HINDUSTHAN

COLLEGE OF ENGINEERING AND TECHNOLOGY

(An Autonomous Institution)

Coimbatore – 641032

DEPARTMENT OF AGRICULTURAL ENGINEERING

Curriculum and ODD Semesters Syllabus for the Batch

2024 – 2028 (R2022)

2023 – 2027 (R2022)

2022 – 2026 (R2022)

2021 – 2025 (R2019 with Amendments)

(Board of Studies held on 16.05.2024)

(Academic Council Meeting held on 21.06.2024)

HINDUSTHAN
EDUCATIONAL AND CHARITABLE TRUST

HICET

HINDUSTHAN

COLLEGE OF ENGINEERING AND TECHNOLOGY

(An Autonomous Institution)

Coimbatore– 641032

DEPARTMENT OF AGRICULTURAL ENGINEERING

Revised Curriculum and Syllabus for the

Batch 2024 – 2028 (ODD SEMESTER)

(Academic Council Meeting held on 21.06.2024)

2022 REGULATIONS

(For the students admitted during the academic year 2024-2025 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	2	0	3	5	40	60	100
THEORY WITH LAB COMPONENT											
3.	22PH1151	ELEMENTS OF PHYSICAL SCIENCE	BSC	2	0	2	3	4	50	50	100
4.	22HE1151	ENGLISH FOR ENGINEERS	HSC	2	0	2	3	4	50	50	100
5.	22AG1251	PRINCIPLES AND PRACTICES OF CROP PRODUCTION	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	தமிழர் மரபு	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**	**3**	**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.	22AG2201	PRINCIPLES OF FOOD SCIENCES	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.	22IT2251	PYTHON PROGRAMMING AND PRACTICES	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	தமிழரும் தொழில்நுட்பமும்	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 extracurricular activities for 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 this 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	[illegible]	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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Programme/ Semester	Course Code	Name of the Course	L	T	P	C
B.Tech/ I	22MA1101	MATRICES AND CALCULUS (Common to all Branches)	3	1	0	4

Course Objective

The learner should be able to

1. Construct the characteristic polynomial of a matrix and use it to identify Eigen values and Eigenvectors
2. Impart the knowledge of single variate calculus.
3. Familiarize the student with functions of several variables.
4. Acquaint the student with mathematical tools needed in evaluating multiple integrals and their applications.
5. Make a vector differential operator for vector function and theorems to solve engineering problems

Unit	Description	Instructional Hours
I	**Matrices** Eigen values and Eigen vectors – Properties of Eigen values and Eigen vectors (without proof) - Cayley - Hamilton Theorem (excluding proof) - Reduction of a quadratic form to canonical form by orthogonal transformation.	12
II	**Single Variate Calculus** Rolle's Theorem – Lagrange's Mean Value Theorem - Maxima and Minima – Taylor's and Maclaurin's Series.	12
III	**Functions of Several Variables** Partial derivatives - Total derivative - Jacobians – Maxima and minima of functions of two variables and Lagrange's method of undetermined multipliers.	12
IV	**Integral Calculus** Double integrals in Cartesian coordinates – Area enclosed by plane curves (excluding surface area) – Triple integrals in Cartesian co-ordinates – Volume of solids (Sphere, Ellipsoid, Tetrahedron) using Cartesian co-ordinates.	12
V	**Vector Calculus** Gradient, divergence and curl vectors - Green's theorem - Stoke's and Gauss divergence theorem (statement only) for cubes only.	12
	Total Instructional Hours	60

Course Outcome

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

CO1: Compute Eigen values and Eigen vectors of the given matrix and transform given quadratic form into canonical form.
CO2: Apply the concept of differentiation to identify the maximum and minimum values of curve.
CO3: Able to use differential calculus ideas on several variable functions.
CO4: Apply multiple integral ideas in solving areas, volumes and other practical problems.
CO5: Apply the concept of vector calculus in two and three-dimensional spaces.

TEXT BOOKS:

T1 - Erwin Kreyszig, "Advanced Engineering Mathematics", John Wiley & Sons, 10th edition, 2019.
T2 - K. P. Uma and S. Padma, "Engineering Mathematics I (Matrices and Calculus) ", Pearson Ltd,2022.

REFERENCE BOOKS:

R1 - Jerrold E. Marsden, Anthony Tromba, "Vector Calculus", W.H.Freeman, 2003-Strauss M. J, G. L Bradley and K. J .Smith, "Multivariable calculus", 6th edition, Prentice Hall, 2011.
R2 - Veerarajan T, "Engineering Mathematics", 5th edition, Mc Graw Hill Education(India) Pvt Ltd, New Delhi, 2016.
R3 - G. B. Thomas and R. L. Finney, "Calculus and Analytical Geometry", 9th Edition, Addison Wesley Publishing Company, 2016.

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

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Programme	Course Code	Name of the Course	L	T	P	C
B.Tech	22ME1201	ENGINEERING DRAWING	1	2	0	3

Course Objective

The learner should be able

1. To gain the knowledge of Engineer's language of expressing complete details about objects and construction of conics and special curves.
2. To learn about the orthogonal projections of straight lines and planes.
3. To acquire the knowledge of projections of simple solid objects in plan and elevation.
4. To learn about the projection of sections of solids and development of surfaces.
5. To study the isometric projections of different objects.

Unit	Description	Instructional Hours
I	**PLANE CURVES** Importance of engineering drawing; drafting instruments; drawing sheets – layout and folding; Lettering and dimensioning, BIS standards, scales. Geometrical constructions, Engineering Curves Conic sections –Construction of ellipse, parabola and hyperbola by eccentricity method. Construction of cycloids and involutes of square and circle – Drawing of tangents and normal to the above curves.	12
II	**PROJECTIONS OF POINTS, LINES AND PLANE SURFACES** Introduction to Orthographic projections- Projection of points. Projection of straight lines inclined to both the planes, Determination of true lengths and true inclinations by rotating line method. Projection of planes (polygonal and circular surfaces) inclined to both the planes by rotating object method (First angle projections only).	12
III	**PROJECTIONS OF SOLIDS** Projection of simple solids like prisms, pyramids, cylinder, cone when the axis is perpendicular, and inclined to one plane by rotating object method.	12
IV	**SECTION OF SOLIDS AND DEVELOPMENT OF SURFACES** Sectioning of simple solids with their axis in vertical position when the cutting plane is inclined to one of the principal planes and perpendicular to the other – Obtaining true shape of section. Development of lateral surfaces of simple and sectioned solids – Prisms, pyramids, cylinder and cone. Development of lateral surfaces of truncated solids.	12
V	**ISOMETRIC AND ORTHOGRAPHIC PROJECTIONS** Isometric views and projections simple and truncated solids such as - Prisms, pyramids,cylinders, cones- combination of two solid objects in simple vertical positions. Free hand sketching of multiple views from a pictorial drawing. Basics of drafting using AutoCAD software.	12
	Total Instructional Hours	**60**

Course Outcome

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

CO1: Understand and interpret the engineering drawings in order to visualize the objects and draw the conics and special curves.
CO2: Draw the orthogonal projections of straight lines and planes.
CO3: Interpret the projections of simple solid objects in plan and elevation.
CO4: Draw the projections of section of solids and development of surfaces of solids.
CO5: Draw the isometric projections and the perspective views of different objects.

TEXT BOOK:

T1. K.Venugopal, V.Prabu Raja, "Engineering Drawing, AutoCAD, Building Drawings", 5thedition New Age International Publishers, New Delhi 2016.
T2. K.V.Natarajan, "A textbook of Engineering Graphics", Dhanlaksmi Publishers, Chennai 2016.

REFERENCES:

R1. BasantAgrawal and C.M.Agrawal, "Engineering Drawing", Tata McGraw Hill Publishing company Limited,New Delhi,2013.
R2. N.S. Parthasarathy, Vela Murali, "Engineering Drawing", Oxford University PRESS, India 2015.

PO & PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	3	2	0	1	0	1	0	0	1	1	1
CO2	3	3	2	1	1	0	1	0	0	1	1	1
CO3	3	3	3	0	1	1	1	0	0	1	1	0
CO4	3	3	3	1	1	2	1	0	0	1	1	1
CO5	3	3	3	1	1	3	1	0	0	1	1	1
AVG	2.8	3	2.6	1	1	2	1	0	0	1	1	1

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Programme / Semester	Course Code	Name of the Course	L	T	P	C
B.Tech/I	2PH1151	ELEMENTS OF PHYSICAL SCIENCE	2	0	2	3

Course Objective

The learner should be able to :

1. Have knowledge on heat and thermodynamics.
2. Acquire knowledge on Ultrasound and their applications.
3. Enhance the fundamental knowledge in properties of materials
4. Adequate knowledge on laser fundamentals and their applications
5. Extend the knowledge about wave optics

Unit	Description	Instructional Hours
I	**THERMAL PHYSICS** Thermal expansion - thermal conduction, convection and radiation- thermal stress - Thermal expansion- Expansion joints - bimetallic strips - thermal conductivity -Lee's disc method to determine the thermal conductivity of bad conductor. - heat conductions in solids - flow of heat through compound media (series and parallel) – applications: refrigerators and solar water heaters.	6
II	**ULTRASONICS** Production – Piezoelectric generator – Properties of Ultrasonic waves. Determination of velocity using acoustic grating –Industrial applications – Drilling and welding – Nondestructive testing (pulse echo system). Medical applications – Ultrasound Scanner – A – mode – B- mode and C – mode	6
III	**MECHANICAL PROPERTIES OF MATERIAL** Elasticity – Hooke's law –Poisson's ratio – Bending moment – Depression of a cantilever – Derivation of Young's modulus of the material of the beam by Uniform bending theory and experiment. Twisting couple - Torsion pendulum: theory and experiment **Determination of Young's modulus by uniform bending method** **Determination of Rigidity modulus – Torsion pendulum**	12
IV	**PHOTONICS** Characteristics of Laser - Principle of spontaneous emission and stimulated emission - Active medium - Types of laser -.Principle, Construction, Working, Properties, Merits, Demerits and applications of Nd-YAG laser – Applications – Holography (3D profiling), laser drilling, and laser welding. **Determination of Wavelength and particle size using Laser** **Visit to IDA lab**	9
V	**WAVE MECHANICS** Interference -Conditions for sustained Interference - Antireflection coating – air wedge and it's applications. Determination of thickness of a thin wire - Diffraction of light – Fraunhofer diffraction at single slit –Diffraction grating – Rayleigh's criterion of resolution power - resolving power of grating. **Determination of wavelength of mercury spectrum – spectrometer grating** **Determination of thickness of a thin wire – Air wedge method.**	12
	Total Instructional Hours	45

Course Outcome

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

CO1: Familiarize the concepts of heat and thermodynamics
CO2: Relate the Ultrasound and their applications
CO3: Illustrate the fundamental properties of materials
CO4: Relate the advanced technology of LASER in the field of Engineering
CO5: Analyze the wavelength of different colors by spectral analysis

TEXT BOOKS:

T1 - Rajendran V, Applied Physics, Tata McGraw Hill Publishing Company Limited, New Delhi, 2017.
T2- Gaur R.K. and Gupta S.L., Engineering Physics, 8th edition, Dhanpat Rai Publications (P) Ltd., New Delhi, 2018.

REFERENCE BOOKS:

R1 - M.N Avadhanulu and PG Kshirsagar "A Text Book of Engineering physics" S. Chand and Company ltd., New Delhi 2018
R2 - Halliday, D., Resnick, R. and Walker, J. "Principles of Physics". Wiley, 2020.

WEB REFERENCES

1. https://nptel.ac.in/courses/112106227/
2. https://nptel.ac.in/courses/105105177/
3. https://en.wikipedia.org/wiki/Aerospace_materials/
4. https://nptel.ac.in/courses/104104085/
5. https://nptel.ac.in/courses/108106135/

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	-	2	1	3	2
CO2	2	2	2	2	1	1	1	-	1	-	1	2	2	2
CO3	2	3	2	1	2	1	1	-	2	-	2	3	2	2
CO4	2	2	2	1	1	1	1	-	2	-	2	2	2	2
CO5	2	3	3	2	2	1	1	-	1	-	2	2	2	2
AVG	2	2.6	2.4	1.4	1.4	1	1	-	1.4	-	1.8	2.4	2	2

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Programme / Semester	Course Code	Name of the Course	L	T	P	C
B.Tech/ I	22HE1151	ENGLISH FOR ENGINEERS	2	0	2	3

Course Objective

The student should be able

1. To help the students of engineering and technology develop a strong base in the use of English.
2. To help learners use language effectively in professional writing.
3. To impart basic English grammar and essentials of important language skills
4. To impart knowledge about the importance of vocabulary and grammar
5. To develop the communication skills of the students in both formal and informal situations

Unit	Description	Instructional Hours
I	**Language Proficiency:** Parts of Speech, Degrees of Comparison, Abbreviation& Acronyms **Writing**: Process Description, Instructions. **Vocabulary** – Words on Environment. **Practical Component: Listening-** Watching Short Videos and answer the questions, **Speaking**- Self introduction , Narrating personal experiences / events; Interviewing a celebrity; Reporting / and summarizing of documentaries / podcasts / interviews **Reading**- Purpose of Reading - Churning & Assimilation, Interpreting Ideas - Interpreting Graphs in Technical Writing.	7+2
II	**Language Proficiency**: Types of Sentences, Framing Question, One Word Substitution **Writing:** Writing Checklist, Reading Comprehension. **Vocabulary–** Words on Entertainment. **Practical Component: Listening**-Comprehensions based on TED talks **Speaking**- Story Telling **Reading** - Skimming – Scanning – Reading: Scientific Texts	7+2
III	**Language Proficiency:** Tenses, Conditional Clause ('If' clause), Active and Passive voices, **Writing:** Formal letter (invitation, acceptance, decline, Congratulation) Cloze test. **Vocabulary –** Words on Tools. **Practical Component: Listening**-Listening pre-recorded English language learning programme **Speaking** - Just a minute **Reading**-Reading feature articles (from newspapers and magazines) -Reading to identify point of view and perspective (opinion pieces, editorials etc.)	5+4
IV	**Language Proficiency:** Subject Verb Concord, Articles, The Use of Prefixes and Suffixes **Writing:** Preparing Agenda &Minutes, Writing Recommendations. **Vocabulary–** Words on Engineering process. **Practical Component: Listening**-An interview with someone who works for recruitment personnel. **Speaking**-Presentation on a general topic. **Reading**- Reading Comprehension - Literary Texts.	5+4
V	**Language Proficiency:** Prepositions, Phrasal Verbs, Modal Auxiliaries, **Writing:** Letter to the Editor, Sequencing of Sentences **Vocabulary –**Words on Engineering material **Practical Component: Listening**- Listening- Comprehensions based on Nat Geo/Discovery channel videos **Speaking**- Preparing posters and presenting as a team. **Reading**- Biographies, Travelogues, Technical blogs.	6+3
	Total Instructional Hours	**45**

Course Outcome

After completion of the course the learner will be able

CO1: Understand English and converse effectively.
CO2: Enable the students to write coherently and cohesively.
CO3: Enable the development of basic grammar to enhance language for a better communication
CO4: Use suitable vocabulary and grammar with confidence and express their ideas both in speech and writing.
CO5: Follow the etiquettes in formal and informal communication.

TEXT BOOKS:

T1- Raymond Murphy, "English Grammar in Use"-5th editionCambridgeUniversityPress, 2019.
T2-Norman Whitby, "Business Benchmark-Pre-intermediate to Intermediate", Cambridge University Press, 2016.

REFERENCE BOOKS:

R1- Kapoor A.N., Business Letters for Different Occasions, New Delhi: S. Chand & Co. Pvt. Ltd., 2012.
R2-RaymondMurphy, " English Grammar For ESL Learners - Premium Fourth Edition.
R3- McCarthy, Michael et.al (2011) English Vocabulary in Use – advanced, Cambridge University Press.

CREDIT DISTRIBUTION – R 2022

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

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PO & PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	-	-	-	-	-	-	-	2	-	3	2	1	3	2
CO2	-	-	-	-	2	3	2	3	1	3	1	-	2	2
CO3	-	-	-	3		2	-	2	2	3	2	2	2	2
CO4	-	-	-	-	-	2	-	2	1	3	1	1	2	2
CO5	-	-	-	2	-	-	-	2	3	3	3	1	2	2
AV G	-	-	-	2.5	2	2.3	2	2.2	1.8	3	1.8	1.3	2	2

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Programme	Course Code	Name of the Course	L	T	P	C
B.Tech	22AG1251	PRINCIPLES AND PRACTICES OF CROP PRODUCTION	2	0	2	3

Course Objective

- To introduce the students to agricultural and horticulturalcrops
- To learn the working and operation of farm implements for cultivation practices
- To gain the knowledge on intercultural operations and protection measures for effective crop production
- To understand the production practices of agricultural crops
- To acquire adequate knowledge on horticultural crops and protected cultivation

Unit	Description	Instructional Hours
I	**AGRICULTURE AND CROP PRODUCTION** Introduction to agriculture – allied sectors - 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 Agricultural farms	9
II	**CROP SELECTION AND ESTABLISHMENT** Regional and seasonal selection of crops - Competition amongcrop plants - Spacing and arrangement of crop plants; Field preparation for crops including systems of tillage - selection and treatment of seed - nursery preparation - wet and dry nursery – main field preparation Lab 3: Identification of seeds, manures and fertilizers Lab 4: seeds - sowing methods – seed treatment methods	9
III	**CROP MANAGEMENT** Crop water Management - irrigation- types – irrigation scheduling - 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 Lab 5: Water Management – Irrigation Methods – Crop Water Requirement	9
IV	**PRODUCTION PRACTICES OFAGRICULTURAL CROPS** Generalized management and cultivation practices for important groups of field crops in Tamil Nadu - cereal crops – rice, maize, sorghum, grain legumes - green gram, red gram, oil seed crops - groundnut, sunflower, other purpose crops - sugarcane, and cotton from land preparation to harvesting Lab 6: Nutrient Management - Organic & Inorganic Fertilizers – Integrated Nutrient Management – Application Methods	9
V	**PRODUCTION PRACTICES OF HORTICULTURAL CROPS** Important groups of horticultural crops in Tamil Nadu such as vegetable crops – tomato, brinjal, onion, guards, fruit crops – mango, banana, guava, flower crop – Jasmine, rose from land preparation to harvesting - green house cultivation. Lab 7: Harvesting – Types & Methods – Maturity Indices	9
	Total Instructional Hours	45

Course Outcome

CO1: To acquire knowledge on agricultural and horticulturalcrops and their cropping system

CO2: To gain knowledge in the area of farm implements to increase the production and

productivity of agricultural and horticultural crops

CO3: To understand the Management practices of irrigation, weeds, fertilizer and protection in crop cultivation.

CO4: To acquire knowledge on the crop production practices in TamilNadu and India for agricultural crops

CO5: To understand the role of greenhouse cultivation in future production technology and cultivation practices of horticultural crops

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/ Semester	Course Code	Name of the Course	L	T	P	C
B.Tech/I	22HE1072	ENTREPRENEURESHIP AND INNOVATION	1	0	0	1

Course Objectives

The student should be made

1. To acquire the knowledge and skills needed to manage the development of innovation.
2. To recognize and evaluate potential opportunities to monetize these innovations.
3. To plan specific and detailed method to exploit these opportunities.
4. To acquire the resources necessary to implement these plans.
5. To make students understand organizational performance and its importance.

Module	Description
1	**Entrepreneurial Thinking**
2	**Innovation Management**
3	**Design Thinking**
4	**Opportunity Spotting / Opportunity Evaluation**
5	**Industry and Market Research**
6	**Innovation Strategy and Business Models**
7	**Financial Forecasting**
8	**Business Plans/ Business Model Canvas**
9	**Entrepreneurial Finance**
10	**Pitching to Resources Providers / Pitch Deck**
11	**Negotiating Deals**
12	**New Venture Creation**
13	**Lean Start-ups**
14	**Entrepreneurial Ecosystem**
15	**Velocity Venture**
	TOTAL INSTRUCTIONAL HOURS **15**

Course Outcome

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

CO1: Understand the nature of business opportunities, resources, and industries in critical and creative aspects.

CO2: Understand the processes by which innovation is fostered, managed, and commercialized.

CO3: Remember effectively and efficiently the potential of new business opportunities.

CO4: Assess the market potential for a new venture, including customer need, competitors, and industry attractiveness..

CO5: Develop a business model for a new venture, including revenue. Margins, operations, Working capital, and investment

TEXT BOOKS

T1:Arya Kumar"Entrepreneurship–CreatingandleadinganEntrepreneurialOrganization",Pearson,SecondEdition(2012).
T2: EmrahYayici"DesignThinkingMethodology", Artbiztech, FirstEdition(2016).

REFERENCE BOOKS

R1: Christopher Golis "Enterprise & Venture Capital", Allen &Unwin Publication, Fourth Edition (2007).
R2: Thomas Lock Wood & Edger Papke"Innovation by Design",Career Press.com,Second Edition(2017).
R3: Jonathan Wilson "Essentials of Business Research", Sage Publication, First Edition(2010).

WEB RESOURCES

W1:https://blof.forgeforward.in/tagged/startup-lessons
W2:https://blof.forgeforward.in/tagged/entrepreurship
W3:https://blof.forgeforward.in/tagged/minimum-viable-product
W4:https://blof.forgeforward.in/tagged/minimum-viable-product
W5:https://blof.forgeforward.in/tagged/innovation

CO PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	3	3	-	-	-	-	-	-	2	2	1
CO2	3	3	3	2	2	-	-	-	-	-	-	2	2	2
CO3	3	3	3	2	3	-	-	-	-	-	-	2	2	2
CO4	3	3	3	3	3	-	-	-	-	-	-	2	2	3
CO5	3	3	3	3	3	-	-	-	-	-	-	2	1	2
AVG	3	3	3	2.6	2.8	-	-	-	-	-	-	2	1.8	2

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Programme/ Semester	Course Code	Course Title	L	T	P	C
B.Tech/I	22HE1073	INTRODUCTION TO SOFT SKILLS	2	0	0	0

Course Objectives:

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	2
V	**Verbal Ability** Nouns and Pronouns – Verbs - Subject-Verb Agreement - Pronoun-Antecedent – Agreement – Punctuations	4
	Total Instructional Hours	30

Course Outcome

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.

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Programme/ Semester	Course Code	Name of the Course	L	T	P	C
B.Tech/I	22MC1094	HERITAGE OF TAMIL	2	0	0	1

The learner should be able to

Course Objective

1. Introduce students to the great History of Tamil literature.
2. Establish the heritage of various forms of Rock art and Sculpture art.
3. To study and understand the various folk and Martial arts of Tamil culture
4. Introduce students to Ancient Tamil concepts to understand the richness of Tamil literature.
5. To learn about the various influences or impacts of Tamil language in Indian culture.

Unit	Description	Instructional Hours
I	**Language and Literature** Language families in India – Dravidian Languages – Tamil as a classical language – Classical Literature in Tamil- Secular nature of Sangam Literature – Distributive justice in Sangam Literature – Management principles in Thirukural – Tamil epics and impacts of Buddhism & Jainism in Tamil and Bakthi literature of Azhwars and Nayanmars – Forms of minor poetry _ Development of Modern literature in Tamil – Contribution of Bharathiyar and Bharathidasan.	6
II	**Heritage _ Rock Art Paintings to Modern Art – Sculpture** Hero Stone to Modern Sculpture – Bronze icons – Tribes and their handcrafts - Art of temple car making – Massive Terracotta sculptures, Village deities, Thiruvalluvar statue at Kanyakumari, Making of musical instruments – Mridangam, Parai, Yazh and Nadhaswaram - Role of Temples in social and economic life of Tamils.	6
III	**Folk and Martial Arts** Therukoothu, Karagattem, Villupattu, Kaniyankoothu, Oyilattam, Leather puppertry, Silambattam.,Valari Tiger dance – Sports and Games of Tamils.	6
IV	**Thinai Concept of Tamils** Flora and Fauna of Tamils – Aham and Puram Concept from Tholkappiyam and Sangam Literature – Aram concept of Tamils – Education and Literacy during Sangam Age - Ancient cities and ports of Sangam age – Exporot and Import during Sangam age – Overseas conquest of Cholas.	6
V	**Contribution of Tamils to Indian National Movement and Indian Culture** Contribution of Tamils to Indian freedom struggle – The cultural influence of Tamils over the other parts of India – Self respect movement – Role of Siddha Medicine in indigenous systems of Medicine – Inscriptions & Manuscripts – Print History of Tamil books.	6
	Total Instructional Hours	**30**

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

Course Outcome

CO1: Learn about the works pertaining to Sangam age
CO2: Aware of our Heritage in art from Stone sculpture to Modern Sculpture.
CO3Appreciate the role of Folk arts in preserving, sustaining and evolution of Tamil culture.
CO4: Appreciate the intricacies of Tamil literature that had existed in the past.
CO5: Understand the contribution of Tamil Literature to Indian Culture

TEXT BOOKS:

T1- Social Life of Tamils (Dr.K.K.Pillay) A joint publication of TNTB & ESC and RMRL – (in print)
T2- Social Life of the Tamils - The Classical Period (Dr.S.Singaravelu) (Published by:International Institute of Tamil Studies.
T3- Historical Heritage of the Tamils (Dr.S.V.Subatamanian, Dr.K.D. Thirunavukkarasu)(Published by: International Institute of Tamil Studies).

REFERENCE BOOKS:

R1-The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) (Published by: International Institute of Tamil Studies)
R2- Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu TextBookand Educational Services Corporation, Tamil Nadu)
R3-Journey of Civilization Indus to Vaigai (R.Balakrishnan) (Published by: RMRL)

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Programme/ sem	Course Code	Name of the Course	L T P C
B.Tech/I	22MC1093	தமிழர்மரபு	2 0 0 1

Unit	Description	Instructional Hours
I	**அலகு I மொழி மற்றும் இலக்கியம்:** 3 இந்திய மொழிக் குடும்பங்கள் - திராவிட மொழிகள் – தமிழ் ஒரு செம்மொழி – தமிழ் செவ்விலக்கியங்கள் - சங்க இலக்கியத்தின் சமயச் சார்பற்ற தன்மை – சங்க இலக்கியத்தில் பகிர்தல் அறம் – திருக்குறளில் மேலாண்மைக் கருத்துக்கள் – தமிழ்க் காப்பியங்கள், தமிழகத்தில் சமண பௌத்த சமயங்களின் தாக்கம் - பக்தி இலக்கியம், ஆழ்வார்கள் மற்றும் நாயன்மார்கள் – சிற்றிலக்கியங்கள் – தமிழில் நவீன இலக்கியத்தின் வளர்ச்சி – தமிழ் இலக்கிய வளர்ச்சியில் பாரதியார் மற்றும் பாரதிதாசன் ஆகியோரின் பங்களிப்பு.	3
II	**அலகு II மரபு – பாறை ஓவியங்கள் முதல் நவீன ஓவியங்கள் வரை – சிற்பக் கலை:** 3 நடுகல் முதல் நவீன சிற்பங்கள் வரை – ஐம்பொன் சிலைகள்– பழங்குடியினர் மற்றும் அவர்கள் தயாரிக்கும் கைவினைப் பொருட்கள், பொம்மைகள் – தேர் செய்யும் கலை – சுடுமண் சிற்பங்கள் – நாட்டுப்புறத் தெய்வங்கள் – குமரிமுனையில் திருவள்ளுவர் சிலை – இசைக் கருவிகள் – மிருதங்கம், பறை, வீணை, யாழ், நாதஸ்வரம் – தமிழர்களின் சமூக பொருளாதார வாழ்வில் கோவில்களின் பங்கு.	3
III	**அலகு III நாட்டுப்புறக் கலைகள் மற்றும் வீர விளையாட்டுகள்** 3 தெருக்கூத்து, கரகாட்டம், வில்லுப்பாட்டு, கணியான கூத்து, ஒயிலாட்டம், தோல்பாவைக் கூத்து, சிலம்பாட்டம், வளரி, புலியாட்டம், தமிழர்களின் விளையாட்டுகள்.	3
IV	**அலகு IV தமிழர்களின் திணைக் கோட்பாடுகள்:** 3 தமிழகத்தின் தாவரங்களும், விலங்குகளும் – தொல்காப்பியம் மற்றும் சங்க இலக்கியத்தில் அகம் மற்றும் புறக் கோட்பாடுகள் – தமிழர்கள் போற்றிய அறக்கோட்பாடு – சங்ககாலத்தில் தமிழகத்தில் எழுத்தறிவும், கல்வியும் – சங்ககால நகரங்களும் துறை முகங்களும் – சங்ககாலத்தில் ஏற்றுமதி மற்றும் இறக்குமதி – கடல்கடந்த நாடுகளில் சோழர்களின் வெற்றி.	3
V	**அலகு V இந்திய தேசிய இயக்கம் மற்றும் இந்திய பண்பாட்டிற்குத் தமிழர்களின் பங்களிப்பு:** 3 இந்திய விடுதலைப்போரில் தமிழர்களின் பங்கு – இந்தியாவின் பிறப்பகுதிகளில் தமிழப் பண்பாட்டின் தாக்கம் – சுயமரியாதை இயக்கம் – இந்திய மருத்துவத்தில், சித்த மருத்துவத்தின் பங்கு – கல்வெட்டுகள், கையெழுத்துப்படிகள் - தமிழ்ப் புத்தகங்களின் அச்சு வரலாறு.	3
	Total Instructional Hours	15

TEXT CUM REFERENCE BOOKS

1. தமிழக வரலாறு – மக்களும் பண்பாடும் – கே.கே. பிள்ளை (வெளியீடு தமிழ்நாடு பாடநூல் மற்றும் கலையியல் பணிகள் கழகம்).
2. கணினித் தமிழ் – முனைவர் இல. சுந்தரம். (விகடன் பிரசுரம்).
3. கீழடி – வைகை நதிக்கரையில் சங்ககால நகர நாகரிகம் (தொல்லியல் துறை வெளியீடு)
4. பொருநை – ஆற்றங்கரை நாகரிகம். (தொல்லியல் துறை வெளியீடு)
5. Social Life of Tamils (Dr K.K.Pillay) A joint publication of TNTB & ESC and RMRL – (in print)
6. Social Life of the Tamils - The Classical Period (Dr.S.Singaravelu) (Published by: International Institute of Tamil Studies.
7. Historical Heritage of the Tamils (Dr.S.V.Subatamanian, Dr.K.D. Thirunavukkarasu) (Published by: International Institute of Tamil Studies).
8. The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) (Published by: International Institute of Tamil Studies.)
9. Keeladi - 'Sangam City Civilization on the banks of river Vaigai' (Jointly Published by: Department ofArchaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)

PO& PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	3	3	-	-	-	-	-	2			2
CO2	2	3	3	-	-	-	-	-	2			2
CO3	2	3	3	-	-	-	-	-	2			2
CO4	2	3	-	-	-	-	-	-	2			2
CO5	2	3	-	-	-	-	-	-	2			2
AVG	2	3	1.8	-	-	-	-	-	2			2

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Programme/ Semester	Course Code	Name of the Course	L	T	P	C
B.Tech/I	22MC1095	UNIVERSAL HUMAN VALUES	2	0	0	0

Course Objectives

The student should be made

1. To help the students appreciate the essential complementarily between 'VALUES' and 'SKILLS' to ensure sustained happiness and prosperity which are the core aspirations of all human beings.
2. To facilitate the development of a Holistic perspective among students towards life and profession as well as towards happiness and prosperity based on a correct understanding of the Human reality and the rest of existence. Such a holistic perspective forms the basis of Universal Human Values and movement towards value-based living in a natural way.
3. To highlight plausible implications of such a Holistic understanding Interms of ethical human conduct, trustful and mutually fulfilling human behavior and mutually enriching interaction with Nature.

