yield estimation – erosivity and Erodibility - Estimation of USLE Parameters - Silt Detention Tanks	9
V	**WATER HARVESTING AND WATER POLLUTION & QUALITY** Water harvesting – types of water harvesting – water harvesting technique : Short Term , Long Term harvesting techniques – Water pollution – sources of water pollution - types of water pollution – Effect of Water pollution – Importance of water quality – National Water quality monitoring Programme .	9
	Total Instructional Hours	45

Course Outcome

CO1: The students will be able to gain fundamental knowledge on the concepts of erosion.

CO2: Students will obtain the knowledge of estimating water erosion.

CO3: Students will obtain the knowledge of estimating wind erosion

CO4: .Students will receive concepts of sedimentation and detention tanks.

CO5: Students can able to design Rainwater harvesting systems and water pollution and quality of water

TEXT BOOKS

T1 Suresh, R., "Soil and Water Conservation Engineering", Standard Publication, New Delhi, 2007.

T2 Ghanshyam Das, "Hydrology and Soil Conservation Engineering", Prentice Hall of India Private Limited, New Delhi, 2000.

T3 "Sedimentation Engineering", 2006, ASCE manual and Report on Engineering Practice No. 54, Edited by Vito A. Vanoni. ASCE publishing.

T4 Troeh FR, Hobbs JA, Donahue RL. Soil and water conservation for productivity and environmental protection. Prentice-Hall, Inc.; 1980.

T5 Pierce FJ. Advances in soil and water conservation. CRC Press; 1998 Feb 1.

REFERENCE BOOKS:

R1 Murthy, V.V.N., "Land and Water Management Engineering", Kalyani Publishers, Ludhiana, 1998.

R2 Gurmail Singh, "A Manual on Soil and Water Conservation", ICAR Publication, New Delhi, 1982.

R3 Mal, B.C., "Introduction to Soil and Water Conservation Engineering", Kalyani Publishers, New Delhi, 2002

R4 Sidle RC, Pearce AJ, O'Loughlin CL. Hillslope stability and land use. American geophysical union; 1985.

R5 Ohlig CP, editor. Integrated Land and Water Resources Management in History: Proceedings of the Special Session on History, May 16th, 2005. BoD–Books on Demand; 2005.

PO&PSO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	1	1	-	-	-	1	2	1	1	-	1	2	3	1
CO2	3	3	3	3	3	2	3	1	3	2	2	3	3	2
CO3	3	3	3	3	2	2	3	1	3	3	3	3	3	2
CO4	2	2	2	2	2	2	3	1	2	3	3	3	3	2
CO5	1	1	-	-	-	1	2	1	1	1	1	2	3	3
Avg	2	2	3	3	2	2	3	1	2	2	2	3	3	2

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Dean (Academics)
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Programme	Course Code	Name of the Course	L	T	P	C
B.Tech.	21AG6602	FARM MACHINERY AND EQUIPMENT'S	3	0	0	3

Course Objective

1. To introduce the students to the working principles of farm Machinery tillage implements.
2. To get thorough knowledge about the feasibility of tractors, power tiller, Earth moving machineries, primary and secondary tillage implements.
3. To gain knowledge about the sowing ,spraying and fertilizer application methodologies
4. To acquire basic knowledge in the field of Weeding and Harvesting.
5. To expose the students to farm mechanization prospects and constraints alongside Cooperative Farming for shared usage of machinery.

Unit	Description	Instructional Hours
	FARM MECHANIZATION	
I	Farm mechanization – objectives and level of mechanization in India- Selection of Farm Machines- Types of farm implements – trailed, mounted and self-propelled. Field capacity, efficiency, economics of machinery use with numerical / problems.	9
	TRACTORS , POWER TILLER AND EARTH MOVING MACHINERIES	
II	Hierarchical Development in Tractor Design- Different Type of Tractors Available in India and abroad- components of a tractors -Power tiller: internal components and Transmission of power - Earth moving machineries: Bulldozer - Advanced agricultural machineries and its Importance in Agriculture.	9
	PRIMARY AND SECONDARY TILLAGE IMPLEMENTS	
III	Tillage - objectives - classification of primary & secondary tillage equipment. Primary Tillage: Mould board plough- Disc plough- Sub-soiler and chisel plough. Secondary tillage: objective- types -Disc harrows, Spike-tooth and spring-tine harrows- cultivator –Levelers-Ridger-Bund former. Miscellaneous tillage tools: rotary tillage tools, rotavators, stirring plough, auger plough, rotary hoes, Oscillating tools.	9
	SOWING, WEEDING AND PLANT PROTECTION EQUIPMENT	
IV	Methods of Crop planting and sowing – Types of seed drills and planters – calibration of seed cum fertilizer drills – Paddy trans planters. Weeding equipment – dry land star weeder – wet land cono weeder and rotary weeder –Power Operated weeder. Sprayers –types-classification – methods of atomization- spray application.	9
	HARVESTING TOOLS AND MACHINERY	
V	Harvesting and Threshing Terminology- Principals and Type of Cutting Mechanism- Types of harvesting machinery: Mowers and Windrowers- Grain Combines - Root crop harvesting equipment - Fruit and Vegetable harvesting tools and machines.	9

Total Instructional Hours 45

Course Outcome

CO1: The students will be able to perceive the role and significance of mechanization in sustaining agricultural production

CO2: The student will be able to understand the contextual usage of advanced farm machineries.

CO3: The students will able to understand the working principle of primary and secondary tillage implements.

CO4: The students will equip with technical knowledge and skills required for the operation, maintenance and evaluation of Sowing and intercultural operational machineries.

CO5: : The students will be able to know the harvesting and threshing mechanism of grains, fruits and vegetable .