Unit	Description	Instructional Hours
I	**Introduction to Value Education** Right Understanding, Relationship and Physical Facility (Holistic Development and the Role of Education)-Understanding Value Education - Self-exploration as the Process for Value Education - Continuous Happiness and Prosperity – the Basic Human Aspirations - Happiness and Prosperity – Current Scenario - Method to Fulfill the Basic Human Aspirations	6
II	**Harmony in the Human Being and Harmony in the Family** Understanding Human being as the Co-existence of the Self and the Body - Distinguishing between the Needs of the Self and the Body - The Body as an Instrument of the Self - Understanding Harmony in the Self- Harmony of the Self with the Body - Programme to ensure self-regulation and Health	6
III	**Harmony in the Family and Society** Harmony in the Family – the Basic Unit of Human Interaction. Values in Human to Human Relationship 'Trust' – the Foundational Value in Relationship Values in Human to Human Relationship 'Respect' – as the Right Evaluation Understanding Harmony in the Society	6
IV	**Harmony in the Nature / Existence** Understanding Harmony in the Nature.Inter connectedness, self-regulation and Mutual Fulfillment among the Four Orders of Nature- Understanding Existence as Co-existence of mutually interacting units in all pervasivespace Realizing Existence as Co-existence at All Levels The Holistic Perception of Harmony in Existence. Vision for the Universal Human Order	6
V	**Implications of the Holistic Understanding – a Look at Professional Ethics** Natural Acceptance of Human Values Definitiveness of (Ethical) Human Conduct A Basis for Humanistic Education, Humanistic Constitution and Universal Human Order-Competence in Professional Ethics Holistic Technologies, Production Systems and Management Models-Typical Case Studies Strategies for Transition towards Value-based Life and Profession	6
	Total Instructional Hours	**30**

Course Outcome

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

CO1: To become more aware of holistic vision of life - themselves and their surroundings.

CO2: To become more responsible in life, in the Society and in handling problems with sustainable Solutions.

CO3: To sensitive towards their commitment towards what they understood towards environment and Socially responsible behavior.

CO4: To able to apply what have learnt to their own self in different day-to-day settings in real life and in handling problems with sustainable solutions.

CO5: To develop competence and capabilities for maintaining Health and Hygiene.

Reference Books:

R1- A Foundation Course in Human Values and Professional Ethics, R R Gaur, R Asthana, G P Bagaria, 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034-47-1

R2- Teachers' Manual for A Foundation Course in Human Values and Professional Ethics, RR Gaur, R Asthana, G P Bagaria, 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93- 87034-53-2

R3-Jeevan Vidya: Ek Parichaya, A Nagaraj, Jeevan Vidya Prakashan, Amarkantak, 1999.

R4- Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004.

CO PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	3	3	-	2	-	-	-	2	-	-	2
CO2	2	3	3	-	2	-	-	-	2	-	-	2
CO3	2	3	3	-	2	-	-	-	2	-	-	2
CO4	2	3	3	-	2	-	-	-	2	-	-	2
CO5	2	3	3	-	2	-	-	-	2	-	-	2
AVG	2	3	3	-	2	-	-	-	2	-	-	2

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Department of Agricultural Engineering

Syllabus Revision carried out in 2024-2025 ODD Semester

2022 Regulation Syllabus revision

S.No	Year	Sem	Course Code & Name	Existing Syllabus	Revised Syllabus	% of Change
1	I	I	22AG1251 - Principles and Practices of Crop Production	**UNIT I AGRICULTURE AND CROP PRODUCTION** Introduction to agriculture - allied 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	**UNIT I AGRICULTURE AND CROP PRODUCTION** Introduction to agriculture - allied sectors - 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	30%
				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 - selection and treatment of seed - nursery preparation - wet and dry nursery – main field preparation	**UNIT II CROP SELECTION AND ESTABLISHMENT** Regional and seasonal selection of crops - 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 - wet and dry nursery – main field preparation	
				UNIT III CROP MANAGEMENT Crop water Management - irrigation- types – irrigation scheduling – crop water	**UNIT III CROP MANAGEMENT** Crop water Management - irrigation- types – irrigation scheduling - Crop nutrition	

				requirement - 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	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 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	**UNIT IV PRODUCTION PRACTICESOFAGRICULTURAL CROPS** Generalized management and cultivation practices for important groups of field crops in Tamil Nadu - cereal crops – rice, maize, sorghum, grain legumes - green gram, red gram, oil seed crops - groundnut, sunflower, other purpose crops - sugarcane, and cotton from land preparation to harvesting	
				UNIT 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 - greenhouse cultivation.	**UNIT V PRODUCTION PRACTICES OF HORTICULTURAL CROPS** Important groups of horticultural crops in Tamil Nadu such as vegetable crops – tomato, brinjal, onion, guards, fruit crops – mango, banana, guava, flower crop – malligai, rose from land preparation to harvesting - green house cultivation	

Syllabus Revision carried out in 2024-2025 ODD Semester

2022 Regulation (2023 Batch) - I semester = 3.2 %

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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 2023-2027 (ODD SEMESTER)

(Academic Council Meeting held on 21.06.2024)

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	தமிழர் மரபு	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	தமிழரும் தொழில்நுட்பமும்	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.	22AG3202R	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.	22AG3252R	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
MANDATORY COURSE											
10	22MC3191	ESSENCE OF INDIAN TRADITIONAL KNOWLEDGE	MC	2	0	0	0	0	100	0	100
TOTAL CREDITS				**19**	**2**	**8**	**25**	**29**	**560**	**440**	**1000**

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	0	0	1	1	1	100	0	100
TOTAL CREDITS				**18**	**2**	**8**	**23**	**29**	**460**	**440**	**900**

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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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33

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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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34

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

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Programme	Course Code	Name of the Course	L	T	P	C
B.Tech	22MA3109	LAPLACE TRANSFORMS , FOURIER SERIES AND TRANSFORMS(AGRI)	3	1	0	4

Course Objective

The learner should be able to

1. Analyze the techniques of Laplace transform & Inverse Laplace transform
2. Analyze the Fourier series which is central to many applications in engineering.
3. Familiarize the effective tools for the solutions of one dimensional boundary value problems.
4. Explore the Fourier transform techniques in various situations.
5. Explore the Z transform techniques for discrete time systems.

Unit	Description	Instructional Hours
I	**LAPLACE & INVERSE LAPLACE TRANSFORM** Laplace transform –Basic properties –Transforms of derivatives and integrals of functions - Periodic functions –Inverse Laplace transform - Convolution theorem (without proof) – Solution of linear ODE of second order with constant coefficients using Laplace transforms.	12
II	**FOURIER SERIES** Dirichlet's conditions- General Fourier Series – Odd and Even Functions – Change of Interval - RMS Value - Parseval's Identity - Half Range Sine and Cosine Series - Harmonic analysis.	12
III	**BOUNDARY VALUE PROBLEMS** Classification of PDE - Solutions of one dimensional wave equation - One dimensional equation of heat conduction (excluding insulated edges).	12
IV	**FOURIER TRANSFORMS** Fourier Transform Pairs - Fourier Sine and Cosine transforms – Properties - Transforms of Simple functions – Convolution Theorem (Statement only) – Parseval's identity (Statement only).	12
V	**Z - TRANSFORMS AND DIFFERENCE EQUATIONS** Z- Transforms - Elementary properties – Inverse Z - transform (using partial fraction) – Convolution theorem(excluding proof)– Solution of difference equations using Z – transform	12
	Total Instructional Hours	60

Course Outcome

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

CO1: Apply Laplace transform and its properties to solve periodic functions.
CO2: Apply the principles of Fourier series which helps them to solve physical problems of engineering.
CO3: Apply the Fourier series in solving the boundary value problems.
CO4: Compute the Fourier transforms techniques which extend its applications.
CO5: Acquire knowledge about the Z- transforms for analyzing discrete-time signals and systems.

TEXT BOOKS:

T1 – Erwin Kreyszig, Advanced Engineering Mathematics, 10th Edition, John Wiley & Sons, 2011.
T2 - Veerarajan T, "Engineering Mathematics ", McGraw Hill Education(India) Pvt Ltd, New Delhi, 2016.

REFERENCE BOOKS :

R1 - Veerarajan. T., "Transforms and Partial Differential Equations", Tata McGraw Hill Education Pvt. Ltd., Second reprint, New Delhi, 2012.
R2 - Grewal B.S., "Higher Engineering Mathematics", 44th Edition, Khanna Publishers, Delhi, 2018.
R3 - Ramana. B.V., "Higher Engineering Mathematics", 12th Edition, Tata McGraw Hill Publishing Company Limited, New Delhi, 2015.

PO& PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	3	3	1	1	-	-	1	2	2	3	2
CO2	3	3	3	3	3	1	1	-	-	1	2	2	3	2
CO3	3	3	3	3	2	1	1	-	-	1	2	2	3	2
CO4	3	3	3	2	2	1	2	-	-	1	2	2	2	2
CO5	3	3	3	2	2	1	2	-	-	1	3	2	2	2
AVG	3	3	3	2.6	2.4	1	1.4			1	2.2	2	2.6	2

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Dean (Academics)

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 PROPERTIES OF 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 Outcome	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.

PO & PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3		3			3	3	2	1		1	3	3	1
CO2	3	2		2				2		1	1	2	3	2
CO3	1		1		2	1			2			3	3	2
CO4	2	1		3	2		1	2	1	3		1	3	2
CO5	3	2	1			2	1	1	2	1	2	2	3	3
Avg	2.4	1	1	1	0.8	1.2	1	1.4	1.2	1	0.8	2.2	3	2

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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

- To develop students understanding of the basic principles of fluid mechanics.
- To identify various types of flow analysis.
- To understand flow measurements, flow through pipes and open channel flow.
- To evaluate the performance of hydraulic turbines and understand the functioning and characteristic curves of pumps

Unit	Description	Instructional Hours
I	**INTRODUCTION TO FLUID MECHANICS** Fluid - Fluid types - Properties of fluids – units of measurement -. Thermodynamic properties - Fluid pressure and measurement. Hydrostatic forces on surfaces – total pressure and centre of pressure – Horizontal - Vertical and Inclined plane surface - Pressure diagram – total pressure on curved surface. Archimedes principles –buoyancy - metacentre – metacentric height.	12
II	**FLUID FLOW ANALYSIS** Types of fluid flow – velocity and acceleration of a fluid particle - Rotational – irrotational circulation and vorticity - Flow pattern – stream line – equipotential line – stream tube path line – streak line – flow net – velocity potential – stream function. Principles of conservation of mass – energy – momentum – continuity equation in Cartesian co-ordinates - Euler's equation of motion.	12
III	**FLOW MEASUREMENT** Bernoulli's equation – applications - Venturimeter – orifice meter – nozzle meter -rotameter - pitot tube – Orifice - Flow through pipes – laminar and turbulent flow in pipes - Reynold's experiment - Darcy – Weisbach equation for friction head loss– Chezy's formula – Manning's formula – Hazen-William's formula - Major and minor losses in pipes – hydraulic gradient line – energy gradient line. Siphon – water hammer in pipes	12
IV	**OPEN CHANNEL FLOW** Types of flow in channel – uniform flow – most economical section	12

	of channel –rectangular – trapezoidal- Flow measurement in channels – notches – rectangular, Cipolletti and triangular – float method - weirs – free and submerged flow – current meter – Parshall flume. Dimensional analysis – Fundamental dimensions – dimensional homogeneity – Rayleigh's method and Buckingham Pi- Theorem - concept of geometric, kinematic and dynamic similarity.	
V	**PUMPS** Pump terminology – suction lift, suction head, delivery head, discharge, water horse power – selection of pump capacity. Centrifugal pumps components – working – types of pumps and impellers - Priming – cavitation – specific speed – characteristic curves - submersible pumps - Jet pump – jet assembly – Other pumps – Air lift pump - reciprocating pump - sludge pump and vacuum pump- Hydraulic ram	12
	Total Instructional Hours	60

Course Outcome

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 Bansal R.K., "Fluid Mechanics & Hydraulic Machines", Laxmi Publications, 2015.

T2 Modi P. N. and Seth S M., "Hydraulics and Fluid Mechanics including Hydraulic Machines",Standard Book House, New Delhi, 2013

REFERENCE BOOKS:

R1 Streeter V.L., Wylie E. B. and Bedford K. W., "Fluid Mechanics", Tata McGraw Hill Publishing Co.Ltd., 2017.

R2 Garde, R. J., "Fluid Mechanics through problems", New Age International Publishers (P) Ltd., New Delhi, 2002.

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

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Programme	Course Code	Name of the Course	L	T	P	C
B.Tech	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** Thermodynamics and Energy – Systems – Types and properties - State and Equilibrium - Processes and Cycles – Forms of Energy – Temperature and Zeroth law of Thermodynamics – Pure substances – Phase change processes of pure substances – Property diagrams – Internal energy – Enthalpy – Energy transfer by Heat, Work and Mass – 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 - Carnot principles – Change in Entropy – Entropy and irreversibility - Applications.	9
III	**GASES AND STEAM POWER CYCLES** Ideal and Real gases – Vander waals equations -Properties of mixture of gases and specific heats of gas mixtures –Gibbs law and Dalton"s law. Air Standard Cycles - Otto, Diesel and Dual– Performance and Comparison.	9
IV	**HEAT ENGINES** Internal Combustion Engines – C.I and S.I Engines – Four Stroke and Two Stroke Engines. Desirable properties and qualities of fuels. Air-fuel ratio calculation Boilers – Fire Tube Boiler & Water Tube Boilers, Boiler Accessories and Components. Gas turbine, Turbine Components.	9
V	**REFRIGERATION AND AIR CONDITIONING SYSTEMS** Refrigeration Cycle – Vapour Compression & Vapour Absorption System, Gas Refrigeration System and Thermoelectric refrigeration. Air conditioning systems, concept of RSHF, GSHF and ESHF, Cooling load calculations.	9
	Total Instructional Hours	45

Course Outcome

CO1- To understanding of basic concepts of thermodynamics and zeroth law.
CO2- To apply the first, second law of thermodynamics and Carnot principles for different applications.
CO3- To analyze gases and basic power cycles to various real life systems. CO4- To understand the internal combustion engines, boiler and gas turbine.

CO5-To understand the refrigeration and air conditioning systems.

TEXT BOOKS

T1 Nag.P.K., "Engineering Thermodynamics", Third Edition, Tata McGraw hill, 2005.

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 Yunus A. Cenegal and Michael A.Boles, "Thermodynamics: An Engineering Approach", Fourth Edition, Tata McGraw-hill, 2004.

R3 Domkundwar.S., C.P.Kothandaraman "A Course in Thermal Engineering", Fifth Edition, Dhanpat Rai & Co (p) Ltd, 2000.

PO & PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	1	2	1	2	2	1	1	-	1	2	2	2
CO2	3	3	2	2	1	2	2	1	2	-	1	2	2	2
CO3	3	2	3	2	1	2	2	1	3	-	3	2	2	2
CO4	3	2	2	2	1	3	3	1	2	-	1	2	2	2
CO5	3	2	3	3	1	3	3	1	3	-	1	2	2	2
Avg	3	2.4	2.2	2.2	1	2.4	2.2	1	2.2	-	1.4	2	2	2

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

Course Objective

- To introduce scope, importance and key concepts of agro processing
- 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 – types of evaporators . **LAB 1: Determination of thermal efficiency and economy of 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 **LAB 2: Study on cyclone separation process and packed bed column**	9
III	**SIZE REDUCTIONAND MIXING** 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 –	9

rolling compression mills - attrition, rod, ball and tube mills – construction and operation.

LAB 3: Determination of energy requirement in size reduction using the ball mill and hammer mill and evaluation of a sieve and determination of particle size of granular foods by sieve analysis

CONTACT EQUILIBRIUM SEPARATION

IV	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 – equipments	9

Lab 4: Determination of drying efficiency for different food samples

CRYSTALLISATION AND DISTILLATION

V	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

Lab 5: Determination of angle of repose for different food materials

Total Instructional Hours 45

Course Outcome	**CO1**	Fundamentals of various unit operation of agricultural processing
	CO2	Understand the liquid characteristics and performance of single and multiple effect evaporator
	CO3	Classify the filter media type and its requirements and sedimentation pf particles in fluid
	CO4	Monitoring and evaluation – concept and definition, monitoring, and evaluation of Extensionprogrammers, Transfer of Technology- Concept and models
	CO5	To expose with various Rural development programmes aimed at poverty alleviation and toincrease employment opportunities and their analysis

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

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

R3 Geankoplis, C.J. "Transport Processes and Separation Process Principles", 4th Edition, Prentice Hall, 2003.

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

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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

- To gain knowledge on basic principle and concepts of different surveying methods.
- To learn how to use compass to carryout land surveying.
- To learn the basics of leveling and its applications.
- To explore the types and characteristics of contours.
- 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) **LAB:** 1. Aligning, Ranging and Chaining 2. 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.	9
III	**LEVELLING** Levelling- Principles and theory of Levelling - Datum - Bench Marks – Temporary and Permanent Adjustments- Methods of Levelling - Sources of errors in Levelling **LAB:** 1.Fly leveling 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	9

adjustments - Heights and distances by single plane and double method

LAB:

1. Computation of area by Theodolite Traverse
2. Computation of area of an agricultural farmland using Total Station
3. Using Global Positioning System (GPS) Technology for Tree marking in an agricultural farmland

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 Punmia, B. C., "Surveying", Vol.1, Laxmi Publications, New Delhi. 2015.

T2 Chandra A.M., "Plane Surveying", New Age International Publishers, 2015.

REFERENCE BOOKS:

R1 Alak De, "Plane Surveying", S. Chand & Company Ltd., 2000.

R2 Bannister and S. Raymond, R. Baker "Surveying", 7th Edition, Pearson Education Ltd., 2009

R3 Roy S.K., "Fundamentals of Surveying", 2nd Edition, Prentice Hall of India, 2010.

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

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

Course Objective

- Expose the students to the genesis of soil formations from rocks.
- Make the students understand the soil profile characterization related to crop production
- Train the students with hands on practical estimations of EC, pH….etc.
- Determine the soil properties such as unit weight, specific gravity, density of soil etc.
- Impart the students with the strategies for reclamation of problem soils and enrich the soil nutrients

S.NO	LIST OF EXPERIMENTS
1	Identification of rocks and minerals
2	Collection of soil sample and its processing.
3	Determination of pH and Electrical conductivity of soil
4	Determination of particle and bulk density of soil
5	Determination of Specific Gravity of soil by Pyconometer
6	Determination of soil compaction by procator method
7	Determination of organic matter and gypsum Requirements of soil
8	Determination of grain size distribution of soil by sieve analysis
9	Determination of field density of soil by core cutter method
10	Determination of field density of soil by Sand Replacement Method
11	Study the working principles of agricultural sensors
12	Study on microwave plasma atomic emission spectrometer

Course Outcome

By the end of the course, the students will be able to

CO1: Understand the soil profile and practical usage of instruments used for soil sampling.

CO2 Understand the methods of determination of physical characteristics of soil

CO3: Understand the quality criteria of root zone soil profiles suitable for crop

CO4: Understand the procedures for reclaiming the problem soils with amendments

CO5: Understand the nutrient availability and enriching nutrients in the soil

S.NO	LIST OF EQUIPMENTS REQUIRED	REQUIRED QUANTITY
1	PH Meter and EC Meter	1
2	Pyconometer	1

3	Mechanical Sieve Shaker	1
4	Core Cutter	1
5	Sand Replacement Tool Test	1

REFERENCES

R1 Punmia, B.C, "Soil Mechanics and Foundation Engineering", Laxmi Publishers, New Delhi. 2000

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

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

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Programme	Course Code	Course Title	L	T	P	C
B.Tech	22HE3071	Soft Skills - II	1	0	0	1

Course Objectives:

1. To make the students aware of the importance, the role and the content of soft skills through instruction, 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 - Interpersonal skills-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 - Coded inequalities - Conditions and Grouping	6

Course Outcome:

CO1:	Students will have learnt to keep going according to plan, coping with the unfamiliar, 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 analysis methodologies 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.Tech.	22AG3072	Basic Electrical, Electronics and Instrumentation Engineering	3	0	0	3

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
I	**ELECTRICAL CIRCUITS** DC Circuits: Circuit Components: Conductor, Resistor, Inductor, Capacitor – Ohm's Law - Kirchhoff's Laws – Simple problems- Nodal Analysis, Mesh analysis with Independent sources only (Steady state) Introduction to AC Circuits and Parameters: Waveforms, Average value, RMS Value, Instantaneous power, real power, reactive power and apparent power, power factor – Steady state analysis of RLC circuits (Simple problems only), Three phase supply – star and delta connection – power in three-phase systems	9
II	**MAGNETIC CIRCUITS AND ELECTRICAL INSTALLATIONS** Magnetic circuits-definitions-MMF, ux, reluctance, magne field intensity, flux density, fringing, self and mutual inductances-simple problems. Domestic wiring, types of wires and cables, earthing, protective devices-switch fuse unit- Miniature circuit breaker-m e circuit breaker, safety precautions and First Aid	9
III	**ELECTRICAL MACHINES** 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. Construction, working principle and Applications of Transformer, Three phase Alternator, Synchronous motor and Three Phase Induction Motor.	9
IV	**ANALOG ELECTRONICS** Resistor, Inductor and Capacitor in Electronic Circuits- Semiconductor Materials: Silicon &Germanium – PN Junction Diodes, Zener Diode – Characteristics Applications – Bipolar Junction Transistor-Biasing, JFET, SCR, MOSFET, IGBT – Types, I-V Characteristics and Applications, Rectifier and Inverters, harmonics	9
V	**SENSORS AND TRANSDUCERS** Sensors, solenoids, pneumatic controls with electrical actuator, mechatronics, types of valves and its applications, electro-pneumatic systems, proximity sensors, limit switches, piezoelectric, hall effect, photo sensors, Strain gauge, LVDT, differential pressure transducer, optical and digital transducers, Smart sensors, Thermal Imagers.	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

PO & PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	1	2	1	2	2	1	1	-	1	2	2	2
CO2	3	3	2	2	1	2	2	1	2	-	1	2	2	2
CO3	3	2	3	2	1	2	2	1	3	-	3	2	2	2
CO4	3	2	2	2	1	3	3	1	2	-	1	2	2	2
CO5	3	2	3	3	1	3	3	1	3	-	1	2	2	2
Avg	3	2.4	2.2	2.2	1	2.4	2.2	1	2.2	-	1.4	2	2	2

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Programme/ Semester	Course Code	Name of the Course	L	T	P	C
B.Tech/ I	22MC3191	ESSENCE OF INDIAN TRADITIONAL KNOWLEDGE	2	0	0	0

Course Objective

The student should be able

1.To facilitate the students with the concepts of Indian traditional knowledge and to make them understand the Importance of roots of knowledge system.

2.To make the students understand the traditional knowledge and analyze it and apply it to their day to day life.

3.To impart basic principles of thought process, Itihas and Dharma Shastra and connecting society and nature.

4. To understand the concept of Intellectual and intellectual property rights with special Reference.

5. The course focuses on introduction to Indian Knowledge System, Indian perspective of modern scientific world-view and basic principles of Yoga and Indian philosophy

Unit	Description	Instructional Hours
I	**Introduction to traditional knowledge:** Define traditional knowledge, nature and characteristics, scope and importance, kinds of traditional knowledge, Indigenous Knowledge (IK), characteristics, traditional knowledge vs indigenous knowledge, traditional knowledge vs western knowledge	6
II	**Protection of traditional knowledge:** The need for protecting traditional knowledge, Significance of TK Protection, value of TK in global economy, Role of Government to harness TK	6
III	**Itihas and Dharma-Shastra** **Itihas:** The Mahabharata - The Puranas - The Ramayana **Dharma-Shastra**: Manu Needhi - The Tirukkural – Thiru Arutpa	6
IV	**Traditional knowledge and intellectual property:** Systems of traditional knowledge protection, Legal concepts for the protection of traditional knowledge, Patents and traditional knowledge, Strategies to increase protection of traditional knowledge	6
V	**Indian philosophy** Jain – Buddhist – Charvaka – Samkhya - Yoga - Nyaya - Vaisheshika - Saiva Siddhanta	6
	Total Instructional Hours	

After completion of the course the learner will be able

Course Outcome

1. Identify the concept of Traditional knowledge and its importance.
2. Explain the need and importance of protecting traditional knowledge.
3. Explain the need and importance of Itihas and Dharma Shastra.
4. Interpret the concepts of Intellectual property to protect the traditional knowledge.
5. Interpret the concepts of indian philosophy to protect the traditional knowledge.

REFERENCE BOOKS:

Traditional Knowledge System in India, by Amit Jha, 2009.

2. Traditional Knowledge System in India by Amit Jha Atlantic publishers, 2002.

3. "Knowledge Traditions and Practices of India" Kapil Kapoor1, Michel Danino2.

4. V. Sivaramakrishna (Ed.), Cultural Heritage of India-Course Material, Bharatiya Vidya Bhavan, Mumbai, 5th Edition, 2014.

5. V N Jha (Eng. Trans,), Tarkasangraha of Annam Bhatta, Inernational Chinmay Foundation, Velliarad, Amakulam.

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Department of Agricultural Engineering

Syllabus Revision carried out in 2024-2025 ODD Semester

2022 Regulation Syllabus revision

S.No	Year	Sem	Course Code & Name	Existing Syllabus	Revised Syllabus	% of Change
1	II	III	22AG3202R Fluid Mechanics and Pumps	**Unit I: PROPERTIES OF FLUIDS** Properties of fluids – definition – units of measurement - Mass density – specific weight, specific volume – specific gravity - equation of state – perfect gas - Viscosity – vapour pressure – compressibility and elasticity - surface tension capillarity. Fluid pressure and measurement – simple, differential and micro manometers - Mechanical gauges – calibration. Hydrostatic forces on surfaces – total pressure and centre of pressure – Horizontal - Vertical and Inclined plane surface - Pressure diagram – total pressure on curved surface. Archimedes principles – buoyancy - metacentre – metacentric height.	**Unit I: INTRODUCTION TO FLUID MECHANICS** Fluid - Fluid types - Properties of fluids – units of measurement Thermodynamic properties - Fluid pressure and measurement -Hydrostatic forces on surfaces – total pressure and centre of pressure – Horizontal - Vertical and Inclined plane surface - Pressure diagram – total pressure on curved surface. Archimedes principles – buoyancy - metacentre – metacentric height.	30
				Unit III : FLOW MEASUREMENT Bernoulli's equation – applications - Venturimeter – orifice meter – nozzle meter - rotameter – elbow meter - pitot tube – Orifice – sharp edged orifice discharging free –	**Unit III : FLOW MEASUREMENT** Bernoulli's equation – applications - Venturimeter – orifice meter – nozzle meter - rotameter - pitot tube – Orifice - Flow through pipes – laminar and turbulent flow in pipes -	

				submerged orifice – mouth piece - Flow through orifice under variable head – time ofemptying a tank with and without inflow. Flow through pipes – laminar and turbulentflow in pipes - Reynold's experiment - Darcy – Weisbach equation for friction head loss– Chezy's formula – Manning's formula – Hazen-William's formula - Major and minor losses in pipes – hydraulic gradient line – energy gradient line. Siphon – water hammer in pipes – gradual and sudden closure of valves	Reynold's experiment - Darcy – Weisbach equation for friction head loss– Chezy's formula – Manning's formula – Hazen-William's formula - Major and minor losses in pipes – hydraulic gradient line – energy gradient line. Siphon – water hammer in pipes	
				Unit IV: OPEN CHANNEL FLOW Types of flow in channel – uniform flow – most economical section of channel – rectangular – trapezoidal. Specific energy and critical depth - momentum in open channel flow – specific force – critical flow – computation. Flow measurement in channels – notches – rectangular, Cipolletti and triangular – float method - Flow measurement in rivers/ streams/ canals – weirs – free and submerged flow – current meter – Parshall flume.	**Unit IV: OPEN CHANNEL FLOW** Types of flow in channel – uniform flow – most economical section of channel –rectangular – trapezoidal- Flow measurement in channels – notches – rectangular, Cipolletti and triangular – float method - weirs – free and submerged flow – current meter – Parshall flume. Dimensional analysis – Fundamental dimensions – dimensional homogeneity – Rayleigh's method and Buckingham Pi-Theorem - concept of geometric, kinematic and dynamic similarity.	
				Unit V: DIMENSIONAL ANALYSIS AND PUMPS	**Unit V: PUMPS** Pump terminology – suction	

				Dimensional analysis – Fundamental dimensions – dimensional homogeneity – Rayleigh's method and Buckingham Pi-Theorem - concept of geometric, kinematic and dynamic similarity. Important non dimensional numbers – Reynolds, Froude, Euler Mach and Weber - Pump terminology – suction lift, suction head, delivery head, discharge, water horse power – selection of pump capacity. Centrifugal pumps components – working – types of pumps and impellers - Priming – cavitation – specific speed – characteristic curves - submersible pumps - Jet pump – jet assembly – Other pumps – Air lift pump - reciprocating pump - sludge pump and vacuum pump- Hydraulic ram.	lift, suction head, delivery head, discharge, water horse power – selection of pump capacity. Centrifugal pumps components – working – types of pumps and impellers - Priming – cavitation – specific speed – characteristic curves - submersible pumps - Jet pump – jet assembly – Other pumps – Air lift pump - reciprocating pump - sludge pump and vacuum pump- Hydraulic ram	
2	**II**	**III**	**22AG3252R Surveying and Levelling**	**Unit 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. LAB: 1. Plane table Surveying - Radiation Method 2. Plane table Surveying – Intersection Method	**Unit 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.	6%

Syllabus Revision carried out in 2024-2025 ODD Semester

2022 Regulation (2022 Batch) - III semester = 5.3 %

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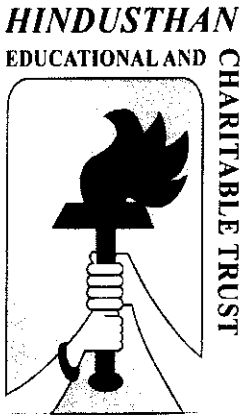

HINDUSTHAN

COLLEGE OF ENGINEERING AND TECHNOLOGY

(An Autonomous Institution)

Coimbatore– 641032

DEPARTMENT OF AGRICULTURAL ENGINEERING

Revised Curriculum and Syllabus for the

Batch 2022 – 2026 (ODD SEMESTER)

(Academic Council Meeting held on 21.06.2024)

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.	22HE4071	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 Enrollment of B.E. / B. TECH. (HONOURS) / Minor Degree (Optional)

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68

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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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Programme	Course Code	Name of the Course	L	T	P	C
B.Tech.	22AG5202	TRACTORS AND ENGINE SYSTEMS	3	1	0	4

Course Objective

- To introduce the students to the different systems and working principles of tractor, power tiller, makes of tractors and power tillers.