TEXT BOOKS

T1 Jagdishwar Sahay. Elements of Agricultural Engineering. Standard Publishers Distributors

T2 Jain S. C. and Grace Philip. 2012. Farm Machinery – An Approach. Standard Publishers Distributors., New Delhi

T3 Ojha, T. P. and Michael, A. M. 2011. Principles of Agricultural Engineering Vol. I. Jain Brothers, New Delhi

T4 Yadav, R., and Solanki, H. B. 2009.Numericals and Short Questions in Farm Machinery, Power and Energy in Agriculture.New India Publishing Agency, New Delhi.

T5 Liljedahl, J. B., Turnquist, P. K., Smith, D. W., and Hokey, M. 2004. Tractors and Their Power Units. CBS Publishers and Distributers Pvt. Ltd, New Delhi

REFERENCE BOOKS

R1 Kepner, R.A., et al. Principles of farm machinery. CBS Publishers and Distributers, Delhi. 99, 1997.

R2 Harris Pearson Smith et al. Farm machinery and equipment. Tata McGraw-Hill pub., New Delhi.,1996.

R3 Srivastava, A.C. Elements of Farm Machinery. Oxford and IBH Pub. Co., New Delhi, 1990

R4 Singh, S., and Verma, S. R. 2009.Farm Machinery Maintenance and Management. Indian Council of Agricultural Research, New Delhi

R5 Kirpal Singh. 2013. Automobile Engineering Vol. I. Standard Publishers Distributors, Delhi

PO&PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	1	2	2	2	1	3	2	-	-	1	3	3	3
CO2	2	2	3	3	-	1	2	-	-	-	-	3	2	3
CO3	2	2	3	3	-	1	2	-	-	-	-	3	2	3
CO4	2	2	3	3	-	1	2	-	-	-	-	3	2	3
CO5	2	2	3	3	1	1	2	-	-	-	-	3	2	3
Avg	1.8	1.8	2.8	2.8	1.5	1	2.2	2	0	0	1	3	2.2	3

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B. TECH (HONS) & B.TECH (HONS WITH SPECIALIZATION) AGRICULTURAL ENGINEERING

(To be offered by Department of Agricultural Engineering)

VERTICAL I	VERTICAL II	VERTICAL III	VERTICAL IV	VERTICAL V
FARM MACHINERY AND POWER	SIMULATION AND MODELLING IN IRRIGATION	FOOD ENGINEERING	AGRIVOLTAICS TECHNOLOGY	ARTIFICIAL INTELLIGENCE
21AG5204	21AG5205	21AG5206	21AG5207	21AG5208
Off-Road Vehicle Engineering	Open Channel Flow	Industrial Processing of Foods and Beverages	Solar radiation and measurements	Big Data Processing
21AG6203	21AG6205	21AG6207	21AG6209	21AG6211
Design of Farm Machinery and System	Water Resources System Engineering	Instrumentation and Control in Food Industries	Basics of solar PV systems and components	Dependable And Secure AI-ML
21AG6204	21AG6206	21AG6208	21AG6210	21AG6212
Tractor Systems Design -I	Watershed Management and Modelling	Food Plant and Equipment Design	Basics of Agronomic practices and components	Deep Learning Foundations and Applications
21AG7203	21AG7205	21AG7207	21AG7209	21AG7211
Tractor Systems Design -II	Water Systems' Simulation And Modelling	Food Process Modelling	Design and installation of Agrivoltaics system	Graph Machine Learning: Foundations and Applications
21AG7204	21AG7206	21AG7208	21AG7210	21AG7212
Farm Machinery Dynamics Noise & Vibrations	Modelling Soil Erosion Processes	Robotics In Food Processing And Handling	Analysis of Agrivoltaics system for Energy food and water production	AI Applications in Agriculture
21AG8311	21AG8312	21AG8313	21AG8314	21AG8315
Operations Research in Farm Power & Machinery Management	Plant Growth Modelling And Simulation	Marketing Of Food And Agricultural Products	Cost analysis and standards	Process Modelling and Simulation

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Programme	Course Code	Name of the Course	L	T	P	C
B.Tech.	21AG6203	DESIGN OF FARM MACHINERY AND SYSTEM	3	0	0	3

Course Objective

To understand the interaction of tillage tools with soil and design the components of the tillage tools based on their requirement and to learn how the systems of planting machinery are designed.

To learn the engineering principles behind application of pesticides and the systems that implements the same.

To learn the concepts behind design of crop harvesting and threshing equipment

Unit	Description	Instructional Hours
I	**DESIGN OF PRIMARY TILLAGE TOOLS** Farm machinery design: Modern trends, tasks and requirements, economic considerations of durability, reliability and rigidity. Physico-mechanical properties of soils. Technological process of ploughing. Wedge. Working process of mould board plough, determination of basic parameters. Design of coulters, shares, landside, frog, jointer, mould boards. Design disk ploughs concave disk working tools. Forces acting on plough bottom and their effect on plough balance	9
II	**DESIGN OF INTER ROW TILLAGE TOOLS** Machines and implements for surface and inter row tillage; Peg toothed harrow, disk harrows, rotary hoes, graders, rollers, cultivators. Design of V shaped sweeps. Rigidity of working tools. Rotary machines: Trajectory of motion of rotary tiller tynes, forces acting, power requirement. Machines with working tools executing an oscillatory motion.	9
III	**DESIGN OF SOWING AND PLANTING EQUIPMENT'S** Methods of sowing and planting: Machines, agronomic specifications. Sowing inter-tilled crop. Grain hoppers: Seed metering mechanism, furrow openers and seed tubes. Machines for fertilizer application: Discs type broadcasters. Organic fertilizer application: Properties of organic manure, spreading machines. Liquid fertilizer distributors. Planting and transplanting Paddy transplanters, potato planters.	9
IV	**DESIGN OF SPRAYING EQUIPMENT'S** Overview of chemical control integrated pest management- Formulation of pesticides. Spray droplets. Hydraulic nozzles. Power operated hydraulic sprayer design principles. Air assisted hydraulic sprayer design principles. Controlled droplet application. Electrostatically charged sprayers. Spray drift and its mitigation. Aerial spraying systems. Use of drones for spraying	9
V	**DESIGN OF HARVESTING MACHINERY** Introduction to combine harvesters. Physical and mechanical properties of plant stem. Properties of plant grain. Design of grain header, Design of auger for plant collection, Design of tangential and axial threshing units. Blower design and flow orientation. Design of conveying system for grain.	9

Total Instructional Hours 45

Course Outcome

CO1: The student will understand the principles behind the design of tillage tools like MB plough and Disck plough.

CO2: The student will be able to appreciate the principles behind the design of inter row tillage tools.

CO3: He will be able to arrive at design configurations for sowing and planting equipment's.

CO4: The student will understand the principles behind the design of Power operated hydraulic energy nozzle and electrostatically charged sprayers.

CO5: The student will know the principles behind the design of crop spraying equipment's and harvesting and threshing machinery.

TEXT BOOKS

T1 Bernacki C, Haman J and Kanafajski Cz 1972. Agricultural Machines Theory and Construction. Vol-I. U.S. Department of Commerce, National Technical Information Service, Springfield, Virginia22151.

T2 Bindra, OS and Singh H. 1971. Pesticides Application Equipments. Oxford & IBH Publishing Co., New Delhi.

T3 Gill R and Vanden Berg GE. 2013. Soil Dynamics in Tillage and Traction. Scientific Publishers (India) ISBN-10: 8172338031.

T4 Yatsuk EP 1981. Rotary Soil Working Machines Construction, Calculation and Design. American Publishing Co. Pvt. Ltd, New Delhi.

T5 Singh S and Verma SR. Farm Machinery Maintenance and Management. DIPA, IC KAB-I, New Delhi

REFERENCE BOOKS

R1 Thornhill EW and Matthews GA. 1995. Pesticide Application Equipment for Use in Agriculture Vol II. Mechanically powered equipment FAO Rome.

R2 Miu P. 2016. Combine Harvesters Modeling and Design. CRC Press, Boca Raton, USA ISBN 13:978-1-4822-8237-5

R3 Carveille LA. 1980. Selecting Farm Machinery. Louisiana Cooperative Extn. Services Publication.

R4 FAO. 1990. Agricultural Engineering in Development: Selection of Mechanization Inputs.

PO&PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	1	2	2	2	1	3	2	-	-	1	3	3	3
CO2	2	2	3	3	-	1	2	-	-	-	-	3	2	3
CO3	2	2	3	3	-	1	2	-	-	-	-	3	2	3
CO4	2	2	3	3	-	1	2	-	-	-	-	3	2	3
CO5	2	2	3	3	1	1	2	-	-	-	-	3	2	3
Avg	1.8	1.8	2.8	2.8	1.5	1	2.2	2	0	0	1	3	2.2	3

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Programme	Course Code	Name of the Course	L	T	P	C
B.Tech.	21AG6204	TRACTOR SYSTEMS DESIGN -I	3	0	0	3

Course Objective

- To introduce the student to the principles Design and Development of Tractor and enable the student to apply the concept of machine design in tractor subsystems and critical components

Unit	Description	Instructional Hours
	Design and Development of Tractor	
I	Design and types, research, development, design procedure- technical specifications of tractors- modern trends in tractor design and development-special design features of tractors in relation to Indian agriculture	9
	Design of Tractor Engine	
II	Engine related terminology- Engine design calculations-Selection of stroke-bore ratio. Design of engine components- Piston, connecting rod, cylinder, cylinder head, crank shaft e. Design of radiator - Balancing of crankshaft.	9
	Design of Power Transmit Systems	
III	Design of tractor systems -clutch, gearbox, differential. Differential lock, final drive-steering, steering geometry-turning force. Transmission component design calculations. Design of gear box - calculation of speed ratios.	9
IV	**Design of Control and Comfort System**	
	Design of brakes (mechanical and hydraulic) -Design of hydraulic system & hitching-chassis-operator's seat-work place area and controls. Tire selection, aspect ratio.	9
V	**Design of Stability and Performance**	
	Mechanics of tractor stability-centre of gravity of tractor, moment of inertia and stability. Computer aided design and its application in farm tractors.	9
	Total Instructional Hours	45

Course Outcome

- The student will be able to basic of principles and development of tractor
- The students acquire concept for the design of tractor engine
- The student will be able to designs of power transmit system.
- The students acquire concept of Control and Comfort System
- The students will gain the knowledge of Stability and Performance of the tractor..

TEXT BOOKS:

T1 Barger EL, Liljedahl JB &McKibben EC. 1967. Tractors and their Power Units. Wiley Eastern.

T2 Sharma PC and Agarwal DK. 2000. Machine Design. S K Kataria and Sons, Delhi

REFERENCE BOOKS:

R1 Liljedahl J.B., Carleton W.M., Turnquist P.K. and Smith D.W. 1984. Tractors and their Power Units. AVI Publishing Co. Inc., Westport, Connecticut.

R2 Macmillan RH. 2002. The Mechanics of Tractor – Implement Performance and Worked Example. University of Melbourne, Australia.

PO & PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	3	1	2	1	1	-	1	1	1	2	3	2
CO2	3	3	3	2	1	2	2	-	2	1	2	3	2	2
CO3	3	3	3	2	2	1	2	-	1	2	1	2	2	2
CO4	3	3	2	3	3	3	3	-	2	3	2	2	2	2
CO5	3	3	3	3	3	3	3	-	3	2	3	2	2	2
Avg	3	2.8	2.8	2.2	2.2	2	2.2	-	1.8	1.8	1.8	2.2	2.2	2

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Programme	Course Code	Name of the Course	L	T	P	C
B.Tech.	21AG6205	WATER RESOURCES SYSTEM ENGINEERING	3	0	0	3

Course Objective To plan, design, construction, and maintenance of water resource system and use the basic principles and practices related to irrigation engineering at site.