Unit	Description	Instructional Hours
I	**TRACTORS** Classification of tractors - Tractor engines – construction of engine blocks, cylinder head and crankcase - features of cylinder, piston, connecting rod and crankshaft – firing order combustion chambers.	12
II	**ENGINE SYSTEMS** Valves-inlet and outlet valves – valve timing diagram. Air cleaner- exhaust – silencer. Cooling systems - lubricating systems - fuel system – governor- electrical system.	12
III	**TRANSMISSION SYSTEMS** Transmission - clutch - gear box - sliding mesh - constant mesh - synchro mesh. Differential, final drive and wheels. Steering geometry - steering systems - front axle and wheel alignment. Brake - types - system.	12
IV	**HYDRAULIC SYSTEMS** Hydraulic system - working principles, three point linkage - draft control - weight transfer, theory of traction - tractive efficiency – tractor chassis mechanics - stability - longitudinal and lateral. Controls - visibility - operator seat.	12
V	**POWER TILLER, BULLDOZER AND TRACTOR TESTING** Power tiller - special features - clutch - gear box - steering and brake. Makes of tractors, power tillers and bulldozers. Bulldozer- salient features – turning mechanism, track mechanism, components – operations performed by bulldozers. Types of tests- test procedure - need for testing & evaluation of farm tractor -Test code for performance testing of tractors and power tillers	12
	Total Instructional Hours	60

Course Outcome

CO1: The students will be able to understand the tractor classification and components.
CO2: The students will have the knowledge engine systems.
CO3: The students will able to understand transmission systems and its working principle.
CO4: The student will able to understand hydraulics and control systems.
CO5: The students will get basic idea about testing procedures of various farm machinery equipments.

TEXT BOOKS:

T1 Jain, S.C. and C.R. Rai. Farm tractor maintenance and repair. Standard publishers and distributors, New Delhi, 1999.

Barger, E.L., J.B. Liljedahl and E.C. McKibben, Tractors and their Power Units. Wiley Eastern
T2 Pvt. Ltd., New Delhi, 1997.

REFERENCE BOOKS:

R1 Black, P.O. Diesel engine manual. Taraporevala Sons& Co., Mumbai, 1996.

R2 Domkundwar A.V. A course in internal combustion engines. Dhanpat Rai & Co. (P) Ltd., Educational and Technical Publishers, Delhi,1999.

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	2	3	2
CO2	3	2	3	2	1	2	2	-	2	-	2	3	2	2
CO3	3	2	3	2	2	1	2	-	1	-	1	2	2	2
CO4	3	2	2	3	3	3	3	-	2	-	1	2	2	2
CO5	3	2	3	3	3	3	3	-	3	-	1	2	2	2
Avg	3	2	2.8	2.2	2.2	2	2.2	-	1.8	-	1.2	2.2	2.2	2

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Programme	Course Code	Name of the Course	L	T	P	C
B.Tech.	22AG5301	FARM POWER AND MACHINERY MANAGEMENT	3	0	0	3

Course Objective

To know the Role of mechanization in Indian agricultural scenario.

To learn the field Performance, replacement and cost analysis of farm machineries.

To understand the Break-even point and cash flow for various farm work

To learn the planning and initiate the research and development for further utilization of farm machinery for various field operation

Unit	Description	Instructional Hours
	Mechanization in Indian Agriculture	
I	Role of Mechanization in Indian Agriculture-Farm Power Availability and Productivity in India-Major Problems Facing Mechanization in Indian Agriculture- Farm mechanization index- Farm mechanization and farm employment in India- Agricultural Mechanization Policy Objectives and Recommendations.	9
	Performance and cost analysis	
II	Importance of farm machinery management- Field Performance and power requirements- Power Requirements- Cost of Operation of Farm Equipment- Fixed Costs -Operating Costs -Depreciation -Straight-line method -Declining-balance method -Sum-of-the years digits method- Interest on Investment- Variable Costs.	9
	Selection of optimum machinery and replacement criteria	
III	Selection of tractors- Selection of matching farm equipment- Development of computer programme for selection of farm equipment- Replacement of farm machinery-time of replacement-Effect of repair cost on accumulated cast.	9
	Break-even point and its analysis	
IV	Break-even point- Break-even point in mechanizing farm operations- Benefits and Limitations of Break Even Analysis -Utilities and reliability index - Cash Flow Analysis- Reasons for Creating a Cash Flow Budget -Cash Flow is not Profitability - Other Financial Statements- Agricultural credit.	9
	Mechanization planning	
V	Present status of farm mechanisation -Factors in favour of farm mechanization- Future targets to achieve the desired level of mechanisation in India - Policy Initiatives by the Government of India to Promote Farm Mechanization - research and development - Case studies and agricultural mechanization in India.	9
	Total Instructional Hours	45

Course Outcome

CO1: The students will be able to understand the role of mechanization and its relationships to productivity, employment, social and technical changes in India

CO2: The students will be able to understand the performance and cost of operation of farm equipment

CO3: The students will able to known the selection procedure and replacement criteria for farm machineries.

CO4: The students will equip with technical knowledge and skills required for analysis the breakeven point and cash flow for various farm operation

CO5: The students will be able to understand the present status and policy initiatives by the Government of India to promote farm mechanization

TEXT BOOKS

T1 Sharma D N and S Mukesh (2013) Farm Power and Machinery Management (Principles and Practices) (Vol.-1). Jain Brothers (New Delhi).

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 Jagdishwar Sahay. Elements of Agricultural Engineering. Standard Publishers Distributors

T5 Singh, S., and Verma, S. R. 2009.Farm Machinery Maintenance and Management. Indian Council of Agricultural Research, New Delhi

REFERENCE BOOKS

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

R2 Mehta C R (2013) Status and Future Mechanization in Indian Agriculture. Lecture delivered in —Summer School on Machinery for Natural Resource Management and Technologiesl held at Deptt. Of FM&PE, PAU, Ludhiana.

R3 Verma S R (2007) Farm Mechanisation for Diversification of Agriculture. Lecture delivered in —National seminar on Farm Mechanisation for diversification of agriculturel held at Deptt.Of FM&PE, PAU, Ludhiana organised by the Institution of Engineers (India) Ludhiana local Centre.

R4 Singh S P, Singh R S and Surendra Singh (2011) Sale trend of Tractors and Farm Power availability in India. Agricultural Engineering Today. Vol. 35(2).

R5 Tyagi K K, Jagbir Singh, K K Kher and V K Jain and Surendra Singh (2010) Status and Projection Estimates of Agricultural Implements and Machinery in India. Agricultural Engineering Today. Vol. 34(4).

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

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Programme	Course Code	Name of the Course	L	T	P	C
B.Tech	22AG5303	TRACTOR SYSTEM AND CONTROLS	3	0	0	3

To enable the students to know the development of agricultural tractors and different operations performed by the tractors. To know the different trouble shootings and remedies, design of different parts. To get knowledge on different tests performed on tractors

Unit	Description	Hours
I	**Design of Transmission Systems** Study of transmission systems, clutches: functioning, parts and design problem on clutch system, Gear box: different types of gear box, calculation of speed ratios, design problems on gear box, Study on differential and final drive and planetary gears, Differential and final drive mechanism.	9
II	**Controlling System** Familiarization of brake mechanism, Design problems. Steering geometry and adjustments Ackerman and hydraulic steering and hydraulic systems.	9
III	**Tractor Power Outlet System** Tractor power outlets: P.T.O., belt pulley, drawbar, etc. Tractor chassis mechanics and design for tractor stability. Methods of finding CG of the tractor, Methods for finding moment of inertia of the tractor.	9
IV	**Safety and Power Tiller** Ergonomic considerations and operational safety. Importance of anthropometric requirements in design. Power Tiller: Construction and working, Power transmission system.	9
V	**Tractor Balancing** Balancing of front and rear attached machinery. Importance of balancing, Techniques in balancing.	9
	Total Instructional Hours	45

Course Outcome

1. Skill development on design of transmission system.
2. Acquiring skills on controlling system of tractor .
3. Student s will able to Tractor Power Outlet System
4. Skill development on safety and power tiller of tractor
5. Skill development on tractor balancing.

Text book

T1 Barger, E.L., Liledahl, J.B., Carleton, W.M. and Mckibben, E.G. (1978). Tractor and their power units. Wiley Eastern pvt. Ltd, New York

T2 Radhey Lal and Datta, A.C. (1978). Problems in Agricultural Engineering. Sathya Prakashan, Allahabad.

REFERENCE BOOKS

R1 Mehta, M.L., Verma, S.R., Misra, S.K., and Sharma, V.K. (1995). Testing and evaluation of Agricultural Machinery. National Agricultural Technology Information Centre, Ludhiana.

R2 2.Raymond N, Yong E.A. and Nicolas S.1984. Vehicle Traction Mechanics, Elsevier Scitific Publications, USA.

R3 3.Kirpal Singh. 2012. Automobile Engineering – Vol I and Vol II. Standard Publishers Delhi.

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

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Programme	Course Code	Name of the Course	L	T	P	C
B.Tech	22AG5303	TRACTOR DESIGN AND TESING	3	0	0	3

Course Objectives To enable the students to know the development of agricultural tractors and different operations performed by the tractors. To know the different trouble shootings and remedies, design of different parts. To get knowledge on different tests performed on tractors

Unit	Description	Hours
I	**Procedure for design and development** Procedure for design and development of agricultural tractor, classification, selection. Study of parameters for balanced design of tractor for stability & weight distribution, traction theory, hydraulic lift and hitch systems design.	9
II	**Complete drive train** Complete drive train, transmission. Design of mechanical power transmission in agricultural tractors: single disc, multi disc and cone clutches. Rolling friction and anti-friction bearings.	9
III	**Design of Ackerman Steering** Design of Ackerman Steering and tractor hydraulic steering. Study of special design features of tractor engines and their selection viz. cylinder, piston, piston pin, crankshaft, etc. Design of seat and controls of an agricultural tractor. Tractor Testing.	9
IV	**Design problem of tractor clutch** Design problem of tractor clutch –(Single/Multiple disc clutch). Design of gear box (synchromesh/constant mesh), variable speed constant mesh drive; Selection of tractor tyres –Problem solving. Problem on design of governor. Design and selection of hydraulic pump. Engine testing as per BIS code	9
V	**Drawbar performance** Drawbar performance in the lab; PTO test and measure the tractor power in the lab/field; Determining the turning space, turning radius and brake test, hydraulic pump performance test and air cleaner and noise measurement test; Visit to tractor testing centre//industry	9
	Total Instructional Hours	**45**

Course Outcome

1.Skill development on design and building of tractor concepts, principals of stability, traction theory, hydraulic system and hitching procedure.
2.Acquiring skills on drive train, transmission design of mechanical power transmission, types of clutches & their principals & construction, rolling friction and run friction bearings.
3.Skill development on principles & law's of steering and its types, design feature of steering, design of seat and controls in tractor
4.Skill development on problem solving on design of clutches, deferent drives, selection of types, design of governors, hydraulic pumps, engine testing as per IS Code.
5.Skill development on draw bar performance and its power measurement, turning dynamics of tractor, testing of breaks and hydraulics pumps, cleaning system, noise measuremen

TEXT BOOK

T1 1.Maleev V.L., 1964. Internal Combustion Engines, Tata McGraw

T2 2.Richey C.B. 1991. Agricultural Engineering Handbook. McGraw

REFERENCE BOOKS

R1 1.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 2.Raymond N, Yong E.A. and Nicolas S.1984. Vehicle Traction Mechanics, Elsevier Scitific Publications, USA.

R3 3.Kirpal Singh. 2012. Automobile Engineering –n Vol I and Vol II. Standard Publishers Delhi.

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

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Programme	Course Code	Name of the Course	L	T	P	C
B.Tech.	22AG5304	Watershed planning and Management	3	0	0	3

Course Objective

- To expose the students to the concept of watershed and its mangement
- To introduce the concepts of land capability and watershed characteristics
- To train the students to explore and use new technologies in watershed planning.

Unit	Description	Instructional Hours
	WATERSHED MANAGEMENT – PROBLEMS AND PROSPECTS	
I	Concept and Definition of Watershed-Scope of Watershed Management - Watershed Management: Indian and Global Perspective -Timeline of Watershed Management Programmes in India-Problems and Constraints in Watershed Management-New Prospects and Opportunities Associated with Watershed Management	9
	LAND CAPABILITY AND WATERSHED BASED LAND USE PLANNING	
II	Definition of Land Capability-Classification of Land Capability-Impact on Watershed due to Land Use- Planning the Land Use-Applications of Remote Sensing and Geographical Information System (GIS) in Watershed Planning	7
	WATERSHED CHARACTERISTICS: PHYSICAL AND GEOMORPHOLOGIC FACTORS AFFECTING WATERSHED	
III	Characteristics of Watersheds-Classification of Watershed-Watershed Characteristics: Physical and Geomorphologic Characteristics associated with Watersheds-Quantitative Characteristics of Watersheds -Objectives of Watershed Management-Effect of Physical Properties on Watershed Management - Effect of Geomorphologic Factors and Associated Processes on Watershed Management	10
	HYDROLOGIC DATA FOR WATERSHED PLANNING	
IV	Definition and Scope of Watershed Planning -Data Required for Watershed Planning - Use of Hydro-meteorological Data in Watershed Planning - Use of Physiographical Data in Watershed Planning	11
V	**WATERSHED DELINEATION AND PRIORITIZATION**	9
	Concept of Topographic or Contour Map -Watershed Boundary Delineation	

from Contour/Topographic Maps - Geographic Information System (GIS) for Watershed Delineation - Accuracy in Watershed Delineation - Concept of Priority Watersheds - Factors Influencing Prioritizing Watersheds - Purpose and Benefits of Watershed Prioritizations

Total Instructional Hours 45

Course Outcome

- To understand the basic concepts of watershed management.
- To explain the land capability and land use planning
- To acquire the knowledge about the watershed characteristics.
- To assess the parameters of watershed planning.
- To get the knowledge about watershed delineation.

TEXT BOOKS:

T1 Soil Conservation and Land Management. S. K. Datta, International Book Distributors, Dehradun, 1985

T2 Soil and Water Conservation Engg. R. Suresh, Standard Publishers Distributors, Delhi-6, Reprint Edition 2006

REFERENCE BOOKS:

R1 Katyal, J.C., R.P. Singh, Shriniwas Sharma, S.K. Das, M.V. Padmanabhan and P.K. Mishra. 1995. Field Manual on Watershed Management. CRIDA, Hyderabad.

R2 Mahnot, S.C. 2014. Soil and Water Conservation and Watershed Management. International Books and Periodicals Supply Service. New Delhi.

PO & PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	3	1	2	2	2	-	-	-	2	2	3	2
CO2	3	3	3	2	1	2	2	-	-	-	3	3	2	3
CO3	3	3	3	1	1	2	2	-	-	-	3	2	3	2
CO4	3	3	3	3	3	2	2	-	-	-	2	2	2	3
CO5	3	3	3	3	3	2	2	-	-	-	3	2	3	2
Avg	3	2.8	3	2	2	2	2	-	-	-	2.6	2.2	2.6	2.4

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Programme	Course Code	Name of the Course	L	T	P	C
B.Tech	22AG5305	GROUNDWATER AND WELL ENGINEERING	3	0	0	3

Course Objective

- To understand the theories and applications of groundwater dynamics
- To study the analysis of well hydraulics
- To understand about groundwater exploration and recharge.
- To study about construction of wells
- To understand the Groundwater quality criteria

Unit	Description	Instructional Hours
I	**GROUNDWATER DYNAMICS** 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
II	**WELL HYDRAULICS** 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
III	**GROUNDWATER EXPLORATION AND RECHARGE** 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
IV	**DESIGN OF WELLS** 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
V	**CONSTRUCTION AND MAINTENANCE OF WELLS** Well drilling - Boring, Jetting – Rotary drilling, Hammer drilling - Construction – Installation of pipes and screens - Well development,	9

Completion and disinfection – Well maintenance – Well performance test – Well effectiveness – Well losses – Pumping equipment – Rehabilitation of open wells and bore wells- groundwater quality analysis.

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

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.

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

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Programme	Course Code	Name of the Course	L	T	P	C
B.Tech.	22AG5306	DESIGN OF MICRO-IRRIGATION SYSTEM	3	0	0	3

Course Objective

- To introduce the concepts of micro irrigation .
- To learn about the components of micro irrigation and quality assurance for components .
- To expose the students to the concept of Irrigation Automation

Unit	Description	Instructional Hours
	Introduction to Micro-Irrigation	
I	Introduction – status – merits and demerits of micro irrigation – scope and application of micro irrigation – mico irrigation application : Hills , arid lands ,coastal and waste lands - Financial Assistance under National Mission on Micro Irrigation – Types of micro irrigation system.	9
	Drip irrigation system and Installation	
II	Design considerations of drip irrigation : wetting pattern , irrigation water requirement , Estimation of evapotranspiration , crop coefficient – Hydraulics of drip irrigation sytem - design of main , submain and laterals – Installation of filters and fertigation equipment – Maintenance of micro irrigation system.	9
	Fertigation System	
III	Need of Fertigation - Advantages and Limitations of Fertigation - Types of Fertilizers - Fertilizers solubility and their compatibility - Fertigation Parameters - Fertilizers Application Methods .	9
	Quality Assurance & Economic Analysis	
IV	Institutions Framing Standards - Testing of Micro-irrigation Components for Standards - Indian Standards for MI Components - Terminologies in Economic Analysis	9
V	**AUTOMATION OF MICRO IRRIGATION SYSTEM**	9

The Need for Automation of Irrigation - Merits and Demerits of Automation - Semiautomatic and Fully Automatic Systems of Automation - Automation Equipments and Their Application .

Total Instructional Hours 45

Course Outcome

To expose the basic components of micro irrigation system

To design the drip irrigation system

To known about the fertigation system used for micro irrigation system

To learn about standards and quality assurance for micro irrigation sytem

To introduce the concepts of automation in irrigation

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.

REFERENCE BOOKS:

R1 Palanisami, K., Mohan,K., Kakumanu, K R and Raman S. (2011). Spread and Economics of Micro-irrigation in India: Evidence from Nine States. Economic & Political Weekly Supplement. 46(26 & 27): 81-85.

R2 Raman, S (2010): State-wise Micro-Irrigation Potential in India-An Assessment. unpublishedpaper, NaturalResources Management Institute, Mumbai.

PO & PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2	2	-	-	2	-	2	1	2	2	3	3
CO2	3	2	2	2	-	-	2	-	3	3	2	2	2	3
CO3	3	2	2	2	-	1	2	-	3	3	2	2	2	3
CO4	3	2	2	2	-	1	2	-	3	3	2	2	2	3
CO5	3	3	3	3	3	-	-	-	-	-	-	2	2	2
Avg	3	2.2	2.2	2.2	0.6	0.2	1.6	-	2.8	2	2	2	2.2	2.8

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Programme	Course Code	Name of the Course	L	T	P	C
B.Tech.	22AG5307	BIOMASS MANAGEMENT FOR FODDER AND ENERGY	3	0	0	3

Course Objective

- To impart the fundamental knowledge on the importance of Bio resources, Bio energy and reactors.

Unit	Description	Instructional Hours
I	**INTRODUCTION TO BIOMASS** Introduction to biomass management- biomass resource assessment management techniques/supply chains-	9
II	**PRODUCTION OF BIOMASS** Processing of paddy straw, densification- Extrusion process, pellets, mills and cubers, Bailing-classification, uses.	9
III	**RESIDUE MANAGEMENT FOR SOIL CONSERVATION** Residue management for surface mulch and soil incorporation, Paddy Straw choppers and spreaders as an attachment to combine Harvester, Mulc seeder.	9
IV	**FODDER MANAGEMENT** Paddy Straw Chopper-cum-Loader, Balar for collection of straw; Processing of straw/ fodder for animal use	9
V	**USE OF BIOMASS IN OTHER PRODUCTION** Agricultural and horticultural use, cushioning material for fruits and vegetables, Mulching and Composting, Paper and cardboard manufacturing, Straw as a fuel.	9
	Total Instructional Hours	45

Course Outcome

CO1: Students will be able to explain the various types of biomass resources, their potential applications, and their significance in sustainable energy and agriculture.
CO2: Students will demonstrate knowledge and skills in the processing of biomass, including the use of equipment for densification, extrusion, pelletizing, and cubing.
CO3: Students will be able to analyze and develop efficient supply chain models for biomass management, considering both economic and

environmental factors.
CO4: Students will understand and implement residue management practices that contribute to soil conservation, such as surface mulching and soil incorporation, and will be proficient in operating related machinery.
CO5: Students will explore and apply biomass in diverse contexts, including agricultural, horticultural, and industrial uses, promoting sustainable practices such as composting, mulching, and the production of renewable materials.

TEXT BOOKS:

T1 Chahal, D.S. (1985). Food, Feed and Fuel from Bio mass . IBH Publishing . Pvt. Ltd. NewDelhi.

T2 Chakravarty, A. (1989). Bio Technology and other Alternative Technologies for Utilisation of Bio mass/Agrl.Wastes. Oxford & IBH Pub.Co.Pvt Ltd

REFERENCE BOOKS:

R1 Alba S. A.E. Humphery and N.E. Milles. (1973). Bio Chemical Engineering (2 ed.).

R2 Baily, J.E and D.F. Ollies. (1986). Bi Chemical Engineering Fundamentals (2 ed.). Prescott and Dunn Industrial Micro Biology.

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.	22AG5308	RENEWABLE ENERGY SOURCES	3	0	0	3

Course Objective

- To understand energy scenario, energy sources and their utilization.
- To explore society's present needs and future energy demands.
- To Study the principles of renewable energy conversion systems.
- To explore energy conservation methods.

Unit	Description	Instructional Hours
I	**Renewable Sources of Energy** Principles of renewable energy; energy and sustainable development, fundamentals and social implications. worldwide renewable energy availability, renewable energy availability in India, brief descriptions on solar energy, wind energy, tidal energy, wave energy, ocean thermal energy, biomass energy, geothermal energy, oil shale.	9
II	**Solar Energy** Fundamentals; Solar Radiation; Estimation of solar radiation on horizontal and inclined surfaces; Solar radiation Measurements- Pyrheliometers, Pyrometer, Sunshine Recorder. Solar Thermal systems: Flat plate collector; Solar distillation; Solar pond electric power plant. Principle of Solar cell, Photovoltaic system for electric power generation, advantages, Disadvantages and applications of solar photovoltaic system.	9
III	**Wind Energy** Properties of wind, availability of wind energy in India, wind velocity and power from wind; major problems associated with wind power, Basic components of wind energy conversion system (WECS); Classification of WECS- Horizontal axis- single, double and muliblade system. Vertical axis- Savonius and darrieus types.	9
IV	**Tidal Power & Ocean Thermal Energy Conversion** Tides and waves as energy suppliers and their mechanics; fundamental characteristics of tidal power, harnessing tidal energy, advantages and limitations. Principle of working, OTEC power stations in the world, problems associated with OTEC.	9
V	**Biomass Energy** Introduction; Photosynthesis Process; Biofuels; Biomass Resources; Biomass conversion technologies-fixed dome; Urban waste to energy	9

conversion; Biomass gasification (Downdraft).

Total Instructional Hours 45

Course Outcome

CO1 Describe the environmental aspects of renewable energy resources. In Comparison with various conventional energy systems, their prospects and limitations.

CO2 Describe the use of solar energy and the various components used in the energy production concerning applications like-heating, cooling, desalination, and power generation.

CO3 Understand the conversion principles of wind energy.

CO4 Understand the conversion principles of tidal energy and ocean thermal energy conversion.

CO5 Understand the concept of biomass energy resources.

TEXT BOOKS:

T1 Nonconventional Energy sources, G D Rai, Khanna Publication, Fourth Edition,

T2 Energy Technology, S.Rao and Dr. B.B. Parulekar, Khanna Publication. Solar energy, SubhasP Sukhatme, Tata McGraw Hill, 2ndEdition,1996.

REFERENCE BOOKS:

R1 Principles of Energy conversion, A. W. Culp Jr.,, McGraw Hill, 1996.

R2 Non-Convention EnergyResources, Shobh Nath Singh, Pearson, 2018.

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.	22AG5309	RENEWABLE ENERGY TECHNOLOGY	3	0	0	3

Course Objective

- To impart knowledge on different types of renewable energy technologies standalone operation, grid connected operation of renewable energy systems

Unit	Description	Instructional Hours
I	**INTRODUCTION** Classification of energy sources – CO_2 Emission - Features of Renewable energy – Renewable energy scenario in India -Environmental aspects of electric energy conversion: impacts of renewable energy generation on environment Per Capital Consumption - CO_2 Emission - importance of renewable energy sources, Potentials – Achievements– Applications.	9
II	**SOLAR PHOTOVOLTAICS** Solar Energy: Sun and Earth-Basic Characteristics of solar radiation- angle of sunrays on solar collector-Estimating Solar Radiation Empirically - Equivalent circuit of PV Cell- Photovoltaic cellcharacteristics: P-V and I-V curve of cell-Impact of Temperature and Insolation on I-V characteristics-Shading Impacts on I-V characteristics-Bypass diode -Blocking diode.	9
III	**PHOTOVOLTAIC SYSTEM DESIGN** Block diagram of solar photo voltaic system : Line commutated converters (inversion mode) - Boost and buck-boost converters - selection of inverter, battery sizing, array sizing - PV systems classification- standalone PV systems - Grid tied and grid interactive inverters- grid connection issues.	9
IV	**WIND ENERGY CONVERSION SYSTEMS** Origin of Winds: Global and Local Winds- Aerodynamics of Wind turbine-Derivation of Betz's limitPower available in wind-Classification of wind turbine: Horizontal Axis wind turbine and Vertical axis wind turbine-Aerodynamic Efficiency-Tip Speed-Tip Speed Ratio-Solidity-Blade Count-Power curve of wind turbine - Configurations of wind energy conversion systems: Type A, Type B, Type C and Type D Configurations- Grid connection Issues - Grid integrated SCIG and PMSG based WECS.	9
V	**OTHER RENEWABLE ENERGY SOURCES** Qualitative study of different renewable energy resources: ocean, Biomass,	9

Hydrogen energy systems, Fuel cells, Ocean Thermal Energy Conversion (OTEC), Tidal and wave energy, Geothermal Energy Resources.

Total Instructional Hours 45

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

CO1: Demonstrate the need for renewable energy sources.

CO2: Develop a stand-alone photo voltaic system and implement a maximum power point tracking in the PV system.

CO3: Design a stand-alone and Grid connected PV system.

CO4: Analyze the different configurations of the wind energy conversion systems.

CO5: Realize the basic of various available renewable energy sources.

TEXT BOOKS:

T1 Rai. G.D, "Non conventional energy sources", Khanna publishes, 1993.

T2 Rai. G.D," Solar energy utilization", Khanna publishes, 1993.

REFERENCE BOOKS:

R1 S.N.Bhadra, D. Kastha, & S. Banerjee "Wind Electrical Systems", Oxford UniversityPress, 2009.

R2 Chetan Singh Solanki, "Solar Photovoltaics: Fundamentals, Technologies and Applications", PHI Learning Private Limited, 2012.

PO & PSO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2	PSO 1	PS O 2
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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Program	Course Code	Name of the Course	L	T	P	C
B.Tech.	22AG5310	HEAT AND MASS TRANSFER FOR AGRICULTURAL ENGINEERS	3	0	0	3

Course Objective

1. To impart the knowledge on heat transfer mechanisms in fluids and solids, and their applications in various heat transfer equipment
2. To introduce non-dimensional numbers and their effects in governing various modes of mass transfer
3. 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 - Force 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** laminar and turbulent flow, combined laminar and turbulent - 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
		45

COURSE OUTCOMES

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:To Recognize the radiation problems in various geometries
CO4: To able Analyze the performance of heat exchangers and evaporators
CO5: Students able to understand the mass transfer

TEXT BOOKS

T1 R. C. Sachdeva, Fundamentals of Engineering Heat and Mass Transfer, New AgeInterr limited, New Delhi, 2010

T2 Yunus A. Cengel, Heat and Mass Transfer: a Practical Approach, Tata McGraw Hillpul 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	PSO2
CO1	3	2	2	2	2	1	-	1	-	-	-	2	3	2
CO2	3	3	3	3	2	1	1	1	-	-	-	2	2	2
CO3	3	3	3	3	2	1	1	1	-	-	-	2	3	3
CO4	3	3	3	3	2	1	1	1	-	-	1	2	2	2
CO5	3	3	3	3	2	1	2	1	-	-	1	2	3	3
Avg	3	2.8	2.8	2.8	2	1	1	1	-	-	0.4	2	2.6	2.4

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Programme	Course Code	Name of the Course	L	T	P	C
B.Tech.	22AG5311	FOOD PROCESS EQUIPMENT DESIGN	3	0	0	3

Course Objective

- Impart knowledge on basic principles of designing equipment for food processing.
- Become familiar with design and manufacture of storage tanks, pulpers, heat exchangers, driers etc.
- Provide an idea about devising cold storage units, freezers etc.

UNITI INTRODUCTION **9 hours**

Material of construction: Introduction to material selection; Material properties; Environmental effects on material selection; Mechanical properties & strength of materials.

UNITII CONSTRUCTIONREQUIREMENTS **9 hours**

Design basis: Design code; Design pressure, stress & factor of safety; Corrosion allowance; Weld joint efficiency factor; Design loadings; Criteria of failure.

UNITIII DESIGNOFPIPESANDPRESSUREVESSELS **9 hours**

Design of pipe and pipe fittings. Process vessels under internal and external pressure; Design of Attachments and closures;

UNITIV DESIGNOF SUPPORTS **9 hours**

Design of flange connections & threaded fasteners; Design of supports; Bracket or Lug supports, Leg Supports, Skirt Supports

UNITV DESIGNOFPROCESSEQUIPMENTS **9 hours**

Process Design of double pipe heat exchanger; Shell & Tube Heat Exchanger. Design of

Evaporator; Agitation Vessels and centrifugal separator. Design of Rotary Dryer.

Course outcome:

1. Know about the designing aspects of food processing equipment
2. Understand the application of processing equipment in food industry
3. Gain knowledge on process parameters in mechanical , thermal and mass transfer operations carried out in food processing

TEXTBOOKS:

1. Rajput R K, 2008 Heat and Mass Transfer. S Chand Publishers

2. Chakraverty, A. Post Harvest Technology of cereals, pulses and oilseeds. Oxford & IBH publishing Co. Ltd., New Delhi.

3. Dash, S.K., Bebartta, J.P. and Kar, A. Rice Processing and Allied Operations. Kalyani Publishers, New Delhi.

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

REFERENCES:

1. Earle, R.L. 2003. Unit Operations in Food Processing. Pergamon Press. Oxford. U.K.

2. Henderson, S.M., and Perry, R. L. Agricultural Process Engineering, Chapman and hall, London

3. McCabe, W.L., Smith J.C. and Harriott, P. Unit operations of Chemical Engineering. McGraw Hill.

4. Singh, R. Paul. and Heldman, R.Dennis. 2004. Introduction to Food Engineering. 3rd Edition.Academic Press, London.

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

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Programme	Course Code	Name of the Course	L	T	P	C
B.Tech.	22AG5312	FOOD PLANT DESIGN AND MANAGEMENT	3	0	0	3

Course Objective

- To understand the engineering properties of different materials for the development of food plant equipment.
- To understand the design considerations of different processing requirement for food industry.
- To understand design procedure of different storage vessel, heat exchangers, and their safety and challenges for implementation.
- To understand design procedure of different dryer, freezer and fermenters in the food industry.
- To apply design procedure for extruders and food equipment safety measures.