Unit	Description	Instructional Hours
I	**INTRODUCTION TO IRRIGATION AND HYDROLOGY** Irrigation and its Classification on the basis of purpose and surface- Hydrology- Definition and Hydrological cycle - Rain Gauge- Methods of calculating average rainfall- Runoff, Factors affecting Run off- Maximum Flood Discharge measurement- Yield and Dependable yield of a catchment, determination of dependable yield	9
II	**WATER REQUIREMENT OF CROPS AND RESERVOIR PLANNING** Crop Water requirement- Methods of application of irrigation water and its assessment- Surveys for irrigation project- Area capacity curve- Silting of reservoir- Control levels in reservoir- Dam and its classification- Methods of construction of earthen dam- Percolation Tanks	9
III	**DIVERSION HEAD WORKS** Weirs - components parts, types- Diversion head works –layout- components and their function- Barrages - components and their functions- Difference between weir and Barrage	9
IV	**CANALS** Canals - Classification according to alignment and position in the canal network, Cross section of canal in embankment and cutting, partial embankment and cutting- Canal lining - Canal regulators- Canal maintenance.	9
V	**MINOR AND MICRO IRRIGATION** Bandhara irrigation- Layout - components, construction - Lift irrigation scheme- Drip and Sprinkler Irrigation - Jalayukt shivar- Well irrigation.	9
	Total Instructional Hours	45

COURSE OUTCOMES

At the end of the study the student will have knowledge on

CO1: Estimate hydrological parameters.

CO2: Estimate crop water requirements of a command area and capacity of canals

CO3: Select the relevant Diversion Head works for the specific site conditions

CO4:Understand the Design, construct and maintain simple Canal structures

CO5: Ability to maintain irrigation structures

TEXT BOOKS

T1 Dahigaonkar, J.G. " Irrigation Engineering "- Asian Book Pvt. Ltd., New Delhi, ISBN 13:

T2 S.K.Garg. " Irrigation and Hydraulic structures ", Khanna Publishers, Delhi, ISBN: 978-81-7409-047-9

T3 Priyani V.B. " Irrigation Engineering ", Charotar Book Stall, Anand International Book Company, 1995.

REFERENCE BOOKS

R1 Punmia, B.C.,. " Irrigation and water power Engineering ", Lakshmi Publications, New Delhi - 110

R2 Sharma, R.K. and Sharma, T.K. " Irrigation Engineering ", S.Chand and Company Ltd.Delhi, 1998. ISBN 13: 9788121921282

PO&PSO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	1	1	-	-	-	1	2	1	1	-	1	2	3	1
CO2	3	3	3	3	3	2	3	1	3	2	2	3	3	2
CO3	3	3	3	3	2	2	3	1	3	3	3	3	3	2
CO4	2	2	2	2	2	2	3	1	2	3	3	3	3	2
CO5	1	1	-	-	-	1	2	1	1	1	1	2	3	3
Avg	2	2	3	3	2	2	3	1	2	2	2	3	3	2

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Programme	Course Code	Name of the Course	L	T	P	C
B.Tech.	21AG6206	WATERSHED MANAGEMENT AND MODELLING	3	0	0	3

Course Objective To impart knowledge of various components of hydrological processes measurements and analysis of variables involved and subsequent applications.

Unit	Description	Instructional Hours
I	**MODELING AND SIMULATION** Definition and purpose of modeling, modeling terminology, modeling versus simulation, types of models, modeling protocol, continuum approach to modeling porous media.	9
II	**APPLICATION OF MODELING TECHNIQUES TO AGRICULTURAL WATER MANAGEMENT** Finite-difference method (FDM), and finite element method (FEM), numerical errors, validity of numerical solutions.	9
III	**MODELING UNSATURATED FLOW** Soil water potential, capillarity, soil moisture characteristics and hydraulic conductivity curves, soil-water flow, effective permeability, motion and mass balance equations, initial and boundary conditions, complete mathematical model of unsaturated flow, on-farm water balance modeling.	9
IV	**MODELING AND SIMULATION OF IRRIGATION CANAL SYSTEMS** Commonly used modeling techniques, overview of popular software packages for canal flow simulation. Water Quality Prediction and Simulation- Fundamentals of water quality modeling, types of water quality models, model development, calibration and verification, NPS models, case studies.	9
V	**RATIONAL USE OF MODELS** Reliability and rational use of models for planning and management of water resources systems, salient software packages for agricultural water management.	9
	Total Instructional Hours	45

COURSE OUTCOMES

At the end of the study the student will have knowledge on

CO1: To understand Hydrologic cycle, processes and budget; Fundamentals of hydrometeorology, Indian monsoon system.

CO2: To develop Application of Modeling Techniques to Agricultural Water Management

CO3: To understand Soil water potential, capillarity, soil moisture characteristics and hydraulic conductivity.

CO4: To develop Irrigation Canal Systems modelling

CO5: Ability to check the Reliability and rational use of models for planning and management of water resources systems

TEXT BOOKS

T1 Chow, V.T., Maidment, D.R., Mays, L.W., Applied Hydrology, McGraw Hill, 1988.

T2 Todd, D.K., Ground Water Hydrology, Wiley, New York, 1998

T3 Loucks, D.P., Stedinger, P.J.R., Haith, D.A., Water Resources Systems Planning and Management, Prentice Hall, New Jersy, 1987

REFERENCE BOOKS

R1 Chaudhry, M. H., Open Channel Flow, Prentice Hall of India, 1998.

R2 Neil, G.S., Water Resources Planning, McGraw Hill, 1985.

PO&PSO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	1	1	-	-	-	1	2	1	1	-	1	2	3	1
CO2	3	3	3	3	3	2	3	1	3	2	2	3	3	2
CO3	3	3	3	3	2	2	3	1	3	3	3	3	3	2
CO4	2	2	2	2	2	2	3	1	2	3	3	3	3	2
CO5	1	1	-	-	-	1	2	1	1	1	1	2	3	3
Avg	2	2	3	3	2	2	3	1	2	2	2	3	3	2

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Programme	Course Code	Name of the Course	L	T	P	C
B.Tech.	21AG6207	INSTRUMENTATION AND CONTROL IN FOOD INDUSTRIAL	3	0	0	3

Course Objective

- To expose the students to the concept of instrumentation for food processing Engineering
- To introduce the concepts of control loop systems
- To train the students to explore and use new technologies in Food plant designs

Unit	Description	Instructional Hours
I	**Instrumentation** Principles of measurements and classification of process instruments, measurement of temperature, pressure, fluid flow, liquid weight and weight flow rate, viscosity, pH, concentration, electrical and thermal conductivity, humidity of gases.	9
II	**Open Loop Systems** Laplace transformation, application to solve ODEs. Open-loop systems, first order systems and their transient response for standard input functions, first order systems in series, linearization and its application in process control, second order systems and their dynamics; transportation lag.	9
III	**Closed Loop Systems** Closed loop control systems, development of block diagram for feed-back control systems servo and regulatory problems, transfer function for controllers and final control element, principles of pneumatic and electronic controllers, transient response of closed-loop control systems and their stability.	10
IV	**Frequency Response** Introduction to frequency response of closed-loop systems, control system design by frequency response techniques, Bode diagram, stability criterion, tuning of controller settings	8
V	**Advanced Control Systems** Introduction to advanced control systems, cascade control, feed forward control, Smith predictor controller, control of distillation towers and heat exchangers, introduction to computer control of chemical processes	9
	Total Instructional Hours	45

Course Outcome

During this course, students have an ability

CO1: To identify process instruments and its principles

CO2:Ability to construct and apply a Open Loop Systems its application in process control

CO3: Understand the development of block diagram for feed-back control systems servo

CO4:Identify the Frequency Response for processing control

CO5:An understanding of Advanced Control Systems.

TEXT BOOKS:

T1 Stephanopoulos, G., Chemical Process Control, Prentice Hall of India, 2003.

T2 Coughnowr, D., Process Systems Analysis and Control, 3rd ed., McGraw Hill,2008.

REFERENCE BOOKS:

R1 Marlin, T. E., Process Control , IInd Edn, McGraw Hill, New York, 2000

R2 Smith, C. A. and Corripio, A. B., Principles and Practice of Automatic Process Control,IInd Edn., John Wiley, New York, 1997.

PO & PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	3	1	2	-	-	-	-	-	-	2	3	2
CO2	3	3	3	2	1	-	-	-	-	-	-	3	2	2
CO3	3	3	3	1	1	-	-	-	-	-	-	2	2	2
CO4	3	3	3	3	3	-	-	-	-	-	-	2	2	2
CO5	3	3	3	3	3	-	-	-	-	-	-	2	2	2
Avg	3	2.8	3	2	2	0	0	0	0	0	0	2.2	2.2	2

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Programme	Course Code	Name of the Course	L	T	P	C
B.Tech.	21AG6208	FOOD PLANT AND EQUIPMENT DESIGN	3	0	0	3

Course Objective

- To introduce the students to know about design and layout of food plant
- To train the students to different problem solving skills regarding food processing operations.
- To expose students to the fundamental knowledge of scientific principles in solving food processing problems and improving product quality.
- To understand the construction requirements, process design, fabrication and installation of equipments and to enhance the knowledge in the design of food processing equipments.

Unit	Description	Instructional Hours
I	**INTRODUCTION OF FOOD PLANT DESIGN** Introduction to plant design, situations, differences in design; general design considerations-food plant design process, feasibility study and analysis, plant location, Food plant size and utilities, and services.	9
II	**FOOD PLANT LAYOUT, PLANNING AND EXPERIMENTATION** Introduction to Plant layout, layout design procedure, Experimentation in pilot plant, symbols used for food plant design and layout.	9
III	**FOOD PROCESSING ENTERPRISE AND ENGINEERING ECONOMICS** Introduction of Food processing enterprise, Total revenue function, Total cost function, Break-even and shutdown Points, Economics of mass production, production management decision. Engineering economics- time value of money, inflation, compound interest, present value, sunk costs, opportunity costs, depreciation, salvage value.	9
IV	**PROCESS SCHEDULING AND OPERATION** Introduction, Planning for process schedule with example (milk-processing plant), Plant operation- Introduction, Models in operations research- linear programming, dynamic programming, Queuing theory, elements of queuing system, system output, customer behavior.	9
V	**DESIGN OF PROCESS EQUIPMENTS** Process design of double pipe heat exchanger; shell & tube heat exchanger; design of evaporator; agitation vessels and centrifugal separator; design of rotary dryer.	9
	Total Instructional Hours	**45**

Course Outcome

After successful completion of this course students are expected to be able to:

CO1: Understand and gain knowledge about design procedure of food plant.

CO2: Understand the layout, planning and experimentation of food plant.

CO3: Know and implement good manufacturing practices.

CO4: Understand and create process scheduling and operation of food process plant.

CO5: Ability to design, fabricate and operate food processing equipments

TEXT BOOKS:

T1 Anantha krishnan. C .P. and M.N. Sinha. Technology and Engineering of Dairy Plant Operations, Laxmi Publications, New Delhi, 1997.

T2 B.C.Bhattacharya. Introduction to Chemical Equipment Design- Mechanical Aspects, CBS Publishers, Delhi.1991.

REFERENCE BOOKS:

R1 Groff, GaneK. and Muthu, JohnF.,—Operations Management Selected Readings, D.B. Taraporevala Sons and Co, Bombay,1995.