Unit	Description	Instructional Hours
	MATERIALS AND PROPERTIES	
I	Materials for fabrication, mechanical properties, ductility, hardness, corrosion, protective coatings, corrosion prevention linings equipment, choice of materials, material codes.	8
	DESIGN CONSIDERATIONS	
II	Stresses created due to static and dynamic loads, combined stresses, design stresses and theories of failure, safety factor, temperature effects, radiation effects, effects of fabrication method, economic considerations.	9
	DESIGN OF STORAGE VESSEL AND EXCHANGERS	
III	Design of pressure and storage vessels-operating conditions, design conditions and stress; Design of shell and its component, stresses from local load and thermal gradient, mountings and accessories. Design of heat exchangers- shell and tube heat exchanger, plate heat exchanger, scraped surface heat exchanger, sterilizer and retort. Design of agitators, separators and baffles; Design of agitation system components and drive for agitation.	10
	DESIGN OF DRYER, FREEZER AND FERMENTERS	
IV	Design of freezing equipment Design of icecream freezers and refrigerated display system Design of dryers Design of tray dryer, tunnel dryer, fluidized dryer, spray dryer, vacuum dryer, freeze dryer and microwave dryer Design of fermenters Design of fermenter vessel, design problems.	9
	EXTRUDERS AND EQUIPMENT SAFETY	
V	Extrusion cookers – cold extrusion, single and twin screw extrusion- Low pressure and high pressure extrusion – properties of Food materials and its significance in	9

equipment design processing and handling – Cold and hot extruder design, design of screw and barrel, design of twin screw extruder. Hazards in process industries, analysis of hazards, safety measures, safety measures in equipment design, pressure relief devices.

Total Instructional Hours 45

Course Outcome After successful completion of this course students are expected to be able to:

CO1: understand principle and working of food processing equipment.

CO2: familiarize with the design of advanced machinery available for food processing sectors.

CO3: apply their knowledge to design storage vessel, heat exchangers, and their safety for setting up a food processing industry.

CO4: implement design procedure of dryer, freezer and fermenters food processing industry.

CO5: familiarize design procedure for extruders and food equipment safety measures.

TEXT BOOKS:

T1 R. Paul Singh and Dennis R. Heldman. Introduction to Food Engineering, 5th Edition. Elsevier, Amsterdam, The Netherlands.2014.

T2 George D. Saravacos and Athanasios E. Kostaropoulos. Handbook of Food Processing Equipment. Springer Science+Business Media, New York, USA.2002.

T3 R. K. Sinnott. Chemical Engineering, Vol. 6, Chemical Engineering Design, 3rd Edition Butterworth-Heinemann, Oxford, UK.1999.

T4 Kenneth J. Valentas, Enrique Rotstein and R. Paul Singh. Handbook of Food Engineering Practice. CRC Press, Boca Raton, FL, USA. 1997.

REFERENCE BOOKS:

R1 Mahajani, V. V. and Umarji, S. B., Process equipment design, 4th edition, 2009, Macmillan publishers.

R2 James R. Couper, W. Roy Penney, James R. Fair and Stanley M. Walas. Chemical Process Equipment Selection and Design. Elsevier Inc. 2012.

R3 Bhattacharyya, B. C., Introduction to Chemical Equipment design, 2008, CBS Publishers and Distributors.

R4 Richarson J.F and Peacock D.G. Chemical Engineering, Vol. Chemical & Biochemical Reactors & Process Control, 3rd Edition. Elsevier Butterworth Heinemann, Amsterdam, The Netherlands. 1994.

PO & PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2	2	2	1	-	1	-	-	-	2	3	2
CO2	3	3	3	3	2	1	1	1	-	-	-	2	2	2
CO3	3	3	3	3	2	1	1	1	-	-	-	2	3	3
CO4	3	3	3	3	2	1	1	1	-	-	1	2	2	2
CO5	3	3	3	3	2	1	2	1	-	-	1	2	3	3
Avg	3	2.8	2.8	2.8	2	1	1	1	-	-	0.4	2	2.6	2.4

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Programme	Course Code	Name of the Course	L	T	P	C
B.Tech.	22AG5313	INTEGRATED FARMING SYSTEM	3	0	0	3

COURSE OBJECTIVE

- To impart knowledge to the students on the fundamentals of farming systems and sustainable agriculture
- To study the various components of farming systems
- The develop practical skills on integrated farming system to make a successful enterprise

UNIT I - FARMING SYSTEM **9 hours**

Farming systems - Definition - Principles - Concepts -Cropping systems for different agro climatic zones of India and Tamil Nadu Crop diversification and intensification in farming system

UNIT II - ENTERPRISES **9 hours**

Enterprises selection and management - interaction between different enterprises with cropping - scope and advantages of Integrated Farming system - Integrated farming system models for different agro eco-systems - interaction between enterprises.

UNIT III - EVALUATION OF FARMING SYSTEM **9 hours**

Resource recycling in IFS - Evaluation indicators of integrated farming system - LEISA & HEIA - concepts and principles - Conservation agriculture - principles, concept and scope - Carbon foot-printing and greenhouse gas emission studies in IFS models

UNIT IV - RESOURCES AND LABOUR MANAGEMENT IN FARMING SYSTEM **9 hours**

Resource management under constraint situation - Cost reduction strategies in crop production - Nonmonetary inputs and low cost technologies - Labour management - farming system and environment.

UNIT V - IFS ENTREPRENEUR **9 hours**

Preparation of bankable projects in IFS under wetland eco-system - irrigated dry land ecosystem - dry land ecosystem - Meeting the entrepreneur and experts from financial institutions-funding opportunities.

Total Hours 45 Hours

COURSE OUTCOME

CO1: To know different cropping and farming system like integrated farming system (IFS).

CO2: To learn the basics of enterprises involved in integrated farming system

CO3: To get knowledge on evaluation indicators and different models of IFS

CO4: To learn the managing skill of resource and labour involved in farming system

CO5: To know the different agribusiness opportunities in relation with farming system

TEXT BOOKS

1. Jayanthi, C. Devasenapathy, P and C. Vennila. 2007. Farming Systems. Principles and practices. Satish Serial Publishing House.Delhi.
2. Jodhpur. Jana, B.L. 2014. Farming Systems. Agrotech Publishing Academy
3. Udaipur Shagufta. 2015. Cropping and Farming Systems. APH Publishing Corporation
4. Ruthenburg, H. 1971. Farming Systems in Tropics. Clarendon Press, London.

REFERENCES:

1. Palaniappan, SP and K. Sivaraman.1996. Cropping systems in the tropics Principles and management.
2. New Age International (P) Ltd., New Delhi.
3. S.C. Panda. 2003. Cropping and Farming Systems. Agrobios Publishers.

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

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Programme	Course Code	Name of the Course	L	T	P	C
B.Tech.	22AG5314	AGRI BUSINESS MANAGEMENT	3	0	0	3

COURSE OBJECTIVE

- To acquaint the learner with meaning and concepts of management and organizational behaviour.
- To develop comprehensive knowledge and understanding of functional areas of management
- To make the students understand various features of agri-business environment
- To develop capabilities for formulating strategies for growth of the agribusiness organizations

UNIT I - AGRI-BUSINESS **9 hours**

Meaning – definition - history and scope of agri-business (Input, Farm Product Sectors) - Importance of agri-business in the Indian economy - Changing dimension of agricultural business.

UNIT II - AGRI-BUSINESS MANAGEMENT **9 hours**

Distinctive features - nature and components - importance of good management - definition of management and management functions - Five Years Plans and agribusiness - characteristics of plans.

UNIT III - ORGANIZATION AND OPERATION OF FARM BUSINESS **9 hours**

Tools of farm business organization and operation - steps in farm business organization - Evaluation of available resources - appraisal and goals of farm business - approach to reorganization of the farm business.

UNIT IV - FARM ADJUSTMENT PROGRAMME **9 hours**

Uncertainty - job of proficient farm planner - farm accountancy - Constraints in agri-business management infrastructure - technological, social and cultural - Analysis of farm records - Farm inventories.

UNIT V - FINANCIAL MANAGEMENT OF AGRI-BUSINESS **9 hours**

Importance of Financial Statement - Balance sheet - Income account/ Profit and Loss Statement - Efficiency measures - Partial and complete budgeting.

Total Hours 45 Hours

COURSE OUTCOMES

CO1: To acquire the knowledge on meaning and concepts of management and organizational behaviour.

CO2: To learn the business management and their different functions and plan

CO3: To expose the learner to the field of production and operations Management

CO4: To learn the evaluation and analysis of farm inventories for effective management of agri business

CO5: To developing understanding of the application of Financial and investment decisions.

TEXT BOOKS:

1. Johl, S.S and T.R Kapur. Fundamentals of Farm Business Management. Kalyani Publishers, 11 Rajendar Nagar, Ludhiana – 114 008, P – 475
2. Adam & Ebert. 2006. Production and Operations Management: Concepts, Models and Behaviour.5th Ed. Prentice Hall of India.
3. Khan MY & Jain PK. 2004. Financial Management: Text, Problems and Cases. Tata McGraw Hill.

REFERENCE BOOKS:

1. Kahlon, A.S and Karan Singh. Economics and Farm Management in India: Theory and Practice. Allied Publishers Pvt. Ltd, 15 JN Heredia Marg, Ballard Estate, Mumbai – 400 038.
2. Singh I.J. Elements of Farm Management Economics. Affiliated East West Press, Pvt Ltd, New Delhi
3. Dhondyal, S.P. Farm Management: An Economic Analysis. Friends Publications, 90, Krishnapur, Meerut – 250 002.

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

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Programme	Course Code	Name of the Course	L	T	P	C
B.Tech.	22AG5315	SUSTAINABLE AGRICULTURE AND FOOD SECURITY	3	0	0	3

Course Objective

- To understanding the principle of sustainable agriculture and issues in adapting.
- To understand the inter-relationship between climate change, environment, food security and sustainability at global and regional level.
- To understand ways of adapting climate change and managing the environment keeping in mind food security and sustainability.
- To understand the concept of food safety and security and issues in achieving it.
- To understand policy, economic and social aspect of food security.

Unit	Description	Instructional Hours
I	**SUSTAINABLE AGRICULTURE** Current production of food Issues/ constraints. Sustainable agriculture-Principles, problems and its impact on agriculture, conservation agriculture strategies, HEIA, LELA and LE1SA and its techniques for sustainability, Integrated farming system components of IFS and its advantages, farming system and environment.	9
II	**ENVIRONMENT, CLIMATE AND FOOD SECURITY** Food security concept; types of food insecurity; poverty, hunger and malnutrition; Inter-relationship between environment, climate and agricultural (arable agriculture and livestocks) and non-agricultural (marine; freshwater; forests) food production; impact on food security. Role of arable agriculture in increasing and decreasing climate change and natural resources; how this can subsequently impact food security.	9
III	**TOWARDS FOOD SECURITY AND SUSTAINABILITY** Adapting to changing climate and management of environment towards food security and sustainability. Methods and strategies for improving crop yield under climate and environment stress- plant breeding, bio-pesticides, GM crops; sustainable agriculture; traditional agriculture; agro-ecology; organic agriculture; subsistence agriculture; and, resource management systems- IWRM, INRM, IPM.	9
IV	**FOOD SAFETY AND SECURITY** Nutritional security, balanced diet, hunger and human health; Impact of various abiotic environmental pollutants (air, water and soil) and changing climate (heat stress, drought) factors and biotic factors (pests) on quality of food crops; impact on health of farmers.	9
V	**POLICY, ECONOMIC AND SOCIAL ASPECT OF FOOD SECURITY**	9

Economics and policy of food security; role of institutions FAO, NABARD, FCI, NAFED, RRB, APMC; agricultural planning in India- recommendations of various committees: Bhutani committee, RB Gupta Committee, K N Raj Committee. Economic viability of small-scale agriculture, regional food systems; farmers' income and livelihood; agricultural financing, credit and crop insurance, challenges ahead.

Total Instructional Hours **45**

Course Outcome After successful completion of this course students are expected to be able to:

CO1: familiarize and the concept of food sustainable agriculture.

CO2: understand the inter-relationship between climate change, environment, food security and sustainability.

CO3: adapt climate change and managing the environment towards food security and sustainability.

CO4: familiarize the concept of food security and issues in achieving it.

CO5: familiarize policy, economic and social aspect of food security.

TEXT BOOKS:

T1 Reynolds M. P. (2010) Climate Change and Crop Production, CABI Series in Climate Change, Volume I. CABI Publishing, UK

T2 National Research Council (2012). A Sustainability Challenge: Food Security for All, Report of Two Workshops. Washington, DC: The National Academies Press.
http://www.nap.edu/catalog.php?record_id=13378#toc

T3 Beddington , sadu aman M , Clar M , ern nde , uillou M., Jahn M., Erda L., Mamo T., Van Bo N., Nobre C.A., Scholes R., Sharma R. andWakhungu J. (2012) Achieving Food Security in the Face of Climate Change: Final Report from the Commission on Sustainable Agriculture and Climate Change. CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS). Copenhagen, Denmark, Available online at: www.ccafs.cgiar.org/commission .

T4 Kenneth J. Valentas, Enrique Rotstein and R. Paul Singh. Handbook of Food Engineering Practice. CRC Press, Boca Raton, FL, USA. 1997.

REFERENCE BOOKS:

R1 Giovannucci D., Scherr S., Nierenberg D., Hebebrand C., Shapiro J., Milder J. and Wheeler K. (2012). Food and Agriculture: The Future of Sustainability, A Strategic Input to the Sustainable Development in the 21st Century (SD21) Project, New York: United Nations Department of Economic and Social Affairs, Division for Sustainable Development. http://www.un.org/esa/dsd/dsd_sd21st/21_pdf/agriculture_and_food_the_future_of_sustainability_w

eb.pdf

R2 Interna W. (2004) Climate Change and India, Universities Press, India.

R3 FAO, WFP and IFAD. 2012. The State of Food Insecurity in the World 2012. Economic growth is necessary but not sufficient to accelerate reduction of hunger and malnutrition, Rome, FAO. http://www.fao.org/docrep/016/i3027e/i3027e.pdf

R4 Food Insecurity Atlas of Rural India (2001) MS Swaminathan Research Foundation and World Food Programme. http://home.wfp.org/stellent/groups/public/documents/ena/wfp076968.pdf

PO & PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2	2	2	1	-	1	-	-	1	2	3	2
CO2	3	2	3	2	2	1	1	1	-	-	-	2	2	2
CO3	3	2	3	2	2	1	1	1	-	-	-	2	3	3
CO4	3	3	2	2	2	1	1	1	-	-	2	2	2	2
CO5	3	3	2	2	2	1	2	1	-	-	2	2	3	3
Avg	3	2.4	2.4	2	2	1	1	1	-	-	1	2	2.6	2.4

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Programme	Course Code	Name of the Course	L	T	P	C
B.Tech.	22AG5316	AUTOMATION IN AGRICULTURE	3	0	0	3

Course Objective

- To equip students with the knowledge and skills necessary to implement and manage automated systems in agriculture effectively, fostering sustainable.
- To focus on sustainable agricultural practices through automation.
- To train the students to collect, analyze, and interpret data obtained from automated systems.
- To educate students on various automation technologies such as sensors, robotics, drones, AI, and IoT (Internet of Things) that can be applied in agriculture.

Unit	Description	Instructional Hours
	Introduction to Automation in Agriculture	
I	Fundamental of electronics Passive devices -semiconductor devices – transistors – diode circuits -amplifier circuits. Integrated circuits and operational amplifier – logic gates – flip flop – counters digital to analog – analog to digital converters- microprocessor.	9
	Precision Farming	
II	Precision farming -Ground based sensors, Remote sensing, GPS, GIS and mapping software, Yield mapping systems, Crop production modelling.	9
	Robotics in Agriculture	
III	Fundamental of Robotics - types – application. Agricultural robots - types- function - application. Future trends in automation in agriculture.	9
	Automation using IoT	
IV	Use of different sensors - Temperature and humidity sensor - Soil Moisture Sensor - Water Level Depth Detector, Raspberry Pi Arduino UNO.	9
	Automation of Agriculture Operation	
V	Automation of agricultural operations using IoT based systems - Smart Irrigation SystemAutomation in Greenhouse – Drones. Case Study- Automation of greenhouse/farm operations.	9

Total Instructional Hours 45

Course Outcome

CO1 Exemplify the working operations of electronic devices and processors.

CO2 Interpret the necessity of sensor requirements for precision farming practices.

CO3 Understand the basics of robotics and their applications in agriculture.

CO4 Apply the IOT concepts in cropping practices.

CO5 Interpolate the concept of automation in governing the agricultural systems.

TEXT BOOKS:

T1 Zhang, Q. and Pierce, F.J. eds., 2013. Agricultural automation: fundamentals and practices.CRC Press

T2 Choudhury, A., Biswas, A., Singh, T.P. and Ghosh, S.K. eds., 2022. Smart Agriculture Automation Using Advanced Technologies: Data Analytics and Machine Learning, Cloud Architecture, Automation and IoT.

REFERENCE BOOKS:

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

R2 Young, S.L. and Pierce, F.J. eds., 2013. Automation: The future of weed control in cropping systems. Springer Science & Business Media.

R3 Nof, S.Y. ed., 2009. Springer handbook of automation. Berlin, Heidelberg: Springer Berlin Heidelberg

R4 Billingsley, J., 2019. Robotics and automation for improving agriculture. Burleigh Dodds Science Publishing Limited

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

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Programme	Course Code	Name of the Course	L	T	P	C
B.Tech.	22AG5317	ELECTRIC AND HYBRID VEHICLE	3	0	0	3

Course Objective

- The objective of this course is to prepare the students to know about the general aspects of Electric and Hybrid Vehicles (EHV), including architectures, modelling, sizing, and sub system design and hybrid vehicle control.

Unit	Description	Instructional Hours
I	**Design considerations for Electric Vehicles** Need for Electric vehicle- Comparative study of diesel, petrol, hybrid and electric Vehicles. Advantages and Limitations of hybrid and electric Vehicles. - Design requirement for electric vehicles- Range, maximum velocity, acceleration, power requirement, mass of the vehicle. Various Resistance- Transmission efficiency- Electric vehicle chassis and Body Design, Electric Vehicle Recharging and Refuelling Systems.	9
II	**Energy Sources** Battery Parameters- - Different types of batteries – Lead Acid- Nickel Metal Hydride - Lithium ion Sodium based- Metal Air. Battery Modelling - Equivalent circuits, Battery charging- Quick Charging devices. Fuel Cell- Fuel cell Characteristics- Fuel cell types-Half reactions of fuel cell. Ultra capacitors. Battery Management System.	9
III	**Motors and Drives** Types of Motors- DC motors- AC motors, PMSM motors, BLDC motors, Switched reluctance motors working principle, construction and characteristics.	9
IV	**Power Converters and Controllers** Solid state Switching elements and characteristics – BJT, MOSFET, IGBT, SCR and TRIAC - Power Converters – rectifiers, inverters and converters - Motor Drives - DC, AC motor, PMSM motors, BLDC motors, Switched reluctance motors – four quadrant operations –operating modes.	9
V	**Hybrid and Electric Vehicles** Main components and working principles of a hybrid and electric vehicles, Different configurations of hybrid and electric vehicles. Power Split devices for Hybrid Vehicles - Operation modes - Control Strategies for Hybrid Vehicle - Economy of hybrid Vehicles - Case study on specification of electric and hybrid vehicles..	9

Total Instructional Hours 45

Course Outcome

CO1 Understand the operation and architecture of electric and hybrid vehicles.

CO2 Identify various energy source options like battery and fuel cell.

CO3 Select suitable electric motor for applications in hybrid and electric vehicles.

CO4 Explain the role of power electronics in hybrid and electric vehicles.

CO5 Analyze the energy and design requirement for hybrid and electric vehicles.

TEXT BOOKS:

T1 Iqbal Husain, " Electric and Hybrid Vehicles-Design Fundamentals", CRC Press,2003

T2 Mehrdad Ehsani, " Modern Electric, Hybrid Electric and Fuel Cell Vehicles", CRCPress,2005.

REFERENCE BOOKS:

R1 James Larminie and John Lowry, "Electric Vehicle Technology Explained " John Wiley & Sons,2003.

R2 Lino Guzzella, " Vehicle Propulsion System" Springer Publications,2005.

R3 Ron HodKinson, "Light Weight Electric/ Hybrid Vehicle Design", Butterworth Heinemann Publication,2005.

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

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Programme	Course Code	Name of the Course	L	T	P	C
B.Tech.	22AG5318	FOUNDATION OF ROBOTICS AND DRONE	3	0	0	3

Course Objective

- To provide students with fundamental knowledge and skills in the fields of robotics and drone technology.

UNIT 1 Introduction to Robotics **9 Hours**

Introduction to Robotics and Automation, laws of robot, brief history of robotics, basic components of robot, robot specifications, classification of robots, human system and robotics, safety measures in robotics, social impact, Robotics market and the future prospects, advantages and disadvantages of robots.

UNIT 2: Robot Anatomy And Motion Analysis: **9 Hours**

Anatomy of a Robot, Robot configurations: polar, cylindrical, Cartesian, and jointed arm configurations, Robot links and joints, Degrees of freedom: types of movements, vertical, radial and rotational traverse, roll, pitch and yaw, Wok volume/envelope, Robot kinematics: Introduction to direct and inverse kinematics, transformations and rotation matrix.

UNIT 3 Robot Drives And End Effectors: **9 Hours**

Robot drive systems: Hydraulic, Pneumatic and Electric drive systems, classification of end effectors, mechanical grippers, vacuum grippers, magnetic grippers, adhesive gripper, gripper force analysis and gripper design, 1 DoF, 2 DoF, multiple degrees of freedom robot hand, tools as end effectors, Robot control types: limited sequence control, point-to-point control, playback with continuous path control, and intelligent control.

UNIT 4: Path Planning: **9 Hours**

Definition-Joint space technique, Use of P-degree polynomial-Cubic,polynomial- Cartesian space technique, parametric descriptions, straight line and circular paths, position and orientation planning.

UNIT 5 : Robotics Applications **9 Hours**

Material Handling: pick and place, palletizing and depalletizing, machining loading and unloading, welding & assembly, Medical, agricultural and space applications, unmanned vehicles: ground, Ariel and underwater applications, robotic for computer integrated manufacturing. Types of robots: Manipulator, Legged robot, wheeled robot, aerial robots, Industrial robots, Humanoids, Robots, Autonomous robots, and Swarm robots

Total Hours 45 Hours

Course Outcomes (COs) (Course Skill Set) At the end of the course, the student will be able to :

CO1: Understand the significance, social impact and future prospects of robotics and automationin various engineering applications.

CO2: Identify and describe the components and anatomy of robotic system.

CO3: Know about various path planning techniques and analyze different motions of robotics system

CO4: Use the suitable drives and end-effectors for a given robotics application.

CO5: Apply robotics concept to automate the monotonous and hazardous tasks and categorize varioustypes of robots based on the design and applications in real world scenarios

Textbooks

1. "Introduction to Robotics: Mechanics and Control" by John J. Craig
2. "Robot Modeling and Control" by Mark W. Spong, Seth Hutchinson, and M. Vidyasagar
3. "Robotics: Modelling, Planning and Control" by Bruno Siciliano and Lorenzo Sciavicco
4. "Modern Robotics: Mechanics, Planning, and Control" by Kevin M. Lynch and Frank C. Park

References:

1. "Introduction to UAV Systems" by Paul Fahlstrom and Thomas Gleason
2. "Small Unmanned Aircraft: Theory and Practice" by Randal W. Beard and Timothy W. McLain
3. "Practical UAVs and Drones: A Hardware and Software Guide" by Alan Perlman
4. "UAV Fundamentals" by Kevin T. McDonough
5. "Drones: Their Many Civilian Uses and the U.S. Laws Surrounding Them" by Gregory S. McNeal

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

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Programme	Course Code	Name of the Course	L	T	P	C
B.Tech.	22AG5251	IRRIGATION AND DRAINAGE ENGINEERING	2	0	2	3

Course Objective

1. At the completion of the course the students should be able to understand the necessity of planning an irrigation system to provide water at the right time and right place.
2. To understand the basic concepts for planning, design and management of land drainage works in cultivated areas

Unit	Description	Instructional Hours
I	**WATER RESOURCES AND IRRIGATION REQUIREMENT** Water Resources- River basins-Development and Utilization in India and Tamil Nadu- Irrigation – duty and delta - Rooting characteristics - Moisture use of crop, Evapotranspiration - ET plot – Crop water requirement - Effective rainfall - Scheduling - Irrigation requirement - Irrigation frequency, Irrigation efficiencies. **LAB:** Exp 1: To study various instruments in the Meteorological Laboratory	9
II	**METHODS OF IRRIGATION** Methods of Irrigation – Surface and Subsurface methods – Drip and Sprinkler - Hydraulics and design - Erodible and non-erodible, Kennedy"s and Lacey"s theories. Materials for lining water courses and field channel, Water control and diversion structure - Underground pipeline irrigation system **LAB:** Exp 2: Determination of infiltration rate using double ring infiltrometer Exp 3 : Estimating ET by climatological data – Blaney criddle and Modified Penman method	9
III	**DIVERSION AND IMPOUNDING STRUCTURES** Head works –Weirs and Barrage –Types of impounding structures - Factors affecting location of dams -Forces on a dam -Design of Gravity dams- Earth dams, Arch dams – Spillways -Energy dissipaters. **LAB:** Exp 4: Design of Drip irrigation system	9
IV	**CANAL IRRIGATION AND COMMAND AREA DEVELOPMENT** Classification of canals- Alignment of canals – Design of irrigation canals– Regime theories- Canal Head works – Canal regulators - Canal drops – Cross drainage works - Canal Outlet, Escapes –Lining and maintenance of canals - Excess irrigation and waterlogging problem -Command area - Concept, Components of CADP - On Farm Development works, Farmer"s committee - its role for water distribution and system operation - rotational irrigation system	9

LAB:

Exp 5: Measurement of flow properties in open irrigated channels (flumes, notches)
Exp 6 : Problems on Irrigation Scheduling

V	**SEDIMENT TRANSPORT** Agricultural drainage - Drainage coefficient; principles of flow through soils, Darcy"s law –infiltration theory, Surface drainage systems - Subsurface drainage - Design of subsurface drainage - Pipe materials - mole drains, drainage wells, Leaching requirements - irrigationand drainage water quality - recycling of drainage water for irrigation. **LAB:** Exp 7: Problems on Crop Water Requirement	9
	Total Instructional Hours	60

Course Outcome

CO1: The students will have knowledge and skills on Planning, design, operation and management of reservoir system.

CO2: The student will gain knowledge on different methods of irrigation

CO3: The student will able to understand various diversion and impounding structures.

CO4: The student will grab knowledge about the command area development and canal irrigation system.

CO5: The students will retrieve basic idea about reclamation of the soils under water logged conditions and salinity problems.

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 Ritzema, H.P., "Drainage Principles and Applications", Publication No. 16, International Institute of Land Reclamation and Improvement, Netherlands,1994.

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 Bhattacharya, A.K., and Michael, A.M., "Land Drainage – Principles, Methods and Applications", Konark Publishers Pvt. Ltd., New Delhi, 2003.

R4 "Irrigation water Management", Training Manual No 6, Drainage of Irrigated Lands, Food and Agriculture Organisation, Rome1996

R6 Kessler, J., "Drainage Principles and Applications", Vol. II and IV, International Institute of Land Reclamation and Improvement, Netherlands,1979

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	1	1
CO2	3	3	3	3	-	-	1	-	3	-	3	2	3	2
CO3	1	1	-	-	-	-	-	-	-	-	-	-	1	2
CO4	3	3	2	2	-	-	1	-	2	-	-	2	2	3
CO5	2	2	1	-	-	-	-	-	-	-	-	1	1	2
Avg	2	1	2	2	-	-	1	-	2	-	3	1	1	2

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HiCET

Programme	Course Code	Name of the Course	L	T	P	C
B.Tech.	22AG5252	FOOD AND DAIRY ENGINEERING	2	0	2	3

Course Objective

- To introduce the students to dairy industry, milk properties, testing, and processing of milk
- To train the students to understand manufacture of dairy products, sanitation and effluent treatment in dairy industry
- To expose the students to the fundamental knowledge of food and their reaction kinetics during the different process.
- To train the students to explore different food processing and preservation methods of foods
- To acquire better understanding of the food packaging and quality control methods.

Unit	Description	Instructional Hours
I	**PROPERTIES AND PROCESSING OF MILK** Introduction – chemical composition and properties of milk - milk types - milk preservation - testing of milk - processing- staining - filtering and clarification - cream separation - homogenization – pasteurization- sterilization- UHT processing. **Lab:** Experiment 1. Determination of specific gravity of milk	9
II	**DAIRY PRODUCTS** Manufacture of milk powder - processing of milk products - condensed milk, flavored milk, skim milk, buttermilk, whey, casein and paneer – manufacture of butter, cheese, ghee, ice creams and frozen desserts - standards for milk and milk products. Experiment 2. Determination of acidity of milk Experiment 3. Clot on boiling test of milk	9
III	**FOOD AND ITS PROPERTIES, REACTION AND KINETICS** Constituents of food - thermal processing of foods - blanching, pasteurization & sterilization - Reaction kinetics, Arrhenius equation- Thermal Death Time (TDT) curves- D, Z & F-values, 12-D Process - water activity, sorption behaviour of foods – isotherm models - monolayer value, BET and GAB model isotherms.	9

Lab:

Experiment 4. Determination of size, true density, bulk density and porosity of food samples

Experiment 5. Determination of moisture content of food samples by oven- dry method

PROCESSING AND PRESERVATION OF FOODS

IV Concentration of foods, freeze concentration - osmotic and reverse osmotic concentration - drying and dehydration of food - Tray, tunnel, belt, vacuum and freeze dryers - 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 oil content of given oil seeds using Soxhlet apparatus

PACKAGING AND QUALITY CONTROL

V Food packaging, importance, flexible pouches - retort pouches – aseptic packaging, granules, powder and liquid packaging machines - nanotechnology – principles - applications in food processing - Quality control of processed food products . 9

Lab:

Experiment 7. Determination of drying characteristics of fruits and vegetables

Total Instructional Hours 45

Course Outcome

After successful completion of this course students are expected to be able to:

CO1: Gain knowledge about properties of milk and various process involved in the dairy industry

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

R5 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

R5 Tanweer Alam. Packaging and Storage of Fruits and Vegetables, Apple Academic Press, India, 2021.

PO & PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	3	2	1	-	-	1	-	-	-	2	3	2
CO2	3	2	3	2	2	-	-	1	1	-	-	2	2	2
CO3	3	3	3	2	2	1	1	1	1	-	-	2	3	3
CO4	3	3	3	2	2	-	1	1	-	-	-	2	2	2
CO5	3	3	3	3	2	1	2	1	-	-	-	2	3	2
Avg	3	2.6	3	2.2	1.8	0.4	0.8	1	0.2	-	-	2	2.6	2.2

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Programme	Course Code	Name of the Course	L	T	P	C
B.Tech.	22AG5001	RENEWABLE ENERGY LABORATORY	0	0	4	2

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	LIST OF EXPERIMENTS
1	Characterization of biomass – proximate analysis
2	Determination of caloric value of fuels – solids and gases
3	Design of KVIC / Deenbandhu model biogas plant
4	Determine the performance of biomass gasifier.
5	Determine the performance of pyrolyser.
6	Study on briquetting and pulverizer
7	Analysis of wind data and prediction
8	Testing of solar water heater
9	Testing of natural convection solar dryer
10	Determine the performance of the improved chula
11	Testing of solar photovoltaic water pumping system
12	Determine the efficiency of the solar distillation unit.

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 CH4, CO2 and CO and H2S 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 the systems

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	Briquetting Machine - Lab Scale	1
10	Automatic weather station.	1
11	Solar water heater	1

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.