R2 Antonio Lopez-Gomez, Gustavo V. Barbosa-Canovas. "Food Plant Design (Food Science and Technology Book 143)", CRC Press, 2005.

R3 Ed Bausbacher, Roger Hunt. Process Plant Layout and Piping Design, Pearson Education (US), 1993.

R4 Christopher G. J. Baker. Handbook of Food Factory Design, Springer New York, NY, 2013.

PO&PSO ⟶	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	3	2	2		2		2	2	1	2	2	3	3
CO2	3	3	2	2		2		2	2	2	2	2	3	3
CO3	3	3	2	2		2		2	2	1	2	2	3	3
CO4	3	3	2	2		2		2	2	2	2	2	3	3
CO5	3	3	2	2		2		2	2	2	2	2	3	3
Avg	3	3	2	1.6	0	2	0	2	2	1.6	2	2	3	3

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Programme	Course Code	Name of the Course	L	T	P	C
B.Tech.	21AG6209	BASICS OF SOLAR PV SYSTEMS AND COMPONENTS	3	0	0	3

Course Objective

- To expose the students to the concept of electricity.
- To introduce the concepts of solar PV Systems and solar array applications
- To train the students to explore and use solar PV technologies in Agricultural engineering.

Unit	Description	Instructional Hours
I	**BASICS OF ELECTRICITY** Voltage, Current, DC Power, AC Power, Energy, Harmonics, Solar.Radiation, Net Metering, Measurement of Electrical and Non.Electrical.Quantities	9
II	**SOLAR PHOTOVOLTAIC** Solar Cell and its function, Solar Technologies, Solar Cell Parameters, Efficiency of Solar Cell, Solar PV Module, Rating of Solar PV Module, PV Module Parameters, Efficiency of PV Module, Measuring Module Parameters	9
III	**SOLAR PHOTOVOLTAIC MODULE ARRAY** Connection of PV Module in Series and Parallel, Estimation and Measurement of PV Module Power, Selection of PV Module. Solar Radiation Energy Measurements, Estimating Energy requirement Types of Solar PV System, Design methodology for SPV system, Design of Off Grid Solar Power Plant, Off Grid Solar power Plant	9
IV	**BATTERIES** Battery function, Types of Batteries, Battery parameters, Selection of Battery, Series Parallel combination of Batteries, Batteries for Photo voltaic System, Application of Batteries in Solar PV system, Battery Maintenance and Measurements, Battery Fault Detection and Test, Battery Installation for PV system.	9
V	**CHARGE CONTROLLER, MPPT AND INVERTER** Power MOSFET and IGBT, Opto coupler, Buck and Boost Converter, Fly back Converter, Full Bridge Inverter, Voltage and Current Feedback, DC to DC power converter, DC to AC Converter, AC to DC Converter, Battery Charge controller, Maximum Power Point Tracking, Specification of Inverter and charger.	9
	Total Instructional Hours	45

Course Outcome	CO1: Students completing this course would have acquired knowledge of the basics of electricity. CO2: The students will have the required knowledge of the device and physics of solar cells. CO3: Understanding the importance of the operating principles of the major commercial photovoltaic technologies. CO4: Understanding the importance of batteries and their requirements. CO5: Understand the role of charge controller, MPPT and Inverter.

TEXT BOOKS:

T1 J. Nelson, Physics of Solar Cells, Imperial College Press, 2003. ISBN-13: 978-1860943492.

T2 M. Green, Solar Cells: Operating Principles Technology (The Red Book), UNSW Photovoltaics, 1986. ISBN: 0858235803.

REFERENCE BOOKS:

R1 Renewable energy Technologies; A Practical Guide for Beginners, Chetan Singh Solanki, PHI School Books (2008)

R2 P. Wurfel. Physics of Solar Cells: From Basic Principles to Advanced Concepts. Wiley VCH, 2009. ISBN: 9783527408573.

PO & PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	3	1	2	-	-	-	-	-	-	2	3	2
CO2	3	3	3	2	1	-	-	-	-	-	-	3	2	2
CO3	3	3	3	1	1	-	-	-	-	-	-	2	2	2
CO4	3	3	3	3	3	-	-	-	-	-	-	2	2	2
CO5	3	3	3	3	3	-	-	-	-	-	-	2	2	2
Avg	3	2.8	3	2	2	-	-	-	-	-	-	2.2	2.2	2

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Programme	Course Code	Name of the Course	L	T	P	C
B.Tech.	21AG6210	BASICS OF AGRONOMIC PRACTICES AND COMPONENTS	3	0	0	3

Course Objective

- To introduce the students to principles of agricultural and horticultural crop production and to introduce the production practices of crops.
- To delineate the role of agricultural and irrigation engineers in relation to various crop production practices.

Unit	Description	Instructional Hours
I	**CROP ECOLOGY** Ecosystem-concept and determinants of crop productivity; Physiological limits of crop yield and variability to ecological optima; Crop adaptation; Climate shift and its ecological implication. Photosynthesis, respiration, net assimilation, solar energy conversion efficiency and relative water content, light intensity, water and CO_2 in relation to photosynthetic rates and efficiency.	9
II	**SOIL FERTILITY AND FERTILIZER USE** Weed control, bio-herbicides: Integrated weed management; Special weeds, parasitic and aquatic weeds and their management in cropped and non-cropped lands; weed control schedules in field crops, vegetables and plantation crops; Role of Genetically Modified (GM) crops in weed management.	9
III	**SOIL-PLANT-WATER RELATIONSHIP** Soil irrigability classifications, Determination of soil water content, computation of soil water depletion, soil water potential and its components; Movement of soil water-saturated and unsaturated water flow; Evapotranspiration (ET), PET, AET and its measurements. Crop co-efficient; Plant water relations: Concept of plant water potential, its components; Methods of moisture estimation in plants	9
IV	**MANAGEMENT OF PROBLEMATIC SOILS AND CROP PRODUCTION** Crop production techniques in problem soils – crops, varieties, cropping system and agronomic practices; Degraded lands and their rehabilitation. Management strategies for flood prone areas; Drainage for improving water logged soils for crop production; Crop production	9
V	**CROPPING AND ORGANIC FARMING** Cropping system - Cropping system for different ecosystem; Interaction and indices; Non-monetary inputs and low cost technologies. LEIA, HEIA and LEISA; Farming systems – type – natural, bio-dynamic, bio-intensive, response, precision, biological and organic farming; organic and bio inputs, Soil health and organic matter and Integrated organic farming systems; IFS – concepts, models for different ecosystem, resource recycling and evaluation.	9
	Total Instructional Hours	45

Course Outcome

Upon successful completion of the course, students shall have ability to

CO1: Students completing this course would have acquired knowledge on crop selection, crop production crop management.

CO2: The students will have the required knowledge in the area of production of agricultural and horticultural crops

CO3: Understanding the important of Crop water Management and Crop nutrition management in crop cultivation.

CO4: Understanding the field crop production practices in Tamil Nadu.

CO5: Understand the role of greenhouse cultivation in future.

TEXT BOOKS:

T1 S S Rajendra Prasad, Text Book of Field Crop Production. Directorate of Information and Publication, Krishi Anusandhan Bhavan, Pusa, New Delhi, 2015.

T2 Reddy T. Sankara G.H. Yellamanda Reddi, Principles of Agronomy, Kalyani Publishers, New Delhi,2005.

REFERENCE BOOKS:

R1 Bose T. K. and L.P.Yadav. Commercial Flowers, Naya Prakash, Calcutta.1989.

R2 Kumar, N., Abdul Khader, M. Rangaswami, P. and Irulappan, I. Introduction to spices, plantation crops, medicinal and aromatic plants. Rajalakshmi Publications, Nagercoil. 1993.

PO & PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	3	1	2	-	-	-	-	-	-	2	3	2
CO2	3	3	3	2	1	-	-	-	-	-	-	3	2	2
CO3	3	3	3	1	1	-	-	-	-	-	-	2	2	2
CO4	3	3	3	3	3	-	-	-	-	-	-	2	2	2
CO5	3	3	3	3	3	-	-	-	-	-	-	2	2	2
Avg	3	2.8	3	2	2	-	-	-	-	-	-	2.2	2.2	2

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Department of Agricultural Engineering

Syllabus Revision carried out in 2023-2024 Even Semester

2019 Regulation with Amendments – 2021 Batch VI semester- Syllabus revision

S.No	Year	Sem	Course Code & Name	Existing Syllabus	Revised Syllabus	% of Change
1	III	VI	21AG6201- Hydrology and Water Resources Engineering	**Unit II: RUNOFF**	**Unit II: RUNOFF AND HYDROGRAPH**	30
				Unit IV: RESERVOIRS Classification of reservoirs General principles of design- site selection- spillways - elevation – area - capacity - storage estimation, sedimentation - life of reservoirs – rule curve.	**Unit IV: RESERVOIRS** Classification of reservoirs - Single Purpose Conservation Reservoir-Single Purpose Flood Control Reservoir-Multipurpose Reservoir- General principles of design- site selection- spillways -elevation – area - capacity - storage estimation, sedimentation - life of reservoirs – rule curve.	
				Unit V: GROUNDWATER AND MANAGEMENT Origin- Classification and types - properties of aquifers- governing equations – steady and unsteady flow - artificial recharge - RWH in rural and urban areas	**Unit V: MANAGEMENT OF WATER RESOURCES** River Training and Riverbank Protection Works – Guide bunds or banks - Approach embankment- Groynes or Spurs- Marginal embankments- Drought and flood Management - drought and flood affected areas of India - Agricultural Drought - Indices for drought monitoring - Tackling drought through water management- Remote Sensing and GIS for water resource management.	

2	III	VI	21AG6181- Professional Ethics	**Unit I: HUMAN VALUES** Morals, values and Ethics – Integrity – Work ethic – Service learning – Civic virtue – Respect for others – Living peacefully – Caring – Sharing – Honesty – Courage – Valuing time – Cooperation – Commitment – Empathy – Self confidence – Character – Spirituality – Introduction to Yoga and meditation for professional excellence and stress management.	**Unit I: HUMAN VALUES** Morals, values and Ethics – Integrity – Work ethic – Service learning – Civic virtue – Respect for others – Living peacefully – Caring – Sharing – Honesty – Courage – Valuing time – Cooperation – Commitment – Empathy – Self confidence – Character – Spirituality – Introduction to Yoga and meditation for professional excellence and stress management. Maintain physical health in yoga.	5
				Unit II: ENGINEERING ETHICS Senses of 'Engineering Ethics' – Variety of moral issues – Types of inquiry – Moral dilemmas – Moral Autonomy – Kohlberg's theory – Gilligan's theory – Consensus and Controversy – Models of professional roles - Theories about right action – Self-interest – Customs and Religion – Uses of Ethical Theories.	**Unit II: ENGINEERING ETHICS** Senses of 'Engineering Ethics' – Variety of moral issues – Types of inquiry – Moral dilemmas – Moral Autonomy – Kohlberg's theory – Gilligan's theory – Consensus and Controversy – Models of professional roles - Theories about right action – Self-interest – Customs and Religion	
3	III	VI	21AG6251 - Food and Dairy Engineering	**Unit I: PROPERTIES AND PROCESSING OF MILK** Dairy Industry – importance and status – Milk Types – Composition and properties of milk - Production of high quality milk - Method of raw milk procurement and milk preservation - Processing – Staining - Filtering and Clarification - cream separation – Pasteurization – Homogenization -sterilization, UHT processing and aseptic packaging –emulsification - Fortification	**Unit I: PROPERTIES AND PROCESSING OF MILK** Dairy Industry – importance and status – Milk Types – Composition and properties of milk - milk preservation - testing of milk- Processing – Staining - Filtering and Clarification - cream separation – Pasteurization – Homogenization -sterilization, UHT processing emulsification - Fortification	13