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	3	1	-	-	-	-	-	-	-	-	2	3	1
CO2	3	2	2	2	1	2	1	-	1	1	1	1	2	3
CO3	2	3	3	1	2	1	2	-	2	1	1	2	3	2
CO4	1	-	1	1	3	2	-	-	-	-	-	2	1	2
CO5	2	-	-	-	-	-	-	-	-	-	-	2	2	1
Avg	2	3	2	1	2	2	2	-	2	1	1	2	2	2

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Department of Agricultural Engineering

2022 Regulation New Courses Introduced (V SEMESTER)

S.No	Subject Code	Name of the Subject
1	22AG5202	Tractors and Engine Systems
2	22AG5301	Farm Power & Machinery Management
3	22AG5302	Tractor Systems and Controls
4	22AG5303	Tractor Design and Testing
5	22AG5304	Watershed planning and Management
6	22AG5305	Groundwater and Well Engineering
7	22AG5306	Design of Micro- irrigation system
8	22AG5307	Biomass Management for Fodder & Energy
9	22AG5308	Renewable Energy Sources
10	22AG5309	Renewable Energy Technology
11	22AG5310	Heat and Mass Transfer for Agricultural Engineering
12	22AG5311	Food Process Equipment and Design
13	22AG5312	Food Plant Design and Management
14	22AG5313	Integrated Farming System
15	22AG5314	Agri Business Management
16	22AG5315	Sustainable Agriculture and Food Security
17	22AG5316	Automation in Agriculture
18	22AG5317	Electric and Hybrid Vehicle
19	22AG5318	Foundation of Robotics and Drone
20	22AG5251	Irrigation and Drainage Engineering
21	22AG5252	Food and Dairy Engineering
22	22AG5001	Renewable Energy Laboratory

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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 (ODD SEMESTER)

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	PC	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	21AG6001	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	Modern Agricultural Practices	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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Principal

Programme	Course Code	Name of the Course	L	T	P	C
B.E	21AG7201	AGRICULTURE 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.	8
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-DEMIC-Kisan call center- VKC.	10
IV	**SURFACE AND MICRO-IRRIGATION AUTOMATION** Audio -visual aids-definition, importance, selection, use and factors influencing selection, merits and demerits-Electronic media -radio, television and video procedure – advantage and limitations. Transfer of technology -meaning , importance and major components – communication -definition, meaning, scope and importance- functions and types- communication process -elements and models	10

V	**Current Approaches in Extension** Decentralised Decision Making-Bottom up Planning-Farming System Approach,Farming Situation Based Extension- Market – Led – Extension	8
	Total Instructional Hours	45

Course Outcome

CO1: To Understand the concept of agriculture extension

CO2: Organize the various extension teaching methods and communication gadgets

CO3: Execute the use of electronic media for transfer of technology

CO4: Execute the use of electronic media for transfer of technology

CO5:To critically analyze different Agricultural Extension approaches

TEXT BOOKS:

T1 Berlo, D.K. 1960. The Process of Communication. Holt, Rinehart and Winston, New York

T2 Mike W Martin and Roland Schinzinger, Ethicsin Engineering, 4th edition, Tata McGraw Hill Publishing Company Pvt. Ltd, New Delhi, 2014

REFERENCE BOOKS:

R1 R S Naagarazan, A text book on professional ethics and human values, New age international (P) limited, New Delhi, 2006

R2 M Govindarajan, S Natarajan and V S Senthil Kumar, Engineering Ethics, PHI Learning Private Ltd,New Delhi, 2012

PO & PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	1	1	2	-	2	2	-	1	3	1	2	1	1
CO2	-	-	-	1	2	1	3	-	2	2	-	2	2	2
CO3	1	1	-	1	2	1	2	-	2	2	-	2	1	-
CO4	-	1	-	1	1	1	2	-	2	3	1	1	1	1
CO5	2	-	-	1	-	1	2	-	1	2	-	2	1	2
Avg	1	1	0.2	1.5	1	1.3	2	-	2	2.5	1	2	1.8	1

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Programme	Course Code	Name of the Course	L	T	P	C
B.E	21AG7202	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	9

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

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.

PO &	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	2	1	-	-	1	-	1	1	1	2	3	1
CO2	3	3	3	1	2	1	2	-	2	1	1	2	3	2
CO3	3	3	3	1	2	1	2	-	2	1	1	2	3	2
CO4	2	3	1	2	2	1	-	-	-	2	2	2	3	2
CO5	1	2	2	2	-	1	1	1	1	3	2	3	3	3
Avg	2.2	2.6	2.2	1.4	2	1	1.5	1	1.5	1.6	1.4	2.2	3	2

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	21AG7301	POSTHARVEST TECHNOLOGY	3	0	0	3

Course Objective

- To introduce the basics of postharvest losses, optimum harvest stage and threshing methods to students.
- The students would be exposed to fundamental knowledge on psychrometric charts, theory of drying and different dryer.
- To expose the students to principles of cleaning and grading of grains and performance of separator.
- To train the students to explore different shelling and handling equipment and their operation.
- To acquire better understanding of different crop processing methods for paddy and pulses.

Unit	Description	Instructional Hours
I	**BASICS OF POST HARVEST OPERATIONS** Postharvest technology – introduction–objectives –post harvest losses of cereals, pulses and oilseeds –optimum stage of harvest. Threshing – traditional methods mechanical threshers – types-principles and operation. Moisture content – measurement –direct and indirect methods – Moisture Content expressions- equilibrium moisture content.	9
II	**PSYCHROMETRY AND DRYING** Psychrometry – importance – Psychrometric charts – Drying – principles and theory of drying – methods of drying- thin layer and deep-bed drying – methods of producing hot air – Types of grain dryers – selection –construction, operation and maintenance of dryers – Performance of dryer.	9
III	**CLEANING AND GRADING** Principles of Cleaning – screening-types of screens-screen openings- effectiveness of screen and performance index -air screen cleaners – adjustments - length separator- cylinder separator – spiral separator – inclined belt separator- magnetic separator – cyclone separator-color sorter.	9
IV	**SHELLING AND HANDLING** 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
V	**CROP PROCESSING** Paddy processing – parboiling of paddy – methods – merits and demerits- dehusking of paddy –methods – merits and demerits – rice polishers –types – constructional details – pulse milling methods	9
	Total Instructional Hours	45

Course Outcome

After successful completion of this course students are expected to be able to:

CO1: Understand different postharvest losses and processing methods for harvested crops.

CO2: Understand the principles drying and selection of dryers based on their performance

CO3: Assess construction details and working principles of various cleaning and grading equipment for agricultural processing.

CO4: Gain knowledge on material handling and shelling equipment's used in food industry.

CO5: Understand different paddy and pulse processing methods used in modern industries.

PO & PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	2	3	2	1	1	-	-	-	-	2	3	3
CO2	3	3	3	3	2	-	-	1	-	-	2	2	2	3
CO3	3	3	3	2	2	-	-	1	-	-	2	2	2	3
CO4	2	3	3	2	1	-	-	1	-	-	-	1	2	2
CO5	3	3	3	2	1	-	-	1	-	-	-	1	2	2
Avg	2.6	2.8	2.8	2.4	1.6	0.2	0.2	0.8	-	-	0.8	1.6	2.2	2.6

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	21AG7401	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 the 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, levelling, 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

CO1	To Understand the various principles of agriculture and gardening
CO2	To develop and Effectively install and maintenance of roof gardening and develop as a small agri-business enterprise.
CO3	To Understand the concept of organic farming
CO4	To gain the knowledge on certification process in organic farming
CO5	To develop and select appropriate model to improve the business opportunity

TEXT BOOKS:

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

T2 P L Maliwal, Principles of Organic Farming Textbook, Publishing by Bio-Green Books, January 1, 2020, ISBN10: 9389184509

REFERENCE BOOKS:

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

R2 F. Somasundaram; D Udhaya Nandhini; M Meyyappan, Principles of Organic Farming: (With Theory and Practicals), Nipa Genx Electronic Resources and Solns Pvt Ltd., July, 2019

R3 April Philips, Designing Urban Agriculture: A Complete Guide to the Planning, Design, Construction, Maintenance and Management of Edible Landscapes, Wiley, April 22, 2013.

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

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	21AG7251	PRECISION FARMING AND PROTECTED CULTIVATION	2	0	2	3

Course Objective

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

Unit	Description	Instructional Hours
I	**PROTECTED CULTIVATION FEATURES** 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 –irrigation and fertigation systems. **LAB 1:** Protected cultivation structures – types and materials **LAB 2:** ventilation systems	9
II	**PROTECTED CULTIVATION OF VEGETABLE CROPS** Protected cultivation technology for vegetable crops - Hi-tech protected cultivation techniques for tomato, capsicum, cucumber, gherkins strawberry and melons – integrated pest and disease management – post harvest handling. **LAB 3:** Protected cultivation technology of tomato	9
III	**PROTECTED CULTIVATION OF FLOWER CROPS** Protected cultivation technology for flower crops - Hi-tech protected cultivation of cut roses, cut chrysanthemum, carnation, gerbera, anthurium, orchids,– integrated pest and disease management – postharvest handling. **LAB 4:** Protected cultivation technology of cut flowers	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 –Sensors for information gathering – UAV - geostatistics – robotics in horticulture – postharvest process management (PPM) **LAB 5 :** – Role of GIS and GPS and its application in precision farming	9
V	**PRECISION FARMING OF HORTICULTURAL CROPS** Precision farming techniques for horticultural crops - Precision farming techniques for bhendi, gourds, cauliflower, cabbage, grapes, banana, jasmine, marigold, tuberose, china aster, turmeric. **LAB 6 :** Precision farming techniques for banana	9
	Total Instructional Hours	45

Course Outcome

CO1: Describe the concept and features of protected cultivation
CO2 : Gain fundamental knowledge on the practices of protected cultivation of vegetable crops
CO3: Make the students understand principles of protected cultivation of Flower crops.
CO4 : Introduce various precision farming techniques and their role in current climate change scenario
CO5 : Acquire fundamental knowledge on the concepts of precision farming of horticultural crops

TEXT BOOKS:

T1 1. Joe.J.Hanan. 1998. Green houses: Advanced Technology for Protected Horticulture, CRC Press, LLC. Florida.
T2 2. Paul V. Nelson. 1991. Green house operation and management. Ball publishing USA.

REFERENCE BOOKS:

R1 1. Lyn. Malone, Anita M. Palmer, Christine L. VIoghatJachDangeermond. 2002. Mapping out world: GIS lessons for Education. ESRI press.
R2 2. David Reed. 1996. Water, media and nutrition for green house crops. Ball publishing USA.

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

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

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	21AG7001	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	LIST OF EXPERIMENTS
1	Characterization of biomass – proximate analysis
2	Determination of caloric value of fuels – solids and gases
3	Design of KVIC / Deenbandhu model biogas plant
4	Determine the performance of biomass gasifier.
5	Determine the performance of pyrolyser.
6	Study on briquetting and pulverizer
7	Analysis of wind data and prediction
8	Testing of solar water heater
9	Testing of natural convection solar dryer
10	Determine the performance of the improved chula
11	Testing of solar photovoltaic water pumping system
12	Determine the efficiency of the solar distillation unit.

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 CH4, CO2 and CO and H2S 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 the systems

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	Briquetting Machine - Lab Scale	1
10	Automatic weather station.	1
11	Solar water heater	1

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.

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	3	1	-	-	-	-	-	-	-	-	2	3	1
CO2	3	2	2	2	1	2	1	-	1	1	1	1	2	3
CO3	2	3	3	1	2	1	2	-	2	1	1	2	3	2
CO4	1	-	1	1	3	2	-	-	-	-	-	2	1	2
CO5	2	-	-	-	-	-	-	-	-	-	-	2	2	1
Avg	2	3	2	1	2	2	2	-	2	1	1	2	2	2

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Programme	Course Code	Name of the Course	L	T	P	C
B.E	21AG7002	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	Instruction Hours
1.	Introduction to QGIS and SAGA	3
2.	Projection by using QGIS	3
3.	Georeferencing 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
CO2: Understand the Image enhancement, Supervised and Unsupervised
CO3: Understand the Database Management Systems of GIS application in
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

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.

PO &	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	2	1	-	-	1	-	1	1	1	2	3	1
CO2	3	3	3	1	2	1	2	-	2	1	1	2	3	2
CO3	3	3	3	1	2	1	2	-	2	1	1	2	3	2
CO4	2	3	1	2	2	1	-	-	-	2	2	2	3	2
CO5	1	2	2	2	-	1	1	1	1	3	2	3	3	3
Avg	2.2	2.6	2.2	1.4	2	1	1.5	1	1.5	1.6	1.4	2.2	3	2

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	21AG7302	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.

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

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	21AG7303	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"

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

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	21AG7304	PROCESS ENGINEERING OF FRUITS AND VEGETABLES	3	0	0	3

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.

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

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	21AG7305	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.

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

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Department of Agricultural Engineering

Syllabus Revision carried out in 2024-2025 ODD Semester

2019 Regulation with amendments Syllabus revision

S.No	Year	Sem	Course Code & Name	Existing Syllabus	Revised Syllabus	% of Change
1	IV	VII	21AG7251 - Precision Farming and Protected Cultivation	**UNIT 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. LAB 1: Protected cultivation structures – types and materials LAB 2: ventilation systems	**UNIT I - PROTECTED CULTIVATION FEATURES** 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. LAB 1: Protected cultivation structures – types and materials LAB 2: ventilation systems	15%
				Protected cultivation technology for vegetable crops - Hi-tech protected cultivation techniques for tomato,	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. LAB 3: Protected cultivation technology of tomato	capsicum, cucumber, gherkins strawberry and melons – integrated pest and disease management – post harvest handling. LAB 3: Protected cultivation technology of tomato	
				UNIT 4 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 system – georeferencing and photometric correction – Sensors for information gathering – UAV - geostatistics – robotics in horticulture – postharvest process management (PPM) – Remote sensing.	**UNIT 4 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 system – georeferencing and photometric correction – Sensors for information gathering – UAV - geostatistics – robotics in horticulture – postharvest process management (PPM)	
2	**IV**	**VII**	**21AG7201-Agriculture extension**	**UNIT 4: 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.	**UNIT 4: 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. Transfer of technology -meaning , importance and major components – communication -definition, meaning, scope and importance-functions and types- communication process -elements and models	15%

3	IV	VII	**21AG7301 - Post harvest Technology**	**Unit I: Basics of Postharvest Operations** 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	**Unit I: Basics of Postharvest Operations** Postharvest technology – introduction–objectives –post harvest losses of cereals, pulses and oilseeds – optimum stage of harvest. Threshing – traditional methods mechanical threshers – types-principles and operation. Moisture content – measurement –direct and indirect methods – Moisture Content expressions-equilibrium moisture content	21%
				Unit II: Psychrometry and Drying 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	**Unit II: Psychrometry and Drying** Psychrometry – importance – Psychrometric charts – Drying – principles and theory of drying –methods of drying-thin layer and deep-bed drying– methods of producing hot air – Types of grain dryers – selection –construction, operation and maintenance of dryers –Performance of dryer.	
				Unit III: Cleaning and Grading 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.	**Unit III: Cleaning and Grading** Principles of Cleaning – screening-types of screens-screen openings- effectiveness of screen and performance index -air screen cleaners – adjustments - length separator-cylinder separator – spiral separator – inclined belt separator- magnetic separator – cyclone separator-color sorter.	
				Unit V: Crop Processing Paddy processing – parboiling of paddy – methods – merits and demerits- dehusking of	**Unit V: Crop Processing** 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.	paddy –methods – merits and demerits – rice polishers – types – constructional details – pulse milling methods.	

Syllabus Revision carried out in 2024-2025 ODD Semester

2019 Regulation with amendments (2021 Batch) - VII semester = 7.1 %

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VERTICALS FOR MINOR DEGREE

AGRICULTURAL ENGINEERING OFFERING MINOR DEGREE (2021 Batch)

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

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Programme	Course Code	Name of the Course	L	T	P	C
B.E	21AG7601	FUNDAMENTALS OF FOOD PROCESS ENGINEERING	3	0	0	3

Course Objective

1. To expose the students to the fundamental knowledge of food, its properties and different methods of food processing.
2. Learn thermal processing of food and hygiene practices in food industry

Unit	Description	Instructional Hours
I	**RHEOLOGY AND TEXTURE OF FOOD MATERIALS** Concept of rheology, elastic, plastic and viscous behaviour, viscoelasticity, rheological models and constitutive equations. Methods of texture evaluation, subjective and objective measurements. Aerodynamic and hydrodynamic characteristics. Application to separation, pneumatic handling and conveying. Materia handling: Material handling machines and conveyors.	9
II	**THERMAL PROCESSING** Thermal processing: Blanching, Pasteurizations and Sterilization - principles, different methods and equipment. Processing in containers, process time, T evaluation, Design of batch and continuous sterilization	9
III	**WATER BINDING AND DRYING** Rault's Law. Water sorption Isotherms - Hysteresis. Water activity measurement method. Water binding and its effect on enzymatic and non-enzymatic reactions and food texture. Control of water activity and moisture. Different types of dryers and components - roller, spray, tray, compartment, fluidized bed	9
IV	**METHODS OF FOOD PROCESSING** Low Temperature: Freezing of Foods, Types of freezers including, ice cream freezers, Freeze concentration and freeze drying. Freezing curves, phase diagrams, methods of freeze concentration. Extrusion: Extrusion cookers, cold extrusion, single and twin screw extrusion	9
	LAYOUT AND COST ESTIMATION	

V	Technology scaleup -Product and process layout - Expansion and Improvements of Existing Facilities- Inventory control - Cost Indexes - Capacity Costs - Factored Cost Estimate – Break – even point - Improvements– Module Cost Estimation - Unit Operations Estimate	9
	Total Instructional Hours	45

Course Outcome

CO1: The students will have knowledge on rheology properties

CO2: The student will gain knowledge on different thermal processing of foods and its applications

CO3: The student will able to understand water activity and drying properties of food grains.

CO4: The student will grab knowledge about the methods of food gains

CO5: The students will estimate the cost of food layouts

TEXT BOOKS

T1 Toledo, Romeo T. "Fundamentals of Food Process Engineering" II Edition. CBS Publishers, 2000

T2 Fellows P. J "Food Processing Technology" Woodhead Publishing, 1998

T3 Smith P. G "Introduction to Food Process Engineering". Springer, 2005

T4 Earle, R.L, "Unit Operations in Food Processing". Pergamon Press. Oxford. U.K, 2003

REFERENCE BOOKS:

R1 Sahay, K. M. and K.K.Singh.."Unit operation of Agricultural Processing", Vikas Publishing House Pvt. Ltd., New Delhi, 2004.

R2 Berk, Zeki. "Food Process Engineering and Technology". Elsevier, 2009.

PO & PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	2	2	2	2	2	2		1	3	1	2	1	1
CO2	2	2	2	1	3	1	1		2	2		2	2	2
CO3	1	3	1	3	2	1	2		2	2		2	1	
CO4	3	3	3	2	1	1	1		2	3	1	1	1	1
CO5	2	2	2	2	2	1	1		1	2		2	1	2
Avg	2	2.5	0.2	1.5	2	1.3	1.4		2	2.5	1	2	1.8	1

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Programme	Course Code	Name of the Course	L	T	P	C
B.Tech.	21AG7602	Non-Conventional Energy Sources	3	0	0	3

Course Objective

- To know the basic need, importance and scope of non-conventional and alternate energy resources.
- To Learn the various additional alternate energy sources are available in nature and energy conservation practices for effective utilization.

Unit	Description	Instructional Hours
	Geothermal Energy	
I	World energy future – Renewable energy sources and advantages – Non conventional sources – Geothermal energy sources – Hydrothermal resources –Vapour dominated system-Liquid dominated systems-Geopressured resources –Interconnection of geothermalfossil systems-Prime movers for geothermal energy conversion-Advantage and disadvantages of geothermal energy over other energy forms.	9
	Energy from the Oceans	
II	Ocean Thermal Electric Conversion (OTEC)-Methods of ocean Thermal Electric Power Generation – Open cycle OTEC system- Closed OTEC system- Energy from Tides- Basic principle of Tidal power –Operation Methods of Utilization of Tidal Energy –Advantages and Limitation of Tidal Power Generation –Ocean waves-Energy and Power from the waves – Wave energy conversion devices –Hybrid system.	9
	Chemical Energy Sources	
III	Fuel cells –Design and Principle of Operation of Fuel Cell –Classification of Fuel Cells-Types of Electrodes –Advantage and Disadvantage of Fuel Cell- Basics of Battery Theory and fundamental characteristics– Classification of batteries – Advantage of Batteries for Bulk Energy storage.	9
	Hydrogen Energy	
IV	Hydrogen Production –Electrolysis- Thermochemical method –Fossil Fuel method-Solar Energy Methods- Hydrogen storage and Transportation - Utilization of Hydrogen Gas –Hydrogen as an alternative fuel for motor vehicles-Hydrogen Technology Development in India.	9
	Additional Alternate Energy Sources and Conservation	
V	Basics Principles of Magneto Hydro Dynamic (MH D) Power Generation – Thermoelectrically power generation –Thermionic generation - Thermounclear fusion energy – Economic concept of Energy -Energy conservation Approach and Technologies.	9
	Total Instructional Hours	45

Course Outcome

CO1: The students will be able to understand the different types of conventional and non-conventional energy sources available in nature.
CO2: The students will be able to understand the geothermal and ocean thermal electric power generation and its limitation.
CO3:The students will be able to understand the design and principle of operation of fuel cell and fundamental characteristics of batteries
CO4:The students will be able to understand the hydrogen energy production , storage and transportation procedures
CO5: The students will be able to understand the basics principles of magneto hydro dynamic power generation and energy conservation approach and technologies.

TEXT BOOKS

T1 Non-Conventional Sources of Energy- G.D.Rai, Khanna Publishers

T2 Energy Technology – S. Rao, Parulkar

T3 Non-conventional Energy Systems – Mittal, Wheelers Publication

T4 Non-Conventional Sources of Energy- B. H. Khan, TMH Publication

REFERENCE BOOKS

R1 Renewable energy technologies - R. Ramesh, Narosa Publication

R2 Renewable Energy sources And Emerging Technologies, DP. Kothari, PHI.

R3 Hand Book of Renewable Energy Technology, Ahmed F Zooba, R C Bansal World scientific.

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

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VERTICALS FOR MINOR DEGREE

AGRICULTURAL ENGINEERING OFFERING MINOR DEGREE (2022 Batch)

S. NO	COURSE CODE	COURSE TITLE	COURSE CATEGORY	L	T	P	C	TCP	CIA	ESE	TOTAL
1.	22AG5601	AGRICULTURE FOR ENGINEERS	MDC	3	0	0	3	3	40	60	100
2.	22AG6601	SOIL & WATER CONSERVATION	MDC	3	0	0	3	3	40	60	100
3.	22AG6602	FARM MACHINERY AND EQUIPMENT'S	MDC	3	0	0	3	3	40	60	100
4.	22AG7601	FUNDAMENTALS OF FOOD PROCESS ENGINEERING	MDC	3	0	0	3	3	40	60	100
5.	22AG7602	NON-CONVENTIONAL ENERGY SOURCES	MDC	3	0	0	3	3	40	60	100
6.	22AG8601	INTEGRATED ON FARM	MDC	3	0	0	3	3	40	60	100

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Programme	Course Code	Name of the Course	L	T	P	C
B.Tech	22AG5601	AGRICULTURE FOR ENGINEERS	3	0	0	3

Course Objective

- To impart basic knowledge on soil properties, Weather Parameters on Crop Growth, water and nutrient requirements of crop
- To know the working principles of farm implements/tools /machinery and seedbed preparation for crop germination.
- The students would be exposed to fundamental knowledge in methods of harvesting and Storage of produces.

Unit	Description	Instructional hours
I	**Nature of Soil and its reaction** Definition and Scope of Agronomy- Rocks and Minerals – types of rocks - Soil Forming Processes- Classification of Soil – Soil profile - Soil Physical Properties - Ion Exchange in Soil - Soil Organic Matter- Factors affecting soil organic matter – Decomposition	12
II	**Crop water requirements and Weather parameters** Effect of Different Weather Parameters on Crop Growth and Development - Quality of irrigation water- Water Management Practices- Plant nutrients- Nutrient Deficiency,- Toxicity and Control Measures- organic and Inorganic fertilizer- Fertilizer application, fertigation & irrigation methods.	9
III	**Land preparation for crop germination** Principal of Tillage - tillage implements primary – secondary – zero tillage - Role of Water in Plant and Its Absorption- Conduction and Transpiration of Water and Plant Processes - weed and pest control practices.	9
IV	**Crop selection and Cropping system** Scope of cereals and pulses crop -Scope of Horticultural & Vegetable Crops- Macro and micro propagation methods- quality of seed and seeding materials- Plant growing structures, pruning and training- Crop rotation, cropping systems, intercropping and mixed cropping.	8
V	**Harvesting and storage practices** Harvesting – maturity indices, grading and packaging, post-harvest practices- harvesting tools - Extraction and storage of seeds - cereals and vegetables – management practices in storage	7
	Total Instructional Hours	**45**

Course Outcome

At the end of the study

CO1: The students will be able to understand the Nature and Origin of Soil

CO2: The students will have the knowledge on Weather parameters and pantrequirements of various inputs like light, water, nutrient etc

CO3: The students will able to understand the tillage practices and Role of Water in plant growth.

CO4: The student will able to understand the cropping system and pattern for cultivation

CO5: The students will get basic idea about Harvesting and storage of grains, and vegetables

TEXT BOOKS:

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

T2 Rajendra Prasad, Text Book of Field Crop Production. Directorate of Information and Publication,Krishi Anusandhan Bhavan, Pusa, New Delhi, 2015.

T3 Jagdishwar Sahay. Elements of Agricultural Engineering. Standard Publishers Distributors, Delhi6.,2010

REFERENCE BOOKS

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

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

R3 Kumar, N.,"Introduction to Horticulture", Rajalakshmi Publications. Nagercoil, 7th edition, 2015.

R4 Kepner, R.A., *et al.* Principles of farm machinery. CBS Publishers and Distributers, Delhi. 99, 1997.

PO & PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO1	PSO2
CO1	-	1	-	1	2	1	2	-	1	-	1	2	-	1
CO2	1	1	1	2	2	1	2	-	1	2	-	2	2	2
CO3	2	2	2	1	3	2	2	1	2	-	1	2	2	2
CO4	-	1	-	-	2	1	2	-	1	-	-	1	1	-
CO5	2	2	2	2	3	2	2	1	2	2	2	2	2	2
Avg	2	2	2	2	2	2	2	1	1	2	1	2	2	2

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Hindusthan College of Engineering and Technology
(An Autonomous Institution, Affiliated to Anna University, Chennai)
Valley Campus, Coimbatore - 641 032

B. TECH (HONS) AGRICULTURAL ENGINEERING (2021 Batch)

(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	**21AG7204**	**21AG7205**	**21AG7206**	**21AG7207**
Tractor Systems Design -II	Water Systems Simulation And Modelling	Robotics In Food Processing And Handling	Analysis of Agrivoltaics system for Energy food and water production	Graph Machine Learning: Foundations and Applications
21AG7252	**21AG7253**	**21AG7254**	**21AG7255**	**21AG7256**
Energy Conservation and Management in Farm Power and Machinery	Modelling Soil Erosion Processes	Food Process Modelling	Design and installation of Agrivoltaics System	AI Applications in Agriculture
21AG8208	**21AG8209**	**21AG8210**	**21AG8211**	**21AG8212**
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.E.	21AG7203	TRACTOR SYSTEMS DESIGN -II	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
I	**TRACTOR CHASSIS AND STABILITY** Mechanics of tractor chassis and stability analysis-Centre of gravity, Issues in chassis mechanics-Weight transfer, Instability, Analysis and Assumptions	9
II	**HITCH SYSTEM AND DRAWBAR** Single and three point hitch systems- Design Concept, Hitch System Components, Design Requirements ,Important Features, Dynamic Load Transfer, Center-ability, Trailing Characteristics, Hitch Lift Capacity and Stability. Drawbar performance testing of general purpose agriculture tractor	9
III	**HYDRAULIC CONTROLS AND SYSTEMS** Introduction- Fundamentals and components for fluid power transmission, Types of Hydraulic Systems, Hydraulic control in tractor. Hydraulic system design considerations- Hydraulic Pumps, Motors, Cylinders, Reservoirs	9
IV	**STEERING SYSTEM** Steering system - Steering Geometry, Analysis of steering-Turning radius. Ackerman Steering, Steering linkage. Types of steering gear (steering box). Hydraulic steering. Electronically Controlled Hydraulic Power Steering System- Electric power steering (EPS).	9
V	**HUMAN FACTORS ENGINEERING IN TRACTOR** Importance of ergonomics in tractor and agricultural machinery design. Tractor noise, vibration and other environmental factors, Safety features including ROPS in tractor.	9
	Total Instructional Hours	45

Course Outcome

- The student will be able to basic of tractor chassis and stability
- The students acquire concept for the hitch system and drawbar
- The student will be able to designs of hydraulic controls and systems
- The students acquire concept of steering system
- The students will gain the knowledge of the human factors engineering in 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.E.	21AG7252	**Energy Conservation and Management in Farm power and Machinery**	2	0	2	3

Course Objective

- To introduce the student to acquaint and equip with the energy use pattern in agriculture production systems, conservation of energy, energy planning and economics.

Unit	Description	Instructional Hours
I	**Energy conservation** Concepts, energy classification, equivalents, scenario, energy pricing, importance. Energy Conservation Act. Energy requirement of different operations in agricultural production systems viz. crop, livestock and aquaculture. **Practical:** 1. Analytical study on energy production and supply in the Indian scenario.	9
II	**Energy auditing and economics** Energy management, energy audit strategy, types. Energy performance: Benchmarking, fuel substitutions, energy audit instruments, material and energy balance. Energy conversion: Energy index, cost index. Energy conservation through proper management and maintenance of farm machinery **Practical:** 2. A study on energy audit instruments and its application	9
III	**Energy conservation planning and practices** Energy forecasting, Energy economics, Energy pricing and incentives for energy conservation, factors affecting energy economics. Energy modelling. **Practical:** 3. Determination of cost-benefit analysis in energy auditing approach.	9
IV	**Thermal energy audit** Performance evaluation, energy conservation opportunities in boilers, steam systems and furnaces, insulation, refractory and other thermal utilities. **Practical:** 4. Energy Efficiency in Thermal Utilities and Systems	9
V	**Energy and environment, air pollution, climate change** United Nations Framework Convention on Climate Change (UNFCC), sustainable development, Kyoto Protocol, Conference of Parties (COP), Clean Development Mechanism (CDM), CDM Procedures case of CDM – Bachat Lamp Yojna and industry; Prototype Carbon Fund (PCF). **Practical:** 5. Determination of energy conservation feasibility in rice mills. 6. Determination of energy conservation feasibility in dairy industries.	9

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

- Acquire insight into the importance of energy.
- Analyze all scenarios from energy consumption.
- Generate scenarios of energy consumption and predict the future trend.
- Suggest and plan energy conservation solutions.
- Manage different agricultural systems and operations for energy conservation.

TEXT BOOKS:

T1 Witte, L.C., Schmidt, P.S. and Brown, D.R. 1988. Industrial Energy Management and Utilization. Hemisphere Publishing Corp., New York.

T2 O'Callaghan, P.W. 1981. Design and Management for Energy Conservation. Pergamon Press, Oxford

REFERENCE BOOKS:

R1 Reay, D.A. 1980. Industrial Energy Conservation, Pergamon Press, Oxford..

R2 Nagrath, I.J. and Gopal, M. 1982. Systems : Modeling and Analysis. Tata McGraw Hill, New 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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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	21AG7204	WATER SYSTEMS SIMULATION AND MODELLING	3	0	0	3

Course Objective

To develop the model for overland and channel flow simulation, which can be used for watershed management and planning and also able to simulate the ground water and surface water by developing the ground water model and runoff models.

Unit	Description	Instructional Hours
	WATER SYSTEM MODEL	
I	Models and their classification, simulation procedure. Rainfall-runoff models. Infiltration models, evapo-transpiration models, structure of a water balance model.	9
	MODELING APPROACHES AND PARAMETERS	
II	Overland and channel flow simulation. Modeling approaches and parameters. Stream flow statistics. Surface water storage requirements.	9
	WATER STORAGE MODELS	
III	Flood control storage capacity and total reservoir capacity. Surface water allocations. Palaeochannels. Ground water models	9
	GENERAL SYSTEMS FRAME WORK	
IV	Design of nodal network. General systems frame work. Description of the model. Irregular boundaries. Decision support system using simulation models. Monte- Carlc approach to water management.	9
	HYDROLOGIC MODELINGSYSTEMS	
V	Stanford watershed model and input data requirements of various hydrologic modeling systems. Soil water assessment tool (SWAT). Groundwater modeling and solute transport	9
	Total Instructional Hours	45

Course Outcome

CO1: The students will have knowledge of Water System Model

CO2: The student will gain knowledge on various modeling approaches and parameters

CO3: The student will able to understand water storage models

CO4: The student will grab knowledge about the simulations

CO5: The students will retrieve basic idea about hydrological model.

TEXT BOOKS

T1 Biswas AK. 1976. Systems Approach to Water Management. McGraw Hill

T2 CoX DR and Mille HD. 1965. The Theory of Stochastic Processes. John Wiley & Sons

REFERENCE BOOKS:

R1 Eagleson PS. 1970. Dynamic Hydrology. Mc Graw Hill .

R2 Linsley RK, Kohler MA and Paulhus JLH. 1949. Applied Hydrology. McGraw Hill

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.E.	21AG7253	MODELLING OF SOIL EROSION PROCESS	2	0	2	3

Course Objective

To acquaint students about the concept of modeling upland erosion, reservoir sedimentation and sediment yield models for estimation of soil erosion.

Unit	Description	Instructional Hours
I	**BASICS OF EROSION AND SEDIMENTATION** Mechanics of soil erosion - Erosion-sedimentation systems of small watersheds. Overland flow theory and simulation- Basic theory of particle and sediment transport- Sediment deposition processes. **LAB:** Exp 1: Estimate of soil Erosion from a Catchment Using GIS	9
II	**MODELING OF EROSION** Modeling upland erosion and component processes- Modes of transport and transport capacity concept and computation- Channel erosion- Erosion and sediment yield measurement and estimates **LAB:** Exp 2: Soil Loss Estimation using GIS	9
III	**SEDIMENT AND ITS MODELS** Reservoir sedimentation surveys and computation - Classification of models structure and mathematical bases of sediment yield models- Nature and properties of sediment: Individual and group of particles- Critical tractive force, lift and drag forces- Shield's analysis. **LAB:** Exp 3: Design of erosion control structures	9
IV	**TESTING OF MODELS FOR EROSION** Calibration and testing of models- Universal soil loss equation, its modification and revisions- Stochastic and dynamic sediment yield models. **LAB:** Exp 4: Prediction of sediment loss	9
V	**EROSION CONTROL MEASURES** Evaluation of erosion control measures- Computer models used for hydrologic and/ or watershed modeling. **LAB:** Exp 5 :Application of sediment yield models	9
	Total Instructional Hours	45

Course Outcome

CO1: The students will have knowledge of soil erosion and sedimentation

CO2: The student will gain knowledge on Models used for erosion and measurement of erosion

CO3: The student will able to understand classification of models and models used for sedimentation

CO4: The student will grab knowledge about the models used to control erosion

CO5: The students will retrieve basic idea about control measures of eroison.

TEXT BOOKS

T1 Garde RJ and Ranga Raju KG. 1977. Mechanics of Sediment Transport and Alluvial StreamProblems. Wiley Eastern Ltd.

T2 Morgan RPC (Ed. D A Davison). 1986. Soil Erosion and Conservation. ELBS

REFERENCE BOOKS:

R1 Longman USDA. 1969. A Manual on Conservation of Soil and Water. Oxford & IBH.

R2 Tripathi RP and Singh HP. 1993. Soil Erosion and Conservation. Publisher- New Age International, New Delhi.

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	2	1	2	-	1	-	1	2	-	1
CO2	1	1	1	2	2	1	2	-	1	2	-	2	2	2
CO3	2	2	2	1	3	2	2	1	2	-	1	2	2	2
CO4	-	1	-	-	2	1	2	-	1	-	-	1	1	-
CO5	2	2	2	2	3	2	2	1	2	2	2	2	2	2
Avg	2	2	2	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.	21AG7205	ROBOTICS IN FOOD PROCESSING AND HANDLING	3	0	0	3

Course Objective

- To understand the robotics and automation in the food industry, highlighting importance, benefits, safety, and challenges for implementation.
- To understand robotic applications in food processing and analyze case studies of robotics in the food industry
- To apply automated quality control techniques for food safety and compliance.
- To apply automated material handling techniques for food transportation and warehouse management.
- To utilize robotics in precision agriculture, AI in food processing, robotics for personalized nutrition, sustainability in automated food production, and R&D for novel food products.

Unit	Description	Instructional Hours
I	**INTRODUCTION TO ROBOTICS AND AUTOMATION IN THE FOOD INDUSTRY** Overview of robotics and automation - importance and benefits of automation in the food industry-types of robots and automation systems used in food processing - safety and hygiene considerations in robotic applications for food - current challenges and opportunities in implementing robotics and automation.	9
II	**ROBOTIC APPLICATIONS IN FOOD PROCESSING AND PACKAGING** Robotic applications in food processing: cutting, slicing, and peeling- robotic sorting and grading of food products - robotic packaging and labeling systems- automation in filling, capping, and sealing of food containers- case studies: successful implementations of robotics in food processing and packaging.	9
III	**AUTOMATION IN QUALITY CONTROL AND INSPECTION OF FOOD PRODUCTS** Automated quality control techniques for food safety and compliance- Vision Systems and Image Processing in food inspection - non-destructive testing and sensing technologies in food quality assurance - robotics in food traceability and tracking - regulatory standards and certifications for automated food inspection.	9
IV	**ROBOTICS AND AUTOMATION IN FOOD HANDLING AND MATERIAL TRANSPORT** Automated material handling systems in food production - conveying and palletizing robots in the food industry - robotic pick-and-place applications for	9

	food handling - autonomous vehicles and drones for food transportation - integration of robotics in warehouse management and logistics.	
V	**FUTURE PROSPECTS IN FOOD ROBOTICS AND AUTOMATION** Robotics in precision agriculture and smart farming for food production - AI and Machine Learning in food processing and quality control - robotics for personalized nutrition and food customization - sustainability and energy efficiency in automated food production - research and development in robotics for novel food products.	9
	Total Instructional Hours	**45**

Course Outcome

After successful completion of this course students are expected to be able to:

CO1: Understand robotics and automation in the food industry, including their benefits, safety considerations, and implementation challenges.

CO2: Analyze case studies of robotic applications in food processing to comprehend their practical use and impact in the food industry.

CO3: Apply automated quality control techniques for food safety using image processing, machine vision system and robotics for traceability and tracking.

CO4: Implement automated material handling techniques for efficient food transportation and warehouse management.

CO5: Utilize robotics in precision agriculture; apply AI in food processing, quality control and development of novel food products with robotics and automation integration.

TEXT BOOKS:

T1 Caldwell, Darwin G., ed. Robotics and Automation in the Food Industry: Current and Future Technologies. Woodhead Publishing, 2012.

T2 Moore, Colin Anthony. Automation in the Food Industry. Springer Science & Business Media, 2012.

T3 Groover, Mikell P. Automation, Production systems, and Computer-Integrated Manufacturing. Pearson Education India, 2016.

REFERENCE BOOKS:

R1 McFarlane, Ian. Automatic Control of Food Manufacturing Processes. Springer Science & Business Media, 1995.

R2 Jean Riescher Westcott, A.K. Gupta and S.K. Arora. Industrial Automation and Robotics,

Publisher: Mercury Learning and Information, 2023.

R3 R K Rajput. Robotics and Industrial Automation. S Chand Publishing, 2008.

R4 S. Muhkerjee. Robotics and Process Automation, Khanna Books, 2020.

PO & PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2	2	2	1	-	1	-	-	-	2	3	2
CO2	3	3	3	3	2	1	1	1	-	-	-	2	2	2
CO3	3	3	3	3	2	1	1	1	-	-	-	2	3	3
CO4	3	3	3	3	2	1	1	1	-	-	1	2	2	2
CO5	3	3	3	3	2	1	2	1	-	-	1	2	3	3
Avg	3	2.8	2.8	2.8	2	1	1	1	-	-	0.4	2	2.6	2.4

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Programme	Course Code	Name of the Course	L	T	P	C
B.E	21AG7254	Food Process Modeling	2	0	2	3

Course Objective To expose the students to the design and operating parameters in food industries

Unit	Description	Instruction Hours
I	**Introduction To Process Modeling** Balance equations and rate equations, mathematical models, empirical models and linear regression, systematic modeling approach, general property balance models in food processing, analytical solutions to ordinary differential equations Laplace transformations and numerical methods in mathematical modeling. **Lab 1: Problems on linear regression of food processing**	9
II	**TRANSPORT PHENOMENA MODELS** Equation of continuity, equation of energy, equation of motion, ODE models in food processing, transport phenomena models involving PDE, chart Solutions to unsteady state transport problem, interfacial mass transfer, and rheological modeling. **Lab 2 : Case study on transport phenomena models**	9
III	**KINETIC MODELING** Kinetics and food processing, the rate expression, temperature effects on the reaction rates, enzyme catalyzed reaction kinetics, metabolic process engineering microbial kinetics, kinetics of microbial death, model of ideal reactors, modeling batch and continuous thermal processing operations of food. **Lab 3: calculation of thermal Death time (TDT) curve**	9

MATHEMATICAL MODELING IN FOOD ENGINEERING OPERATIONS

IV	Moving boundary and other transport phenomena models for processes involving phase change, unit operation models: drying, baking, frying, evaporation, distillation. extraction, crystallization	9
	Lab 4: Mathematical modeling for different unit operation modeling	

MODELING OF FOOD QUALITY

V	Heating, introduction, processing of packed and solid foods, continuous heating and cooling processes, Modeling food quality and microbiological safety.	9
	Lab 5 : Calculation of colony formation units in different foods	
	Total Instructional Hours	45

Course Outcome

CO1: To identify the design, operating and performance parameters in food processing operations

CO2: Ability to develop mechanistic process models for unit operations in food processing

CO3: To understand the use up-to-date approach of computation for solving model equation

CO4: Ability to solve and validate the model equations and analyze for sensitivity. CO5: To develop and validate phenomenological models for food processing operations.

TEXT BOOKS

T1 Hangos, K. M. and Cameron, I. T. Process Modelling and Model Analysis, Academic Press, 2001

T2 Ozilgen, M. Food process modelling and control: chemical engineering applications, Gordon and Breach Science Publishers, 1998.

REFERENCE BOOKS:

R1 Tijskens, L.M., Hertog, M.L., Nicolaï, B.M., Food process modelling, Woodhead Publishing, 2001.

R2 Ozilgen, M. Hand book of food process modelling and statistical quality control: with extensive MATLAB applications, CRC Press, 2011.

PO & PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	2	2	2	2	2	2	-	1	3	1	2	1	1
CO2	2	2	2	1	3	1	1	-	2	2	-	2	2	2
CO3	1	3	1	3	2	1	2	-	2	2	-	2	1	
CO4	3	3	3	2	1	1	1	-	2	3	1	1	1	1
CO5	2	2	2	2	2	1	1	-	1	2	-	2	1	2
Avg	2	2.5	0.2	1.5	2	1.3	1.4	-	2	2.5	1	2	1.8	1

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Programme	Course Code	Name of the Course	L	T	P	C
B.Tech.	21AG7206	ANALYSIS OF AGRIVOLTAICS SYSTEM FOR ENERGY FOOD AND WATER PRODUCTION	3	0	0	3

Course Objective

- To understand the fundamental concepts of the EWF Nexus and its importance.
- Analyze biophysical and social-ecological components of water and food systems.
- Evaluate the impact of industrialization, policy, and decision-making on the EWF Nexus.
- Examine global challenges such as climate change, population growth, and resource scarcity.

Unit	Description	Instructional Hours
I	**CONCEPT OF ENERGY-FOOD-WATER NEXUS SYSTEM** Introduction- Connecting science to problem-solving - Social-ecological systems approaches - Biophysical and Systems Engineering Approaches	9
II	**WATER NEXUS** Biophysical elements of water systems - Indian water policy - Decision-making at the intersection of water and agriculture - Water nexus	9
III	**FOOD NEXUS** Food Systems - Biophysical elements of food systems at multiple scales - Industrialization of the agri-food system: Ecological and social consequences.	9
IV	**ECOSYSTEM SERVICES** Climate Regulation - Carbon sequestration - Water and soil conservation – Improved Water Retention- Temperature Moderation- Wind Breaker- Case study	9
V	**ENERGY -WATER – FOOD INTERCONNECTION** Global Challenges in the EWF Nexus - Climate change impacts on energy, water, and food - Population growth and urbanization - Environmental degradation and resource scarcity – Case study	9
	Total Instructional Hours	45

Course Outcome

CO1: Clearly explain the concept of the energy-water-food nexus and articulate its importance in sustainable resource management.
CO2: Identify and describe the biophysical elements of water and food systems and their interconnections with energy systems.
CO3: Critically assess water policies, especially in the context of agricultural decision-making, and understand their implications for the EWF nexus.
CO4: Analyze the various ecosystem services that contribute to the EWF nexus and understand their benefits and limitations.
CO5: Demonstrate an understanding of global challenges such as climate change and resource scarcity and propose solutions to mitigate their impacts on the EWF nexus.

TEXT BOOKS:

T1 Muthu, S. S. (Ed.). (2021). The Water–Energy–Food Nexus: Concept and Assessments. Springer Singapore.

T2 Pandey, V. P., Anal, A. K., Shrestha, S., & Salam, P. A. (Eds.). (2017). Water-Energy-Food Nexus: Principles and Practices. American Geophysical Union.

REFERENCE BOOKS:

R1 Hoff, H. (2011). Understanding the Nexus. Background Paper for the Bonn2011 Conference: The Water, Energy, and Food Security Nexus.

R2 Ringler, C., Bhaduri, A., & Lawford, R. (2013). The Nexus Across Water, Energy, Land, and Food (WELF): Potential for Improved Resource Use Efficiency? Current Opinion in Environmental Sustainability.

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.E.	21AG7255	DESIGN AND INSTALLATION OF AGRIVOLTAICS SYSTEM	2	0	2	3

Course Objective

- Comprehend the fundamental concepts and principles of agrivoltaic systems, including their design, operation, and benefits.
- Learn to identify and evaluate key design parameters such as module height, spatial configurations, and crop selection.
- Learn to perform comprehensive environmental impact assessments of agrivoltaic systems, including land use and water consumption analysis.

Unit	Description	Instructional Hours
I	**DESIGN PARAMETERS AND PERFORMANCE METRICS** Height of the modules from the ground – Spatial configurations of PV – Types of crops – Performance metrics - Land equivalent ratio – Water usage efficiency – Land area occupation ratio- Shading ratio (SR). Lab 1: Design and development of a structure for a grivoltaic system.	9
II	**FOUNDATION DESIGN FOR AGROVOTAICS** Screw anchor or helical pile- Dead load- Snow load - Wind load - ASD for safety assessment Lab 2: Design and development of an integrated solar and agriculture system on the same land.	9
III	**APV MODELS** STICS model- Radiation model- GECROS crop model- AVrain model- environmental policy integrated climate (EPIC) model- view factor (VF) - Agricultural Production Systems sIMulator (APSIM) Lab 3: Performance calculation of agrivoltaic system.	9
IV	**APV TECHNOLOGY ON AGRICULTURE** Field management implications - Microclimatic alterations and their impact on crop cultivation- Effect of shading on yield and quality- Monitoring and harvest of crops Lab 4: Preparation of an irrigation model for better farming in an agrivoltaic system	9
V	**ENVIRONMENTAL ANALYSIS OF AGRIVOLTAIC SYSTEMS** Environmental impact assessment of PVs– Land use of agrivoltaic systems – Water consumption– Environmental risk and sensitivity assessment. Lab5: Preparation of EIA report for APV system	9
	Total Instructional Hours	45

Course Outcome

CO1: Students will demonstrate the ability to apply key design parameters in the planning and optimization of agrivoltaic systems.

CO2: Students will be able to design and assess foundations for agrivoltaic structures,

considering various load scenarios and safety factors.
CO3: Students will be capable of utilizing different agrivoltaic models to simulate and predict system performance under varying conditions.
CO4: Students will be able to analyze the implications of agrivoltaic systems on field management, microclimate, and crop productivity.
CO5: Students will conduct detailed environmental analyses to evaluate the sustainability and ecological impact of agrivoltaic systems.

TEXT BOOKS:

T1 **Dimitris A. Chalkias, Elias Stathatos,** (2024) The Emergence of Agrivoltaics: Current Status, Challenges and Future Opportunities, Springer Nature.

T2 **Giuseppe Saturno,** (2023), Agrivoltaics- A Sustainable Integration of Solar Energy and Agriculture, Amazon Digital Services LLC.

REFERENCE BOOKS:

R1 **Constantin Klyk, & Stephan Schindele** (2024), Agrivoltaics-Technical, Ecological, Commercial and Legal Aspects, Institution of Engineering & Technology.

R2 **Reuben Davis, (2023),** Agrivoltaics - Solar Power and Agriculture, Amazon Digital Services LLC.

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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B. TECH (HONS) AGRICULTURAL ENGINEERING (2022 Batch)

(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
22AG5202	**22AG5203**	**22AG5204**	**22AG5205**	**22AG5206**
Off-Road Vehicle Engineering	Open Channel Flow	Industrial Processing of Foods and Beverages	Solar radiation and measurements	Big Data Processing
22AG6203	**22AG6205**	**22AG6207**	**22AG6209**	**22AG6211**
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
22AG6204	**22AG6206**	**22AG6208**	**22AG6210**	**22AG6212**
Tractor Systems Design -I	Watershed Management and Modelling	Food Plant and Equipment Design	Basics of Agronomic practices and components	Deep Learning Foundations and Applications
22AG7203	**22AG7204**	**22AG7205**	**22AG7206**	**22AG7207**
Tractor Systems Design -II	Water Systems' Simulation And Modelling	Robotics In Food Processing And Handling	Analysis of Agrivoltaics system for Energy food and water production	Graph Machine Learning: Foundations and Applications
22AG7251	**22AG7252**	**22AG7253**	**22AG7254**	**22AG7255**
Energy Conservation and Management in Farm Power and Machinery	Modelling Soil Erosion Processes	Food Process Modelling	Design and installation of Agrivoltaics System	AI Applications in Agriculture
22AG8201	**22AG8202**	**22AG8203**	**22AG8204**	**22AG8205**
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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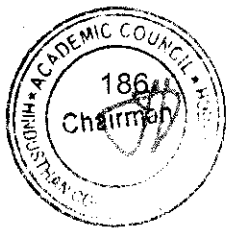

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Programme	Course Code	Name of the Course	L	T	P	C
B.Tech.	22AG5202	OFF-ROAD VEHICLE ENGINEERING	3	0	0	3

Course Objective

- To understand the Air standard cycle and fuel cycle in diesel engine.
- To Understand the Performance characteristics of engine based on its fuel system
- To understand the various off road vehicle and their systems and features.

Unit	Description	Instructional Hours
I	**ENGINE CYCLE** Engine components and basic engine nomenclature, IC engine classification, Air standard cycle and fuel cycle analysis for diesel and dual combustion - Combustion in CI engines..	9
II	**ENGINE FUEL SYSTEM** Alternate fuels for CI engines, Engine friction and lubrication, Engine cooling, Supercharging, Dual fuel and multi fuel engines, Exhaust emissions and its measurement, testing of farm engines, Performance parameter and characteristics	7
III	**CLASSIFICATION OF OFF ROAD VEHICLES** Classification and Requirements of off Road Vehicles- Power plants-chassis and transmission-Multi axle vehicles.	10
IV	**LAND CLEARING AND EARTH MOVING MACHINERY** Land clearing machines- Bush cutter, stumpers, Tree dozer, Rippers. Earth Moving Machines-Bulldozers -cable and hydraulic dozer. Crawler trach– Dump track and dumpers – Power and capacity of earth moving machines.	11
V	**SCRAPERS AND SHOVELS** Scrapers and Graders- Scrapers, elevating graders, self-powered scrapers and graders. Shovels and Ditchers- Power shovel, revolving and stripper shovels – drag lines – ditchers – Capacity of shovels.	9
	Total Instructional Hours	45

Course Outcome

- The students will remember the working principle of IC engine and it's Fuel System.
- The students will understand the important and Requirements of off Road Vehicles in Agriculture.
- The students will understand the types, special features, design methodology, working principle, application of Land clearing machines and Earth Moving Machines
- The students will understand the types, special features, design methodology, working principle, application of Shovels and Ditchers and Scrapers and Graders
- The students will apply their knowledge for design of off Road Vehicles for suitable agricultural operation

TEXT BOOKS:

T1 Abrosimov.K. Bran berg. A. and Katayer. K., Road making Machinery, MIR Publishers, Moscow, 1971

T2 Wang. J.T., Theory of Grand vehicles, John Wiley & Sons, New York, 1987

T3 Off the road Wheeled and combined traction devices – Ashgate Publishing Co. Ltd. 1988

REFERENCE BOOKS:

R1 Nakra C.P., Farm machines and equipments Dhanparai Publishing company Pvt. Ltd

R2 Robert L Peurifoy, Construction, planning, equipment and methods Tata McGraw Hill Publishing company

R3 SAE Handbook Vol. III., Society of Automotive Engineers, 1997

R4 Bart H Vanderveen, "Tanks and Transport Vehicles", Frederic Warne and Co Ltd.,

R5 London.Ia. S. Ageikin, Off the Road Wheeled and Combined Traction Devices: Theory and Calculation, Ashgate Publishing Co. Ltd. 1988.

R6 Schulz Erich.J, "Diesel equipment I and II", McGraw Hill company, London, 1982.

R7 Satyanarayana. B., "Construction planning and equipment", standard publishers and distributors, New Delhi,

PO & PSO	PO1	PO2	PO3	PO4	PO5	PO 6	PO 7	PO 8	PO 9	P O1 0	P O1 1	P O1 2	PSO1	PSO2
CO1	-	1	-	1	2	1	2	-	1	-	1	2	-	1
CO2	1	1	1	2	2	1	2	-	1	2	-	2	2	2
CO3	2	2	2	1	3	2	2	1	2	-	1	2	2	2
CO4	-	1	-	-	2	1	2	-	1	-	-	1	1	-
CO5	2	2	2	2	3	2	2	1	2	2	2	2	2	2
Avg	2	2	2	2	2	2	2	1	1	2	1	2	2	2

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Department of Agricultural Engineering

Syllabus for Value Added Courses

Programme	Course Code	Name of the Course
B.E.	21VAAG05	DESIGN OF FARM AND FARM STRUCTURES

Course Objective	• To conceive and design various farm structures related to Agricultural Engineering

1. Planning and Layout of farmstead
2. Design of Green house
3. Design of Solar Park
4. Design of poultry house
5. Design of a sheep / goat house
6. Design of ventilation system for Green house
7. Design of silos – over ground and underground and hay storages
8. Design of farm fencing system
9. Design of machinery and equipment shed and workshops
10. Design of bund structures
11. Design of rural/farm roads and culverts

Course Outcome	At the end of the course, the student will be able to design and draw all farm structures connected to agricultural engineering including animal housing, grain storage, small civil structures

TEXT BOOKS:	
T1	Barre, H.J. and Sammet, L.L. "Farm Structures". John Wiley and Sons Inc. 1950.

T2	Neubaur, L. W. and Walker, H.B. "Farm Buildings Design". Prentice Hall Inc., 1961.
T3	Khanna, S.K. and Justo, C.E.G. "Highway Engineering". Nemchand and Bros., Roorkee, India.
T4	Dutta, B.N. "Estimating and Costing in Civil Engineering Theory and Practice". S. Dutta and Co .

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Programme	Course Code	Name of the Course
B.Tech.	22AGVA04	FOOD SAFETY AND QUALITY MANAGEMENT

Course Objective	• To emphasize on the importance of food safety, food quality and food laws and regulations • Enables the students in application of basic aspects of public health and food safety and quality surveillance system.

Unit	Description	Instructional Hours
I	**STANDARD OPERATING PROCEDURES** Preparing scope, quality policy and quality objectives of food processing company, Defining Standard operating procedure. SOP for purchasing raw materials, receiving raw materials, storage, cleaning, holding, cooling, freezing, thawing, reheating, personal hygiene, facility and equipments. Systems in laboratory accreditation.	8
II	**QUALITY MANAGEMENT** Good Manufacturing Practices - Personal hygiene – occupational health and safety specification, Food Plant Sanitation Management - Plant facilities construction and maintenance - exterior of the building- interior of the building- equipments. Storage, transportation, traceability, recalling procedures, training	9
III	**FOOD PACKAGING AND LABELING** Food Packaging: Definition, Functions, Classification, Laws related to packaging. Food Labelling: Standards, purpose, description types of labels, labelling regulation barcode, Nutrition Labelling: Nutrition labelling, health claims, and mandatory labelling provision	9
IV	**FOOD QUALITY AUDIT** Preparation of HACCP based SOP checklist - personal hygiene, food preparation, hot holding, cold holding, refrigerator, freezer and milk cooler, food storage and dry storage, cleaning and sanitizing, utensils and equipments, large equipments, garbage storage and disposal and pest control.	9
Total Instructional Hours		**35**

Course Outcome	After successful completion of this course students are expected to be able to: **CO1:** familiarize students to apply protocol for safe food handling techniques, water and waste management. **CO2:** understand the role of food packaging and the importance of Nutrition labeling. **CO3:** analyse consequences of food poisoning and infection on the health of individuals **CO4:** understand the basic principles food preservation methods.

TEXT BOOKS:	
T1	Andres Vasconcellos J. 2005. Quality Assurance for the Food industry - A practical approach. CRC press.
T2	Inteaz Alli. 2004. Food quality assurance - Principles & practices. CRC Press. New York.
T3	Sara Mortimore and Carol Wallace. 2013. HACCP - A practical approach. Third edition. Chapman and Hall, London.
T4	Roday, S. 1998. Food Hygiene and Sanitation, Tata McGraw-Hill Education.
REFERENCE BOOKS:	
R1	The Food Safety and Standards Act along with Rules and Regulations, 2011, Delhi, Commercial Law Publishers (India) Pvt Ltd.
R2	Mahindra N. S, 2008, Food Additives, Characteristics, Detection and Estimation, APH Publishing Corporation, New Delhi

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Programme	Course Code	Name of the Course
B.Tech.	22AGVA03	SOIL TESTING AND WATER ANALYSIS

Course Objective	• To develop basic understanding regarding soil testing in the students • To introduce them with macro and micro nutrients for soil • To enhance their skills about water analysis

Chapter	Content	Lectures
1.	**Soil Analysis:** Introduction, Types of soil, Soil pollutants, role of soil testing, Collection of soil sample for testing, determination of soil parameters viz., pH, EC, Organic carbon, NPK, soil testing for micronutrients, Gypsum requirement of soil, Lime requirement of soil, Uses of soil analysis	12
2.	**Water Analysis:** Introduction, Types of Water, Water pollutants, role of water testing, Common Sampling tools and accessories, sample collection procedure, water quality parameters viz., pH, electrical conductivity, chlorides, sulphates, calcium, magnesium, sodium, potassium, Water quality indices and suitability.	12

Course Outcome	At the end of the course, the student will be able to Impart knowledge on soil health, its assessment and maintenance for sustaining soil productivity and Understand the role of water testing

TEXT BOOKS:	
T1	Basic concepts of analytical chemistry By S. M. Khopkar. .
T2	Vogel's textbook of quantitative chemical analysis. (Longman) ELBS) Edn..
T3	Handbook of organic qualitative analysis, By Clarke.
T4	Vigel's text book of qualitative chemical analysis. (Longman) ELBS) Edn .

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COLLEGE OF ENGINEERING AND TECHNOLOGY

(An Autonomous Institution)

Coimbatore – 641032

DEPARTMENT OF AGRICULTURAL ENGINEERING

Curriculum and Even Semesters Syllabus for the Batch

2024 – 2028 (R2022)

2023 – 2027 (R2022)

2022 – 2026 (R2022)

2021 – 2025 (R2019 with Amendments)

(Board of Studies held on 12.12.2024)

(Academic Council Meeting held on 19.12.2024)

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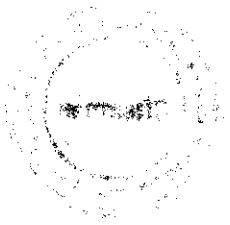

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COLLEGE OF ENGINEERING AND TECHNOLOGY

(An Autonomous Institution)

Coimbatore– 641032

DEPARTMENT OF AGRICULTURAL ENGINEERING

Revised Curriculum and Syllabus for the

Batch 2024 – 2028 (EVEN SEMESTER)

2022 REGULATIONS

(For the students admitted during the academic year 2024-2025 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	2	0	3	5	40	60	100
THEORY WITH LAB COMPONENT											
3.	22PH1151	ELEMENTS OF PHYSICAL SCIENCE	BSC	2	0	2	3	4	50	50	100
4.	22HE1151	ENGLISH FOR ENGINEERS	HSC	2	0	2	3	4	50	50	100
5.	22AG1251	PRINCIPLES AND PRACTICES OF CROP PRODUCTION	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	தமிழர் மரபு	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**	3	**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.	22AG2201	PRINCIPLES OF FOOD SCIENCES	BSC	2	0	0	2	3	40	60	100
THEORY WITH LAB COMPONENT											
4.	22CY2151	CHEMISTRY FOR BIOCHEMICAL ENGINEERING	BSC	2	0	2	3	4	50	50	100
5.	22IT2251	PYTHON PROGRAMMING AND PRACTICES	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	தமிழரும் தொழில்நுட்பமும்	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.	22AG3202R	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.	22AG3252R	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.	22AG4202R	THEORY OF MACHINES	PCC	3	0	0	3	3	40	60	100
5.	22AG4203	HYDROLOGY AND WATER RESOURCES	PCC	3	1	0	3	4	40	60	100
THEORY WITH LAB COMPONENT											
6.	22AG4251	SOIL AND WATER CONSERVATION	PCC	2	0	2	3	4	50	50	100
7.	22AG4252R	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 student unable to undergo in semester III then the Internship offered in the semester IV can be clubbed with Internship III (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	AGRICULTURAL EXTENSION	PCC	3	0	0	3	3	40	60	100
3.	22HE6101	PROFESSIONAL ETHICS	HSC	3	0	0	3	3	40	60	100
4.	22AG63XX	PROFESSIONAL ELECTIVE-4	PEC	3	0	0	3	3	40	60	100
5.	22AG63XX	PROFESSIONAL ELECTIVE-5	PEC	3	0	0	3	3	40	60	100
6.	22XX64XX	OPEN ELECTIVE – 1*	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.		WASTE AND BY PRODUCT UTILIZATION		3	1	0	4	4	40	60	100

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3.	22AG7203	ERGONOMICS AND SAFETY IN AGRICULTURAL ENGINEERING	PCC	3	1	0	4	4	40	60	100
4.	22AG73XX	PROFESSIONAL ELECTIVE-6	PEC	3	0	0	3	3	40	60	100
5.	22XX74XX	OPEN ELECTIVE – 2*	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. Furth the students' who enrolled his/her name in HiCET NCC and Air Wing are eligible to undergo this subject. The earned extra credits printed 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 hav 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	8	12	-	70
5.	PEC	-	-	-	-	9	6	3	-	18
6.	OEC	-	-	-	-	-	3	3	-	6
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
(VI SEMESTER – COMMON LIST FOR ALL THE PROGRAMS)
(EMERGING TECHNOLOGIES)

Students must choose an open elective course from the given list. The content of the course should not be related to their current program of study.