				Unit II: DAIRY PRODUCTS Manufacture of Milk Powder - Processing of Milk Products - Condensed Milk – Skim milk – Buttermilk Flavoured Milk, why, casein, yoghurt and paneer – Manufacture of Butter – Cheese, Ghee, ice creams and frozen desserts - standards for milk and milk products - Packaging of Milk and Milk ProductsCleaningandSanitation – Dairy effluent treatment and disposal.	**Unit II: DAIRY PRODUCTS** Manufacture of Milk Powder - Processing of Milk Products - Condensed Milk – Skim milk – Buttermilk - Flavoured Milk, whey, casein, yoghurt and paneer – Manufacture of Butter – Cheese, Ghee, ice creams and frozen desserts - standards for milk and milk products - Packaging of Milk and Milk Products	
				Unit III: FOOD AND ITS PROPERTIES, REACTION AND KINETICS Constituents of food - thermal processing of foods - cooking, blanching, sterilization, pasteurization, canning - Interaction of heat energy on food components, reaction kinetics, Arrhenius equation, TDT curves - water activity, sorption behaviour of foods – isotherm models - monolayer value, BET model isotherms. Raoult"s law, Norrish, Ross, Salwin - Slawson equations.	**Unit III: FOOD AND ITS PROPERTIES, REACTION AND KINETICS** Constituents of food - thermal processing of foods - cooking, blanching, sterilization, pasteurization, canning - Interaction of heat energy on food components, reaction kinetics, Arrhenius equation, TDT curves - water activity, sorption behaviour of foods – isotherm models - monolayer value, BET and GAB model isotherms, Gordon–Taylor equation and WLF equation.	
				Unit IV: PROCESSING AND PRESERVATION OF FOODS Coffee, Tea processing - Concentration of foods, freeze concentration - osmotic and reverse osmotic concentration - drying and dehydration of food - Tray, tunnel, belt, vacuum and freeze dryers - rehydration of dehydrated foods - Fat and oil processing, sources,	**Unit IV: PROCESSING AND PRESERVATION OF FOODS** Concentration of foods, freeze concentration - osmotic and reverse osmotic concentration - drying and dehydration of food - Tray, tunnel, belt, vacuum and freeze dryers - rehydration of dehydrated foods - Fat and oil processing, sources, extraction, methods and equipment,	

				extraction, methods and equipment, refining of oils, hydrogenation, manufacture of margarine - Food preservation methods - preservation by irradiation, microwave and dielectric heating of food.	refining of oils, hydrogenation, Food preservation methods - preservation by irradiation, microwave and dielectric heating of food.	

Syllabus Revision carried out in 2023-2024 Even Semester						
2022 Regulation – 2023 Batch II semester- Syllabus revision						
S.No	**Year**	**Sem**	**Course Code & Name**	**Existing Syllabus**	**Revised Syllabus**	**% of Change**
1	**I**	**II**	**22AG2252R - Principles and Practices of Crop Production**	**UNIT I - AGRICULTURE AND CROP PRODUCTION** Introduction to agriculture and its crop production sub-sectors - field crop production and horticulture; Factors affecting crop growth and production: genetic (internal) and environmental (external) factors; Crop management through environmental modification and adaptation of crops to the existing environment through crop cultural practices	**UNIT I- AGRICULTURE AND CROP PRODUCTION** Introduction to agriculture sub-sectors - field crop production and horticulture - Factors affecting crop growth and production: genetic (internal) and environmental (external) factors - Crop management through environmental modification and adaptation of crops to the existing environment through crop cultural Practices – cropping system and cropping pattern	10
				UNIT II - CROP SELECTION AND ESTABLISHMENT Regional and seasonal selection of crops; Systems of crop production; Competition among crop plants; Spacing and arrangement of crop plants; Field preparation for crops including systems of tillage;	**UNIT II - CROP SELECTION AND ESTABLISHMENT** Regional and seasonal selection of crops - Systems of crop production; Competition among crop plants - Spacing and arrangement of crop plants; Field preparation for crops	

				Establishment of an adequate crop stand and ground cover, including selection and treatment of seed, and nursery growing	including systems of tillage - - selection and treatment of seed - nursery preparation – main field preparation	
				UNIT III CROP MANAGEMENT Crop water Management; Crop nutrition management - need for supplementation to soil supplied nutrients, sources, generalized recommendations, methods and timing of application of supplemental nutrients including fertigation scheduling; Crop protection including management of weeds, pests and pathogens; Integrated methods of managing water, nutrients and plant protection; Types and methods of harvest.	**UNIT III CROP MANAGEMENT** Crop water Management - irrigation- types – irrigation scheduling – crop water requirment - Crop nutrition management - organic and inorganic nutrients, sources, generalized recommendations, methods and timing of application. Crop protection including management of weeds, pests and pathogens - Integrated management of water, nutrients and plant protection	
				UNIT IV PRODUCTION PRACTICES OF AGRICULTURAL CROPS Generalized management and cultivation practices for important groups of field crops in Tamil Nadu: cereal crops, grain legumes, oil seed crops, sugarcane, and fiber crops, and special purpose crops such as those grown for green manure and fodder.	**UNIT IV PRODUCTION PRACTICES OF AGRICULTURAL CROPS** Generalized management and cultivation practices for important groups of field crops in Tamil Nadu - cereal crops, grain legumes, oil seed crops, sugarcane, and fiber crops, and special purpose crops - from land preparation to harvesting	

Syllabus Revision carried out in 2023-2024 EVEN Semester

2022 Regulation (2023 batch) - II semester = **10 %**
2019 Regulation with amendments (2021 batch) - VI semester = **8 %**

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