SL. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS	Strength
				L	T	P			
1	22AI6401	Artificial Intelligence and Machine Learning Fundamentals	OEC	3	0	0	3	3	65
2	22CS6401	Block chain Technology Fundamentals	OEC	3	0	0	3	3	130
3	22EC6402	IoT Concepts and Applications	OEC	3	0	0	3	3	130
4	22IT6401	Data Science and Analytics Fundamentals	OEC	3	0	0	3	3	130
5	22BM6401	3D printing	OEC	3	0	0	3	3	65
6	22AE6401	Space Science	OEC	3	0	0	3	3	65
7 8	22MT6401	Introduction to Industrial Engineering	OEC	3	0	0	3	3	65
9	22MT6402	Industrial Safety and Environment	OEC	3	0	0	3	3	65
10	22CE6401	Climate Change and its Impact	OEC	3	0	0	3	3	65
11	22CE6402	Environment and Social Impact Assessment	OEC	3	0	0	3	3	65
12	22ME6401	Renewable Energy System	OEC	3	0	0	3	3	65
13	22ME6402	Additive Manufacturing systems	OEC	3	0	0	3	3	65
14	22EI6401	Introduction to Industrial Instrumentation and Control	OEC	3	0	0	3	3	65
15	22AU6401	Basics of Automobile Engineering	OEC	3	0	0	3	3	65
16	22EE6401	Fundamentals of Electric vehicles	OEC	3	0	0	3	3	65
17	22FT6401	Traditional Foods	OEC	3	0	0	3	3	65
18	22AG6401	Urban Agriculture and Organic Farming	OEC	3	0	0	3	3	65
19	22CH6401	Waste to Energy conversion	OEC	3	0	0	3	3	65
20		NCC Level - I	OEC	3	0	0	3	3	65

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OPEN ELECTIVE II
(VII SEMESTER - COMMON LIST FOR ALL THE PROGRAMS)
LIFE SKILL COURSES

Students shall choose any one of the Life Skill courses from the open elective courses listed below.

SL. NO.	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS PER WEEK			TOTAL CONTAC T PERIODS	CREDITS	Strength
				L	T	P			
1	22LS7401	General studies for competitive examinations	OEC	3	0	0	3	3	130
2	22LS7402	Human Rights, Women Rights and Gender equity	OEC	3	0	0	3	3	130
3	22LS7403	Indian ethos and Human values	OEC	3	0	0	3	3	130
4	22LS7404	Financial independence and management	OEC	3	0	0	3	3	130
5	22LS7405	Yoga for Human Excellence	OEC	3	0	0	3	3	130
6	22LS7406	Democracy and Good Governance	OEC	3	0	0	3	3	130
7	22LS7407	NCC Level - II	OEC	3	0	0	3	3	130
8	22LS7408	Cybercrime and Awareness	OEC	3	0	0	3	3	130
9	22LS7409	First Aid and Emergency care	OEC	3	0	0	3	3	130
10	22LS7410	Business Communication	OEC	3	0	0	3	3	130

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 c B.E. / B. Tech. (Honours) or Minor Degree. For B.E. / B. Tech. (Honours), a student shall register for the addition courses (18 credits) from semester V onwards. These courses shall be from the same vertical or a combination c different verticals of the same programme of study only. For minor degree, a student shall register for the addition courses (18 credits) from semester V onwards. All these courses have to be in a particular vertical from any one c 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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PO& PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	2	2	1	1	-	-	1	-	2
CO2	3	3	3	2	2	1	1	-	-	1	-	2
CO3	3	3	3	3	3	1	-	-	-	1	-	2
CO4	3	3	3	2	2	1	-	-	-	1	-	2
CO5	3	3	3	3	3	1	-	-	-	1	-	2
AVG	3	3	3	2.4	2.4	1	1			1		2

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Programme/sem	Course Code	Name of the Course	L	T	P	C
B.TECH/ II	22CY2101	ENVIRONMENTAL STUDIES (common to all branches except CSE, IT, AIML & CS)	2	0	0	2

Course Objective

1. Introduce the basic concepts of environment, ecosystems, and biodiversity and emphasize on the biodiversity of India and its conservation.
2. Impart knowledge on the causes, effects, and control or prevention measures of environmental pollution and natural disasters.
3. Facilitate the understanding of global and Indian scenario of renewable and nonrenewable resources, causes of their degradation, and measures to preserve them.
4. Gain knowledge on the scientific, technological, economic and political solutions to environmental problems.
5. Familiarize the concept of sustainable development goals and appreciate the interdependence of economic and social aspects of sustainability, recognize and analyze climate changes, concept of carbon credit, and the challenges of environmental management.

Unit	Description	Instructional Hours
I	**ENVIRONMENT, ECOSYSTEMS AND BIODIVERSITY** Scope and objectives of environmental studies-Importance of environment – need for public awareness - Eco-system and Energy flow–ecological succession- Structure and function of the forest and ponds ecosystem – Types of biodiversity:– values of biodiversity, India as a mega-diversity nation – hot-spots of biodiversity – threats to biodiversity – endangered and endemic species of India – conservation of biodiversity: Insitu and ex-situ.	6
II	**UNIT II 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.	6
III	**UNIT III RENEWABLE SOURCES OF ENERGY** Energy management and conservation, New Energy Sources: Need of new sources. Different types new energy sources. Applications of- Hydrogen energy, Ocean energy resources, Tidal energy conversion. Concept, origin and power plants of geothermal energy.	6
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.	6
V	**SUSTAINABILITY AND MANAGEMENT** Development, GDP, Sustainability- concept, needs and challenges-economic, social and aspects of sustainability-from unsustainability to sustainability-millennium development goals, and protocols. Sustainable Development Goals-targets, indicators and intervention areas. Climate change- Global, Regional, and local environmental issues and possible solutions (global warming, acid rain and ozone layer depletion). Concept of Carbon Footprint.	6
	Total Instructional Hours	45

Course Outcome

CO1: Recognize and understand the functions of environment, ecosystems and biodiversity and their conservation.

CO2: Identify the causes, effects of environmental pollution and natural disasters and contribute to the preventive measures in the society.

CO3: Identify and apply the understanding of renewable and non-renewable resources and contribute to sustainable measures to conserve them for future generations.

CO4: Demonstrate an appreciation for need for sustainability, management and understand the various social issues and solutions to solve the issues.

CO5: Recognize the different goals of sustainable development and apply them for suitable technological advancement and societal development.

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TEXTBOOKS

T1 - Anubha Kaushik and C. P. Kaushik's "Perspectives in Environmental Studies", 6th Edition, New Age International Publishers, 2018.

T2 - Benny Joseph, 'Environmental Science and Engineering', Tata McGraw-Hill, New Delhi, 2016.

REFERENCES

R1 – Rajagopalan, R, 'Environmental Studies-From Crisis to Cure', Oxford University Press, Third Edition, 2015.

R2 - Erach Bharucha "Textbook of Environmental Studies for Undergraduate Courses" Orient Blackswan Pvt. Ltd. 2013.

PO& PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	1	-	-	-	2	3	-	-	-	-	2
CO2	3	2	-	-	-	3	3	-	-	-	-	2
CO3	3	-	1	-	-	2	2	-	-	-	-	2
CO4	3	2	1	1	-	2	2	-	-	-	-	2
CO5	3	2	1	-	-	2	2	-	-	-	-	1
AVG	2.8	1.8	1	1	-	2.2	2.4	-	-	-	-	1.8

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Programme/sem	Course Code	Name of the Course	L	T	P	C
B.TECH/ II	22AG2201	PRINCIPLES OF FOOD SCIENCES	2	0	0	2

Course Objective

1. To introduce the basic fundamentals of food science.
2. To obtain knowledge of different food groups and their composition.
3. To get exposure to different methods of processing and cooking.
4. To know about food additives and quality control of foods.
5. To gain knowledge on food fortification and food packaging.

Unit	Description	Instructional Hours
I	**INTRODUCTION TO FOOD SCIENCE** Definition of food Nutrients- Macro and Micro constituents-Functions of foods -Food groups. Food Science - Definition - objectives and applications. Structure of water and ice, free and bound water activity (aw) and food stability.	6
II	**METHODS OF COOKING AND SENSORY EVALUATION OF FOODS** Methods of cooking - Moist heat, Dry heat and Combination methods- Nutrient losses during cooking and processing-Sensory evaluation of foods - Methods and Applications.	6
III	**COOKING QUALITIES OF FOODS** Nutritive value - Factors affecting during cooking of foods- Cereals, Pulses, Nuts and Oilseeds, Vegetables, Milk, Meat, Fish, Egg and Poultry .Spices and condiments types – Use in cookery.	6
IV	**PROPERTIES OF FOODS** Gelatinization, Denaturation, Colloids, Emulsion, Foam, Sol, Gel, Fermentation, Crystallization, Enzymatic and Non - Enzymatic browning of foods - Anti nutritional factors in foods.	6
V	**FOOD ADDITIVES** Classification and role - Preservatives, Antioxidants, Chelating agents, Flour improvers, Artificial sweeteners, Flavours, Colours, Nutrient enhancement. Stabilizers and Emulsifier - Food fortification - Enrichment - need - application in foods. Foam and its stability - Food Packaging.	6
	Total Instructional Hours	**30**

Course Outcome

CO1: Recognize and understand the functions of environment, ecosystems and biodiversity and their conservation.
CO2: Identify the causes, effects of environmental pollution and natural disasters and contribute to the preventive measures in the society.
CO3: Identify and apply the understanding of renewable and non-renewable resources and contribute to sustainable measures to preserve them for future generations.
CO4: Demonstrate an appreciation for need for sustainability, management and understand the various social issues and solutions to solve the issues.
CO5: Recognize the different goals of sustainable development and apply them for suitable technological advancement and societal development.

TEXTBOOKS

T1 - Anubha Kaushik and C. P. Kaushik's "Perspectives in Environmental Studies", 6th Edition, New Age International Publishers ,2018.
T2 - Benny Joseph, 'Environmental Science and Engineering', Tata McGraw-Hill, New Delhi, 2016.

REFERENCES

R1 – Rajagopalan, R, 'Environmental Studies-From Crisis to Cure'. Oxford University Press, Third Edition. 2015.
R2 - Erach Bharucha "Textbook of Environmental Studies for Undergraduate Courses" Orient Blackswan Pvt. Ltd. 2013.

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Co No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P010	PO11	PO12	PSO1	PSO2
1	2	3	2	3	2	2	2	-	-	1	1	1	2	3
2	3	3	3	2	3	3	2	-	1	3	1	2	3	2
3	2	3	2	3	2	3	2	-	-	2	2	2	3	2
4	1	3	3	2	2	3	2	-	1	1	2	3	2	2
5	2	3	2	3	2	2	3	1	-	2	1	2	2	3
Avg	**2**	**3**	**2.4**	**2.6**	**2.2**	**2.6**	**2.2**	**1**	**1**	**1.8**	**1.4**	**2**	**2.4**	**2.4**

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Programme/ Sem	Course Code	Name of the Course	L	T	P	C
B.Tech/ II	22CY2153	CHEMISTRY FOR BIOCHEMICAL ENGINEERING (AGRI, CHEM)	2	0	2	3

Course Objective

The student should be conversant with

1. Sound understanding of water quality parameters and water treatment techniques.
2. The principles of electrochemistry and the mechanism of corrosion and its control
3. The understanding of principles and significance of nanochemistry, including the unique properties of nanoscale materials compared to bulk materials, and familiarize students with various methods for synthesizing nanomaterials.
4. A detailed understanding of the key components of batteries and familiarize students with various battery types.
5. Acquire the concept and working principle of spectral analytical instruments and applications.

Unit	Description	Instructional Hours
I	**WATER SCIENCE** Impurities in Water, Hardness of Water and Boiler feed Water – Boiler troubles -Sludge and scale formation, Caustic embrittlement, priming and foaming, boiler corrosion- - Softening Methods - Ion-Exchange Method, Desalination of Brackish Water - Reverse Osmosis. **Estimation of 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+9=15
II	**ELECTROCHEMISTRY AND CORROSION** Electrochemical cells – reversible and irreversible cells - EMF- Single electrode potential – Nernst equation (derivation only). Chemical corrosion – Pilling – Bedworth rule – electrochemical corrosion – different types –galvanic corrosion – differential aeration corrosion – corrosion control – sacrificial anode and impressed cathodic current methods - protective coatings – paints – constituents and functions. **Determination of rate of corrosion of mild steel by weight loss method. Estimation of Ferrous iron by Potentiometry.**	6+6=12
III	**NANOCHEMISTRY** Introduction, size-dependent properties of nanomaterial (surface area, catalytical and thermal), synthesis of nanoparticles by sol-gel, and co-precipitation method. Nanomaterials: Introduction, properties and engineering applications of carbon nanotubes and graphene.	6
IV	**ENERGY SOURCES** Batteries - Characteristics - types of batteries – primary battery (alkaline battery), secondary battery (lead acid, lithium-ion-battery)- emerging batteries – nickel-metal hydride battery, aluminum air battery, batteries for automobiles and satellites - Fuel cells (Types) – H_2-O_2 fuel cell. Renewable Energy: Solar- solar cells, DSSC	6
V	**SPECTRAL ANALYSIS** Introduction- UV- Visible Spectroscopy- Beer – Lambert's Law- IR-Spectroscopy. principles – instrumentation (block diagram only)and applications – flame photometry – principle – instrumentation (block diagram only) – estimation of sodium by flame photometry.	6
	Total Instructional Hours	45

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

Course Outcome

CO1: Demonstrate knowledge of water quality in various industries and develop skills in analyzing water quality parameters for domestic and industrial purposes.

CO2: Apply fundamental knowledge of corrosion protection techniques and develop skills to conduct experiments for measuring and preventing corrosion.

CO3: Identify and apply fundamental concepts of nanoscience and nanotechnology for engineering and technology applications and to develop skills in synthesizing nanomaterials.

CO4: Study the fundamentals of energy storage devices and develop skills in constructing and experimenting with batteries.

CO5: Extend the knowledge on the concepts of spectroscopy and its applications on analytical instrumentation.

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TEXTBOOKS

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).

REFERENCES

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

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

PO& PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	3	3	1	1	1	1	-	1	-	1	2
CO2	2	3	2	1	1	1	1	-	1	-	1	2
CO3	2	2	2	2	1	1	1	-	1	-	1	2
CO4	2	2	2	2	1	1	1	-	1	-	1	2
CO5	2	3	2	-	-	-	3	-	-	-	-	-
AVG	2	2.6	2.2	1.5	1	1	1.4	-	1	-	1	2

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Programme/ Sem	Course Code	Name of the Course	L	T	P	C
B.E/B.Tech/ II	22IT2251	PYTHON PROGRAMMING AND PRACTICES (AGTI,AUTO,FT,IT, CSE AND CS)	2	0	2	3

Course Objective

The student should be able

1. To know the basics of algorithmic problem solving
2. To read and write simple Python programs
3. To develop Python programs with conditionals and loops and to define Python functions and call them
4. To use Python data structures –- lists, tuples, dictionaries
5. To do input/output with files in Python

Unit	Description	Instructional Hours
I	**ALGORITHMIC PROBLEM SOLVING** Algorithms, building blocks of algorithms (statements, state, control flow, functions), notation (pseudo code, flow chart, programming language), algorithmic problem solving, simple strategies for developing algorithms (iteration, recursion).	(5+2)
II	**DATA, STATEMENTS, CONTROL FLOW** Data Types, Operators and precedence of operators, expressions, statements, comments; Conditionals: Boolean values and operators, conditional (if), alternative (if -else), chained conditional (if –elif-else); Iteration: state, while, for, break, continue, pass;	(6+4)
III	**FUNCTIONS, STRINGS** Functions, parameters and arguments; Fruitful functions: return values, local and global scope, function composition, recursive functions. Strings: string slices, immutability, string functions and methods, string module.	(6+4)
IV	**LISTS, TUPLES, DICTIONARIES** Lists: list operations, list slices, list methods, list loop, mutability, aliasing, cloning lists, list parameters; Tuples: tuple assignment, tuple as return value; Dictionaries: operations and methods; advanced list processing - list comprehension.	(6+4)
V	**FILES, MODULES, PACKAGES** Files and exception: text files, reading and writing files, errors and exceptions, handling exceptions, modules, packages	(6+2)
	TOTAL INSTRUCTIONAL HOURS	45

S.No	List of Experiments
1	Read NAME, REG NO, PHYSICS, CHEMISTRY, MATHS MARKS and calculate cutoff marks out of 200 print the cutoff marks of the student
2	Take two numbers of int data type, two numbers of float data type as input. Print the sum and difference of two int variable on a new line Print the sum and difference of two-float variable rounded to one decimal place on a new line.
3	Get two integer inputs from user as dividend named as x and y. Find out Greatest Common Divisor Between both of the above two dividends

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4	Tony's Maths teacher ask him to solve an exponential problem but he don't know how to solve. Teacher gives two values as named base and exponent value ask tony to find the factor. Help him to do his task.
5	Read four inputs from the user named X1, X2, Y1, Y2 and compute to find a distance between two points.
6	Read the five different subject marks of the student, calculate total marks and print the total marks, grade.
7	Given the age input as N from the user and check whether user is eligible for voting or not using if condition and print Eligible or Not Eligible. Hint: The minimum age to vote is 18 years.
8	Write a program that reads a integer value as N from the user and then produces n lines of output The first line contains 1 star, the second line contains 2 stars and so on until the last line which should have N stars. can you Write this using single loop? Hint: remember what the expression ' +' *5 does.
9	A year is a leap year if it is divisible by 4, unless it is divisible by 100 and not by 400. Write a function that takes an integer value representing a year , and returns a Boolean result indicating whether or not the year is a leap year
10	Sheela wants to convert time into minutes but she have no idea about it. Create a function named time() and get the input from the user as two integers hours, minutes and print the minutes as output. Help sheela to do this conversion
11	Get the two different matrix elements for (2x2) matrix. Perform addition operation and subtraction operation and print the result in matrix format using nested loop in python.
12	Read the input from the user for no of elements as N and then append it into the list. Write a python program to find the maximum element in the list.
13	Read the N no of elements from the user and append it into the list, perform linear search operations using python programming List operations
14	Read the List of Numbers from the user with N elements and perform Selection sorting operation using python programming.
15	Write a python program to take input as filename with extension, perform reading and writing operations in the file.

Course Outcome

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

CO1: Develop algorithmic solutions to simple computational problems

CO2: Read, write, execute by hand simple Python programs

CO3: Structure simple Python programs for solving problems and Decompose a Python program into functions

CO4: Represent compound data using Python lists, tuples, dictionaries

CO5: Read and write data from/to files in Python Programs.

TEXT BOOKS:

T1: Guido van Rossum and Fred L. Drake Jr, An Introduction to Python – Revised and updated for Python 3.6.2, Shroff Publishers, First edition (2017).

T2: S. Annadurai, S.Shankar, I.Jasmine, M.Revathi, Fundamentals of Python Programming, Mc-Graw Hill Education (India) Private Ltd, 2019

REFERENCE BOOKS:

R1: Charles Dierbach, —Introduction to Computer Science using Python: A Computational Problem-Solving Focus, Wiley India Edition, 2013.

R2: Timothy A. Budd, —Exploring Python, Mc-Graw Hill Education (India) Private Ltd., 2015

R3: Robert Sedgewick, Kevin Wayne, Robert Dondero, —Introduction to Programming in Python: An Inter-disciplinary Approach, Pearson India Education Services Pvt. Ltd., 2016

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Course Code & Name: 22IT2251 Python programming and Practices

PO& PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12
CO1	3	1	1	3	0	1	0	0	2	0	0	1
CO2	3	1	1	3	0	3	0	1	2	0	0	2
CO3	3	1	1	3	0	1	0	1	2	0	0	1
CO4	3	2	1	3	0	1	0	1	0	0	0	2
CO5	3	1	1	3	0	2	0	0	2	0	0	1
Avg	3	1	1	3	0	2	0	1	2	0	0	1

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Programme/ Sem	Course Code	Name of the Course	L	T	P	C
B.Tech/II	22HE2151	**EFFECTIVE TECHNICAL COMMUNICATION (Common to all Branches)**	2	0	2	3

Course Objective

The learner should be able to

1. Improve essential business communication skills.
2. Enrich employability knowledge.
3. Acquire the crucial organizing ability in official forum.
4. Develop study skills and communication skills in formal and informal situations.
5. Improve the language proficiency of students in English with an emphasis on Vocabulary, Grammar, Reading and Writing skills

Unit	Description	Instructional Hours
I	**Language Proficiency**: Sentence Pattern, Writing definitions **Writing**: Describing product, work place and service (purpose, appearance, function) **Vocabulary** – Words on Nature **Practical Component:** **Listening-**Watching and interpreting advertisements /short films **Speaking-** Extempore / Public Speaking, Difference between Extempore / Public Speaking, Communication Guidelines for Practice	7+2
II	**Language Proficiency**: The Concept of Word Formation, 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	7+2
III	**Language Proficiency**: Homophones and Homonyms, Question Tag **Writing**: Preparing a detail plan for an official visit, Schedule and Itinerary, Spotting Errors **Vocabulary**– Words on Society **Practical Component :** **Listening-** Listening-paraphrasing the listened content **Speaking**-Group Discussion with preparation	5+4
IV	**Language Proficiency**: Idioms, Commonly Confused Words **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	5+4
V	**Language Proficiency** :Relative Pronoun , Regular and Irregular verb **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.	6+3
	Total Instructional Hours	45

Course Outcome

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

CO1: Use English Language effectively in spoken and written forms

CO2: Make oral and written presentations in corporate forum.

CO3: Acquire basic proficiency in English including reading and listening comprehension,

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Writing and speaking skills.

CO4: Take an effective role and manage in an organizational sector.

CO5: Prepare and demonstrate a professional presentation

TEXTBOOKS:

T1- Technical Communication by Gajendra Singh Chauhan and Et al, Cengage learning India Pvt Limited [Latest Revised Edition] - 2019

T2-Raymond Murphy, "Essential English Grammar", 5 the Edition Cambridge University Press, 2019.

T3-Technical Communication – Principles and Practice, Third Edition by Meenakshi Raman and Sangeetha Sharma, Oxford University Press 2017.

REFERENCEBOOKS:

R1- A Course in Technical English–D Praveen Sam, KN Shoba, Cambridge University Press – 2020

R2-English Language Communication Skills – Lab Manual cum Workbook, Cengage learning India Pvt Limited [Latest Revised Edition] – 2019.

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Programme	Course Code	Name of the Course	L	T	P	C
B.E/B.Tech	22ME2001	ENGINEERING PRACTICES (Common to all branches)	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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22ME2001- ENGINEERING PRACTICES

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	0	0	0	0	0	0	0	0	0	0	0	0
CO2	0	0	0	0	0	0	0	0	0	0	0	0
CO3	3	0	0	0	0	0	0	1	1	0	0	1
CO4	0	0	0	0	0	0	0	0	0	0	0	0
CO5	0	0	0	0	0	0	0	0	0	0	0	0
AVG	1	0	0	0	0	0	0	0.3	0.3	0	0	0.3

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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

Course Objective

The student should be able to

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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Course Code & Name: 22HE2071 Design Thinking

PO& PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	3	1	3	2	1	0	0	2	0	0	1	1	0
CO2	3	2	1	3	2	3	0	1	2	0	0	2	1	1
CO3	3	3	1	3	2	1	0	1	2	0	0	1	1	1
CO4	3	2	1	3	0	1	0	1	0	0	0	2	1	1
CO5	3	1	1	3	2	2	0	0	2	0	0	1	1	0
Avg	3	2	1	3	2	2	0	1	2	0	0	1	1	1

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

The student should be able to

Course Objective

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**

After completion of the course the learner will be able to

Course Outcome

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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ம்	பாடநெறி குறியீடு	பாடத்தின் பெயர்	L	T	P	C
பி.இ/க	22MC2094/2095	தமிழரும்தொழில்நுட்பமும் முதலாம் ஆண்டு பி.இ பொது பாடப்பிரிவு	2	0	0	0

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-சாரோசெனிக் 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

பாடத்தின்முடிவு

பாடநெறியின்முடிவில்கற்றவர்கற்றபின்

பா முடி: பண்டைய தொழில்நுட்பதை அடையாளம் கொள்ள தெரியும்.
பா முடி: சங்க கால கட்டுமானப் பொருட்கள் சிற்ப வகைகளை வேறுபடுத்த முடியும்
பா முடி: வரலாறு மற்றும் தொல்லியல் சான்றுகளின் ஆதாரமாக உலோகவியல் ஆய்வுகளில் பட்டியலிட்டு அடையாளம் காண முடியும்
பா முடி: விவசாயம் மற்றும் வேளாண் செயலாக்கத்தில் பயன்படுத்தப்படும் பழங்கால நுட்பங்களைப் பற்றி விளக்கத்துடன் நிரூபிக்க முடியும்
பா முடி: 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.

Chairman - BoS
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Programme	Course Code	Name of the Course	L	T	P	C
B.Tech.	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. Collaborate 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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PO& PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO1 2
CO1	2	3	3	-	-	-	-	-	2			2
CO2	2	3	3	-	-	-	-	-	2			2
CO3	2	3	3	-	-	-	-	-	2			2
CO4	2	3	-	-	-	-	-	-	2			2
CO5	2	3	-	-	-	-	-	-	2			2
AVG	2	3	1.8	-	-	-	-	-	2			2

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Programme	Course Code	Course Title	L	T	P	C
BE/BTECH	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 SwachhbharathAbhiyan - 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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II SEMESTER

NEW COURSES INTRODUCED

Programme/sem	Course Code	Name of the Course	L	T	P	C
B.TECH/ II	22AG2201	PRINCIPLES OF FOOD SCIENCES	2	0	0	2

Course Objective

1. To introduce the basic fundamentals of food science.
2. To obtain knowledge of different food groups and their composition.
3. To get exposure to different methods of processing and cooking.
4. To know about food additives and quality control of foods.
5. To gain knowledge on food fortification and food packaging.

Unit	Description	Instructional Hours
	INTRODUCTION TO FOOD SCIENCE	
I	Definition of food Nutrients- Macro and Micro constituents-Functions of foods -Food groups. Food Science - Definition - objectives and applications. Structure of water and ice, free and bound water activity (aw) and food stability.	6
	METHODS OF COOKING AND SENSORY EVALUATION OF FOODS	
II	Methods of cooking - Moist heat, Dry heat and Combination methods- Nutrient losses during cooking and processing-Sensory evaluation of foods - Methods and Applications.	6
	COOKING QUALITIES OF FOODS	
III	Nutritive value - Factors affecting during cooking of foods- Cereals, Pulses, Nuts and Oilseeds, Vegetables, Milk, Meat, Fish, Egg and Poultry .Spices and condiments types – Use in cookery.	6
	PROPERTIES OF FOODS	
IV	Gelatinization, Denaturation, Colloids, Emulsion, Foam, Sol, Gel, Fermentation, Crystallization, Enzymatic and Non - Enzymatic browning of foods - Anti nutritional factors in foods.	6
	FOOD ADDITIVES	
V	Classification and role - Preservatives, Antioxidants, Chelating agents, Flour improvers, Artificial sweeteners. Flavours, Colours, Nutrient enhancement, Stabilizers and Emulsifier - Food fortification - Enrichment - need - application in foods. Foam and its stability - Food Packaging.	6
	Total Instructional Hours	**30**

Course Outcome

CO1: Recognize and understand the functions of environment, ecosystems and biodiversity and their conservation.

CO2: Identify the causes, effects of environmental pollution and natural disasters and contribute to the preventive measures in the society.

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CO3: Identify and apply the understanding of renewable and non-renewable resources and contribute to sustainable measures to preserve them for future generations.

CO4: Demonstrate an appreciation for need for sustainability, management and understand the various social issues and solutions to solve the issues.

CO5: Recognize the different goals of sustainable development and apply them for suitable technological advancement and societal development.

TEXTBOOKS

T1 - Anubha Kaushik and C. P. Kaushik's "Perspectives in Environmental Studies", 6th Edition, New Age International Publishers ,2018.

T2 - Benny Joseph, 'Environmental Science and Engineering', Tata McGraw-Hill, New Delhi, 2016.

REFERENCES

R1 – Rajagopalan, R, 'Environmental Studies-From Crisis to Cure', Oxford University Press, Third Edition, 2015.
R2 - Erach Bharucha "Textbook of Environmental Studies for Undergraduate Courses" Orient Blackswan Pvt. Ltd. 2013.

Co No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P010	PO11	PO12	PSO1	PSO2
1	2	3	2	3	2	2	2	-	-	1	1	1	2	3
2	3	3	3	2	3	3	2	-	1	3	1	2	3	2
3	2	3	2	3	2	3	2	-	-	2	2	2	3	2
4	1	3	3	2	2	3	2	-	1	1	2	3	2	2
5	2	3	2	3	2	2	3	1	-	2	1	2	2	3
Avg	**2**	**3**	**2.4**	**2.6**	**2.2**	**2.6**	**2.2**	**1**	**1**	**1.8**	**1.4**	**2**	**2.4**	**2.4**

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(An Autonomous Institution)

Coimbatore– 641032

DEPARTMENT OF AGRICULTURAL ENGINEERING

Revised Curriculum and Syllabus for the

Batch 2023-2027 (EVEN SEMESTER)

2022 REGULATIONS

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.	22AG3202R	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.	22AG3252R	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
MANDATORY COURSE											
10	22MC3191	ESSENCE OF INDIAN TRADITIONAL KNOWLEDGE	MC	2	0	0	0	0	100	0	100
TOTAL CREDITS				**19**	**2**	**8**	**25**	**29**	**560**	**440**	**1000**

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(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	தமிழர் மரபு	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	தமிழரும் தொழில்நுட்பமும்	MC	2	0	0	1	2	100	0	100
	22MC2095	TAMILS AND TECHNOLOGY									
11.	22MC2093	NCC */NSS / YRC / Sports / Club / 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				**18**	**1**	**12**	**2**				**1000**

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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.	22AG4202R	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.	22AG4252R	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
MANDATORY COURSE											
10	22MC4091	INDIAN CONSTITUTION	MC	2	0	0	0	0	100	0	100
TOTAL CREDITS				**20**	**2**	**8**	**23**	**29**	**460**	**440**	**900**

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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	AGRICULTURAL EXTENSION	PCC	3	0	0	3	3	40	60	100
3.	22HE6101	PROFESSIONAL ETHICS	HSC	3	0	0	3	3	40	60	100
4.	22AG63XX	PROFESSIONAL ELECTIVE-4	PEC	3	0	0	3	3	40	60	100
5.	22AG63XX	PROFESSIONAL ELECTIVE-5	PEC	3	0	0	3	3	40	60	100
6.	22XX64XX	OPEN ELECTIVE – 1*	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**

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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 UTILIZATION	PCC	3	1	0	4	4	40	60	100
3.	22AG7203	ERGONOMICS AND SAFETY IN AGRICULTURAL ENGINEERING	PCC	3	1	0	4	4	40	60	100
4.	22AG73XX	PROFESSIONAL ELECTIVE-6	PEC	3	0	0	3	3	40	60	100
5.	22XX74XX	OPEN ELECTIVE – 2*	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.

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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	8	12	-	70
5.	PEC	-	-	-	-	9	6	3	-	18
6.	OEC	-	-	-	-	-	3	3	-	6
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

(VI SEMESTER – COMMON LIST FOR ALL THE PROGRAMS)

(EMERGING TECHNOLOGIES)

Students must choose an open elective course from the given list. The content of the course should not be related to their current program of study.

SL. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS	Strength
				L	T	P			
1	22AI6401	Artificial Intelligence and Machine Learning Fundamentals	OEC	3	0	0	3	3	65
2	22CS6401	Block chain Technology Fundamentals	OEC	3	0	0	3	3	130
3	22EC6402	IoT Concepts and Applications	OEC	3	0	0	3	3	130
4	22IT6401	Data Science and Analytics Fundamentals	OEC	3	0	0	3	3	130
5	22BM6401	3D printing	OEC	3	0	0	3	3	65
6	22AE6401	Space Science	OEC	3	0	0	3	3	65
7 8	22MT6401	Introduction to Industrial Engineering	OEC	3	0	0	3	3	65
9	22MT6402	Industrial Safety and Environment	OEC	3	0	0	3	3	65
10	22CE6401	Climate Change and its Impact	OEC	3	0	0	3	3	65
11	22CE6402	Environment and Social Impact Assessment	OEC	3	0	0	3	3	65
12	22ME6401	Renewable Energy System	OEC	3	0	0	3	3	65
13	22ME6402	Additive Manufacturing systems	OEC	3	0	0	3	3	65
14	22EI6401	Introduction to Industrial Instrumentation and Control	OEC	3	0	0	3	3	65
15	22AU6401	Basics of Automobile Engineering	OEC	3	0	0	3	3	65
16	22EE6401	Fundamentals of Electric vehicles	OEC	3	0	0	3	3	65
17	22FT6401	Traditional Foods	OEC	3	0	0	3	3	65
18	22AG6401	Urban Agriculture and Organic Farming	OEC	3	0	0	3	3	65
19	22CH6401	Waste to Energy conversion	OEC	3	0	0	3	3	65
20		NCC Level - I	OEC	3	0	0	3	3	65

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OPEN ELECTIVE II
(VII SEMESTER - COMMON LIST FOR ALL THE PROGRAMS)
LIFE SKILL COURSES

Students shall choose any one of the Life Skill courses from the open elective courses listed below.

SL. NO.	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS PER WEEK			TOTAL CONTAC T PERIODS	CREDITS	Strength
				L	T	P			
1	22LS7401	General studies for competitive examinations	OEC	3	0	0	3	3	130
2	22LS7402	Human Rights, Women Rights and Gender equity	OEC	3	0	0	3	3	130
3	22LS7403	Indian ethos and Human values	OEC	3	0	0	3	3	130
4	22LS7404	Financial independence and management	OEC	3	0	0	3	3	130
5	22LS7405	Yoga for Human Excellence	OEC	3	0	0	3	3	130
6	22LS7406	Democracy and Good Governance	OEC	3	0	0	3	3	130
7	22LS7407	NCC Level - II	OEC	3	0	0	3	3	130
8	22LS7408	Cybercrime and Awareness	OEC	3	0	0	3	3	130
9	22LS7409	First Aid and Emergency care	OEC	3	0	0	3	3	130
10	22LS7410	Business Communication	OEC	3	0	0	3	3	130

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

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

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 c B.E. / B. Tech. (Honours) or Minor Degree. For B.E. / B. Tech. (Honours), a student shall register for the additiona courses (18 credits) from semester V onwards. These courses shall be from the same vertical or a combination c different verticals of the same programme of study only. For minor degree, a student shall register for the additiona courses (18 credits) from semester V onwards. All these courses have to be in a particular vertical from any one c 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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Semester	I	II	III	IV	V	VI	VII	VIII	Total
Credits	18	23	25	23	22	24	20	10	165

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

Course Objective

The learner should be able to

1. Construct a well-defined knowledge on Probability.
2. Interpret measures of central tendency, dispersion, and association.
3. Introduce Correlation concepts to understand the relation between two random variables.
4. Describe some basic concepts of statistical methods for testing the hypothesis.
5. Educate the design of experiment techniques to analyze various engineering problems.

Unit	Description	Instructional Hours
I	**PROBABILITY** Definition – Axioms of Probability – Conditional Probability – Total Probability – Baye's Theorem (without proof) – Simple problems.	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: Apply the concepts of probability.
CO2: Identify the concepts of Descriptive Statistics.
CO3: Compute correlation coefficient and predict unknown values using regression.
CO4: Analyze the statistical statement using testing of hypothesis.
CO5: Apply Design of Experiment techniques to analyze 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.

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

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

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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 equip nent. 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	1	1	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.	22AG4202R	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- *f* Classification of gears -*f* Gear nomenclature -*f* Forms of teeth, cycloid profile and involute profile teeth- *f* 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** Static and Dynamic balancing – Balancing of revolving and reciprocating masses – Balancing machines. Governors - Types - Centrifugal governors – Porter & Proell governor, Hartnell, Hartung – Characteristics	9
	Total Instructional Hours	45

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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 balancing of machine.

TEXT BOOKS:

T1 Rattan S B. 1993.Theory of Machines.Tata McGraw Hill Publishing Co. Ltd., 12/4 Asaf Ali Road, New 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., New Delhi, 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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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 concepts of hydrological aspects of water availability to the student community
- 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- 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

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Course Outcome

At the end of this course students will be able to
CO 1: Compute mean precipitation, infiltration rate and runoff from a catchment area and work out water yield.
CO 2: Estimate Runoff and Construct unit hydrograph and S hydrograph
CO 3: Compute peak flood flow and design flood for hydraulic structures.
CO 4: Workout reservoir capacity, develop idea about reservoir sedimentation and its control
CO 5: Suggest measures of water resource conservation

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	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.	22AG4251	SOIL AND WATER CONSERVATION ENGINEERING	3	0	0	3

Course Objective

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

Unit	Description	Instructional Hours
	MECHANICS OF WATER AND WIND EROSION	
I	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. **Exp 1 :** Computation of Erosivity Index	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)–RevisedUniversalSoilLossEquation(RUSLE) Tolerancelimit(TValue)ofsoil loss–Land use capability classification-Wind drift losses **Exp 2** : Computation of Universal Soil Loss Equation	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 **Exp 3** : Design of Spillways **Exp 4** : Identify the Problems on Bench Terraces	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 Exp 5: Identify the Problems on Farm Ponds	9

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V	**SEDIMENT TRANSPORT** 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 **Exp 6 :** Design of Grassed Waterway	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 Rain water harvesting systems.

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

TEXT BOOKS:

T1 Suresh,R.,"SoilandWaterConservationEngineering".StandardPublication,NewDelhi,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 byVito 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 waterconservation.CRCPress;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,NewDelhi,1982.

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

R4 SidleRC,PearceAJ,O'LoughlinCL.Hill slope stability and land use. Americangeophysicalunion;1985.

R5 OhligCP,editor.IntegratedLandandWaterResourcesManagementinHistory:ProceedingsoftheSpecialSession onHistory, May16th,2005. BoD- BooksonDemand;2005.

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PO&PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	-	2	-	-	2	3	-	-	2	3	3	3	2
CO2	3	3	2	2	-	3	2	-	-	2	3	3	3	3
CO3	3	3	2	2	-	3	2	-	-	2	3	3	3	2
CO4	3	3	2	2	-	3	2	-	-	2	3	3	2	3
CO5	3	3	2	2	-	3	2	-	-	2	3	3	2	3
Avg	3	2.4	2	1.6	-	2.8	2.2	-	-	2	3	3	2.6	2.6

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Programme	Course Code	Name of the Course	L	T	P	C
B.Tech.	22AG4252R	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 – 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** Determination of member forces by indeterminate plane trusses – Blending Trusses Lab: Experiment 4. Hardness test on metals (Rockwell and Brinell Hardness Tests)	7
III	**TRANSVERSE LOADING AND STRESSES IN BEAM** Beams – types transverse loading on beams – Shear force and bending moment in beams –Cantilevers – Simply supported beams. Theory of simple bending–bending stress distribution – Shear stress distribution	10

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	Lab: Experiment 5. Deflection test on metal beam	
IV	**TORSION** Torsion formula - stresses and deformation in circular and hollows 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	11
V	**DEFLECTION OF BEAMS** Computation of slopes and deflections in determinate beams - Double Integration method –Macaulay"s method	9
	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

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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	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PS
CO1	3	2	3	1	2	-	-	-	-	-	-	2	3	
CO2	3	3	3	2	1	-	-	-	-	-	-	3	2	
CO3	3	3	3	1	1	-	-	-	-	-	-	2	2	
CO4	3	3	3	3	3	-	-	-	-	-	-	2	2	
CO5	3	3	3	3	3	-	-	-	-	-	-	2	2	
Avg	3	2.8	3	2	2	-	-	-	-	-	-	2.2	2.2	

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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

- Tillage, sowing, plant protection, harvesting and threshing
- Care and maintenance; lubrication
- Fits and tolerances and replacements
- Adjustments of farm machines
- 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	2
9.	Study on wetland preparation implements and machineries	2
10.	Visit to farm machinery industry and its research center	2
11.	Study of reaper cum binder and flail mowers	2
12.	Determination of operational cost of farm implements	2
	Total Instructional Hours	60

Course Outcome

During this course, students have the 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. Sukhpal Singh and Grace Philip. 2012. Farm Machinery – An Approach. Standard Publishers

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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 Distributors 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 type cultivator	1
6.	Seed drill	1
7.	Sprayer	1
8.	Weeder	1
9.	Seed drill cum fertilizer	1
10.	Rocker arm sprayer	1

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PO & PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	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	3	3	2	2	-	-	-	-	-	-	2.2	2.2	2

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Programme	Course Code	Course Title	L	T	P	C
BE/BTECH	22HE4071	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. Crack mock interviews with ease

Unit	Description	Instructional Hours
	Logical Reasoning	
I	Logical Connectives - Syllogisms - Venn Diagrams: Interpretation - Venn Diagrams - Solving- Critical Reasoning	6
	Quantitative Aptitude	
II	Logarithm - Arithmetic Progression - Geometric Progression - Surds and Indices - Geometry - Mensuration - Heights and Distance- Coded inequalities - Quadratic Equations - Permutation, Combination: Fundamental Counting Principle, Permutation and Combination, Computation of Permutation, Circular Permutations, Computation of Combination - Probability	14
	Verbal Ability	
III	Idioms and Phrasal Verbs, Collocations, Gerund and Infinitives - Reading Comprehension for placements: Types of questions, Comprehension strategies - Articles.	6
	Recruitment Essentials	
IV	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	4
	Total Instructional Hours	30

Course Outcome:

CO1: Students will excel in the complex reasoning.
CO2: Students will be proficient to create and verify their own conjectures.
CO3: Imbibe effective relevant knowledge in English.
CO4: Students will identify different life skills required in personal and professional life.

REFERENCE BOOKS:

R1: Logical Reasoning and Data Interpretation for CAT by Nishit K. Sinha
R2: A Modern Approach to Verbal Reasoning by R S Aggarwal.
R3: Quantitative Aptitude for Competitive Examinations (5th Edition) - Abhjit Guha
R4: Verbal Ability & Reading Comprehension by Ajay Singh

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Programme/ Sem	CourseCode	Name of the Course	L	T	P	C
B.E./B.Tech/IV	22MC4091	**INDIAN CONSTITUTION** (Common for all Branches)	2	0	0	0

Course Objectives

The student should be made to

1. Sensitization towards self, family (relationship),society and nature
2. Understanding (or developing clarity) of nature, society and larger systems, on the basis of human relationships and resolved individuals
3. Strengthening of self-reflection
4. Development of commitment and courage to act

Unit	Description	Instructional Hours
	BASIC FEATURES AND FUNDAMENTAL PRINCIPLES	
I	Meaning of the constitution law and constitutionalism–Historical perspective of the constitution of India– salient features and characteristic of the constitution of India.	6
	FUNDAMENTAL RIGHTS	
II	Scheme of the fundamental rights–fundamental duties and its legislative status–The directive principles of state policy–its importance and implementation-Federal structure and distribution Of legislative and financial powers between the union and states.	6
	PARLIAMENTARY FORM OF GOVERNMENT	
III	The constitution powers and the status of the president in India.–Amendment of the constitutional Powers and procedures–The historical perspective of the constitutional amendment of India– Emergency provisions: National emergency, President rule, Financial emergency.	6
	LOCALGOVERNANCE	
IV	Local self-government-Rural Local Government-Panchayath Raj, Elections of Panchayat-State Election Commission- Urban Local Government-Amendment Act, Urban Local Government Structures in India	6
	INDIANSOCIETY	
V	ConstitutionalRemediesforcitizens–PoliticalPartiesandPressureGroups;Right of Women,Childrenand Scheduled Castes and Scheduled Tribes and other Weaker Sections.	6
	Total Instructional Hours	**30**

Course Outcome

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

CO1:Understand the functions of the Indian government.

CO2:Understand and abide the rules of the Indian Constitution

TEXTBOOKS:

T1: DurgaDasBasu,"IntroductiontotheConstitutionofIndia",PrenticeHallofIndia,NewDelhi.1997.

T2: Agarwal R C.,"Indian Political System", S.Chand and Company, NewDelhi,1997.

T3: MaciverandPage,"Society:AnIntroductionAnalysis",MacMilanIndiaLtd.,NewDelhi.

T4: Sharma K L., "Social Stratification in India: Issues and Themes ",Jawaharlal NehruUniversity.NewDelhi,1997.

REFERENCEBOOKS:

R1-Sharma,Brij Kishore,"Introduction to the Constitution of India:, Prentice Hall of India, New Delhi.

R2-GahaiUR.,"IndianPoliticalSystem",NewAcademicPublishingHouse. Jalaendhar.

R3-Sharma R N., "Indian Social Problems",Media Promoters and Publishers Pvt. Ltd.

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Department of Agricultural Engineering

Syllabus Revision carried out in 2024-2025 Even Semester

2022 Regulation –IV semester- Syllabus revision

S. No	Year	Sem	Course Code & Name	Existing Syllabus	Revised Syllabus	% of Change
1	II	IV	22AG4202R- Theory of Machines	**Unit V: GOVERNORS** Governors - Types - Centrifugal governors – Porter & Proell governor, Hartnell, Hartung – Characteristics	**Unit V: GOVERNORS** Static and Dynamic balancing – Balancing of revolving and reciprocating masses – Balancing machines. Governors - Types - Centrifugal governors – Porter & Proell governor, Hartnell, Hartung – Characteristics	10
2	II	IV	22AG4252R - Strength of Materials for Agricultural Engineering	**Unit 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 **Unit II: ANALYSIS OF PLANE TRUSSES** Determinate and indeterminate plane trusses – determination of member forces by method of joints,	**Unit 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 – circumferential and longitudinal stresses in thin cylinders - deformation of thin cylinder **Unit II: ANALYSIS OF PLANE TRUSSES** Determination of member forces by indeterminate plane trusses – Blending Trusses	35

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				method of sections and method of tension coefficient **Unit 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 **Unit V: DEFLECTION OF BEAMS** Computation of slopes and deflections in determinate beams - Double Integration method –Macaulay"s metho – Area moment method – Conjugate beam method	**Unit III: TRANSVERSE LOADING AND STRESSES IN BEAM** Beams – types transverse loading on beams – Shear force and bending moment in beams –Cantilevers – Simply supported beams. Theory of simple bending–bending stress distribution – Shear stress distribution **Unit V: DEFLECTION OF BEAMS** Computation of slopes and deflections in determinate beams - Double Integration method –Macaulay"s method	

2022 Regulation (2023 Batch) - IV semester = 12 %

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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)

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	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**

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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.	22HE4071	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 III summer vacation and same will be evaluated in Semester IV. If students unable to undergo in semester III then the Internship II 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	AGRICULTURAL EXTENSION	PCC	3	0	0	3	3	40	60	100
3.	22HE6101	PROFESSIONAL ETHICS	HSC	3	0	0	3	3	40	60	100
4.	22AG63XX	PROFESSIONAL ELECTIVE-4	PEC	3	0	0	3	3	40	60	100
5.	22AG63XX	PROFESSIONAL ELECTIVE-5	PEC	3	0	0	3	3	40	60	100
6.	22XX64XX	OPEN ELECTIVE – 1*	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 UTILIZATION		3	1	0	4	4	40	60	100

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3.											
4.	22AG73XX	PROFESSIONAL ELECTIVE-6	PEC	3	0	0	3	3	40	60	100
5.	22XX74XX	OPEN ELECTIVE – 2*	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. Furthe the students' who enrolled his/her name in HICET NCC and Air Wing are eligible to undergo this subject. The earned extra credits printed i 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	8	12	-	70
5.	PEC	-	-	-	-	9	6	3	-	18
6.	OEC	-	-	-	-	-	3	3	-	6
7.	EEC	1	3	3	1	1	2	2	10	23
8.	MC	1	1							2
	Total	19	22	25	23	22	24	20	10	165

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OPEN ELECTIVE I
(VI SEMESTER – COMMON LIST FOR ALL THE PROGRAMS)
(EMERGING TECHNOLOGIES)

Students must choose an open elective course from the given list. The content of the course should not be related to their current program of study.

SL. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS	Strength
				L	T	P			
1	22AI6401	Artificial Intelligence and Machine Learning Fundamentals	OEC	3	0	0	3	3	65
2	22CS6401	Block chain Technology Fundamentals	OEC	3	0	0	3	3	130
3	22EC6402	IoT Concepts and Applications	OEC	3	0	0	3	3	130
4	22IT6401	Data Science and Analytics Fundamentals	OEC	3	0	0	3	3	130
5	22BM6401	3D printing	OEC	3	0	0	3	3	65
6	22AE6401	Space Science	OEC	3	0	0	3	3	65
7 8	22MT6401	Introduction to Industrial Engineering	OEC	3	0	0	3	3	65
9	22MT6402	Industrial Safety and Environment	OEC	3	0	0	3	3	65
10	22CE6401	Climate Change and its Impact	OEC	3	0	0	3	3	65
11	22CE6402	Environment and Social Impact Assessment	OEC	3	0	0	3	3	65
12	22ME6401	Renewable Energy System	OEC	3	0	0	3	3	65
13	22ME6402	Additive Manufacturing systems	OEC	3	0	0	3	3	65
14	22EI6401	Introduction to Industrial Instrumentation and Control	OEC	3	0	0	3	3	65
15	22AU6401	Basics of Automobile Engineering	OEC	3	0	0	3	3	65
16	22EE6401	Fundamentals of Electric vehicles	OEC	3	0	0	3	3	65
17	22FT6401	Traditional Foods	OEC	3	0	0	3	3	65
18	22AG6401	Urban Agriculture and Organic Farming	OEC	3	0	0	3	3	65
19	22CH6401	Waste to Energy conversion	OEC	3	0	0	3	3	65
20		NCC Level - I	OEC	3	0	0	3	3	65

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OPEN ELECTIVE II
(VII SEMESTER - COMMON LIST FOR ALL THE PROGRAMS)
LIFE SKILL COURSES

Students shall choose any one of the Life Skill courses from the open elective courses listed below.

SL. NO.	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS PER WEEK			TOTAL CONTAC T PERIODS	CREDITS	Strength
				L	T	P			
1	22LS7401	General studies for competitive examinations	OEC	3	0	0	3	3	130
2	22LS7402	Human Rights, Women Rights and Gender equity	OEC	3	0	0	3	3	130
3	22LS7403	Indian ethos and Human values	OEC	3	0	0	3	3	130
4	22LS7404	Financial independence and management	OEC	3	0	0	3	3	130
5	22LS7405	Yoga for Human Excellence	OEC	3	0	0	3	3	130
6	22LS7406	Democracy and Good Governance	OEC	3	0	0	3	3	130
7	22LS7407	NCC Level - II	OEC	3	0	0	3	3	130
8	22LS7408	Cybercrime and Awareness	OEC	3	0	0	3	3	130
9	22LS7409	First Aid and Emergency care	OEC	3	0	0	3	3	130
10	22LS7410	Business Communication	OEC	3	0	0	3	3	130

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 c B.E. / B. Tech. (Honours) or Minor Degree. For B.E. / B. Tech. (Honours), a student shall register for the additiona courses (18 credits) from semester V onwards. These courses shall be from the same vertical or a combination c different verticals of the same programme of study only. For minor degree, a student shall register for the additiona courses (18 credits) from semester V onwards. All these courses have to be in a particular vertical from any one c 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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Programme	Course Code	Name of the Course	L	T	P	C
B.Tech.	22AG6201	REMOTE SENSING AND GEOGRAPHICAL INFORMATION SYSTEM	3	0	0	3

Course Objective

- To initiate the basic principles and concepts of Remote Sensing and GIS as applicable to the multi-facets of Agricultural Engineering
- To develop the spatial data models, analysis and presentation techniques
- To examine the methods of image enhancement and classification techniques.
- To utilize 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	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

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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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At the end of this course students will be able to

Course Outcome

CO1: 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: Develop decision making process using DBMS and utilization of these advanced techniques in addressing the real world problems

CO5: Apply 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

PO &	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	2	1	-	-	1	-	1	1	1	2	3	1
CO2	3	3	3	1	2	1	2	-	2	1	1	2	3	2
CO3	3	3	3	1	2	1	2	-	2	1	1	2	3	2
CO4	2	3	1	2	2	1	-	-	-	2	2	2	3	2
CO5	1	2	2	2	-	1	1	1	1	3	2	3	3	3
Avg	2	2.5	2	2	2	1	2	1	2	2	2	2	3	2

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Programme	Course Code	Name of the Course	L	T	P	C
B.Tech	22AG6202	AGRICULTURE 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
	Principles of Extension	
I	Extension Education – Meaning, objectives, concepts, principles and philosophy–Extension teaching methods and factors influencing the selection of teaching.	9
	Methods of contact	
II	Individual contact-Group contact Exhibition-campaign and public speaking -Field trips- and tours -purpose procedure, advantage and limitations.	8
	Methods of communication	
III	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- Domestic and Export Market Intelligence Cell (DEMIC)-Kisan call center- Village knowledge center (VKC).	10
	Visual communication	
IV	Audio -visual aids-definition, importance, selection, use and factors influencing selection, merits and demerits-Electronic media -radio, television and video procedure – advantage and limitations. Transfer of technology -meaning , importance and major components – communication -definition, meaning, scope and importance-functions and types- communication process -elements and models	10

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V	**Current Approaches in Extension** Decentralised Decision Making-Bottom up Planning-Farming System Approach, Farming Situation Based Extension- Market – Led – Extension - Digital Extension	8
	Total Instructional Hours	45

Course Outcome

CO1: To Understand the concept of agriculture extension

CO2: Organize the various extension teaching methods and communication gadgets

CO3: Execute the use of electronic media for transfer of technology

CO4: Execute the use of electronic media for transfer of technology

CO5:To critically analyze different Agricultural Extension approaches

TEXT BOOKS:

T1 Berlo, D.K. 1960. The Process of Communication. Holt, Rinehart and Winston, New York

T2 Mike W Martin and Roland Schinzinger, Ethicsin Engineering, 4th edition, Tata McGraw Hill Publishing Company Pvt. Ltd, New Delhi, 2014

REFERENCE BOOKS:

R1 R S Naagarazan, A text book on professional ethics and human values, New age international (P) limited, New Delhi, 2006

R2 M Govindarajan, S Natarajan and V S Senthil Kumar, Engineering Ethics, PHI Learning Private Ltd,New Delhi, 2012

PO & PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PS
CO1	1	1	1	1	-	2	2	-	1	3	1	2	1	1
CO2	-	-	-	-	-	1	3	-	2	2	-	2	2	2
CO3	1	1	-	-	-	1	2	-	2	2	-	2	1	-
CO4	-	1	1	1	-	1	2	-	2	3	1	1	1	1
CO5	2	-	-	1	-	1	2	-	1	2	-	2	1	2
Avg	1	1	1	1	-	1	2	-	2	2.5	1	2	1.8	1

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Programme	Course code	Name of the Course	L	T	P	C
B.Tech	22HE6101	PROFESSIONAL ETHICS	3	0	0	3

Course Objective

1. To foster ethical behavior and life skills for holistic development.
2. To educate the value of Engineering Ethics
3. To inculcate the social responsibility of an engineer.
4. To impart knowledge on issues related to safety, responsibility and rights
5. To educate on professional practice on global issues

Unit	Description	Instructional Hours
I	**VALUE EDUCATION** Moral values and Right understanding- Holistic development and the Role of Value Education- Understanding Value Education- Self-exploration as the process for value Education- Integrity -Work Ethics- Empathy- Spirituality	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 – Uses of Ethical Theories.	9
III	**ENGINEERING AS SOCIAL EXPERIMENTATION:** Engineering as Experimentation – Engineers as responsible Experimenters – Codes of Ethics – A Balanced Outlook on Law.	9
IV	**SAFETY, RESPONSIBILITIES AND RIGHTS** 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 Outcomes

CO1: Understand the importance of various components of human values
CO2: Apply ethics in society
CO3: Discuss the ethical issues related to engineering and
CO4: Realize the responsibilities and rights in the society
CO5: Apply professional ethics in solving global issues

TEXT BOOKS:

T1 - Mike W. Martin and Roland Schinzinger, "Ethics in Engineering", Tata Mc Graw Hill, New Delhi, 2003.
T2 - Govindarajan M, Natarajan S, Senthil Kumar V. S, "Engineering Ethics", Prentice Hall of India, New Delhi, 2009.

REFERENCES BOOKS:

R1 - Charles B. Fleddermann, "Engineering Ethics", Pearson Prentice Hall, New Jersey, 2004.
R2 - John R Boatright, "Ethics and the Conduct of Business", Pearson Education, New Delhi, 2003
R3 - Edmund G Seebauer and Robert L Barry, "Fundamentals of Ethics for Scientists and Engineers", Oxford University Press, Oxford, 2001

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

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Professional Elective 4

Programme	Course Code	Name of the Course	L	T	P	C
B.Tech.	22AG6303	PROTECTED CULTIVATION	3	0	0	3

Course Objective

- To impart knowledge on the protected all season confined space cultivation strategies for vegetables, fruits and flower crops
- To sensitize the students on hi-tech production technology of horticultural crops

Unit	Description	Instructional Hours
	INTRODUCTION TO PROTECTED CULTIVATION	
I	Importance and scope of protected cultivation – status in India and World - types of protected structure based on site and climate – green house – poly house – shade net house – crops grown under protected structures - Study of environmental factors influencing greenhouse production	9
	SYSTEMS & DESIGNS	
II	Cladding (covering material) – ventilation systems – cultivation systems including nutrient film technique - hydroponics – aeroponics - culture growing media and nutrients – planning and design of protected structure	9
	MANAGEMENT TECHNIQUES	
III	Soil preparation and management - Canopy management – micro irrigation and fertigation systems – nursery development in protected cultivation - Propagation and production of quality planting material of horticultural crops.	9
	PROTECTED CULTIVATION OF VEGETABLE CROPS	
IV	Protected cultivation technology for vegetable crops - Hi-tech protected cultivation techniques for tomato, capsicum, cucumber, gherkins strawberry and melons – integrated pest and disease management – post harvest handling.	9
	PROTECTED CULTIVATION OF FLOWER CROPS	
V	Protected cultivation technology for flower crops - Hi-tech protected cultivation of cut roses, cut chrysanthemum, carnation, gerbera, asiatic lilies, anthurium, orchids – integrated pest and disease management – postharvest handling.	9
	Total Instructional Hours	45

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Course Outcome

CO1: To understand the concept and features of protected cultivation

CO2 : To implement basic knowledge on the Planning and designing of Protected cultivation of vegetable crops

CO3: To acquire skill and knowledge on management of various operations inside the protected structure

CO4 : To interpret the protected cultivation technologies on vegetable crops and their post-harvest process

CO5 : To examine the concepts of protected cultivation technologies on flower crops and their post-harvest process

TEXT BOOKS:

T1 Reddy P. Parvatha, 2003. Protected Cultivation. Springer Publications. USA

T2 Brahma Singh, 2014. Advances in Protected Cultivation. New India Publishing Agency. New Delhi.

T3 Balraj Singh. 2006. Protected cultivation of vegetable crops. Kalyani Publishers, Ludhiana.

REFERENCE BOOKS:

R1 Reddy, P. Parvatha. 2011. Sustainable crop protection under Protected Cultivation. Springer Publications, USA.

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

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

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

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Professional Elective 5

Programme	Course Code	Name of the Course	L	T	P	C
B.Tech.	22AG6308	REFRIGERATION AND COLD STORAGE	3	0	0	3

Course Objective

- To interpret principles of operation of different Refrigeration & A conditioning systems
- To understand the types of compressors and expansion devices and the applications
- To combine the parameters involved in design of the various air conditionin and cold storage systems

Unit	Description	Instructional Hours
	REFRIGERATION PRINCIPLES AND COMPONENTS	
I	Refrigeration principles - refrigeration effect coefficient of performance -units of refrigeration -Refrigeration components -compressor-classification-principle and working- condensers-types construction,principle and working. Evaporators - types-principle and working. Expansion device types construction, principle and working. Refrigerants properties classification comparison and advantages chloroflouro carbon (CFC) refrigerants - effect on environmental pollution – alternate refrigerants.	9
	VAPOUR COMPRESSION AND VAPOUR ABSORPTION CYCLE	
II	Simple vapour compression cycle - T-S diagram - p-h chart- vapour compression system-different types-vapour absorption cycle simple and practical vapour absorption system- advantages- ideal vapour absorption system- Electrolux refrigerator Lithium bromide refrigeration-construction and principles	9
	APPLIED PSYCHROMETRY	
III	Principle and properties of psychrometry, Representation of various psychometric processes on psychometric chart and their analysis, by-pass factor, sensible heat factor, room sensible heat factor, equipment sensible heat factor, grand sensible heat factor, apparatus dew point, ventilation and infiltration, energy efficiency ratio. Use of psychometric charts. Cooling and heating load calculations	9
	AIR CONDITIONING SYSTEM	
IV	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- application of refrigeration and air conditioning-domestic refrigerator and freezer- ice manufacture	9

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APPLICATIONS OF REFRIGERATION IN FOOD PROCESSING AND PRESERVATION

V	Cooling and heating load estimation, cold storage design, types of cooling plants for cold storage. Insulation properties and types of insulation material. Cold storage for milk, meat, fruits, vegetables, poultry and marine products. Refrigerated Transport, Handling and Distribution, Cold chain, refrigerated product handling, order picking, refrigerated vans, refrigerated display. Sensors for cold storage management	9
	Total Instructional Hours	45

Course Outcome

CO1: Select appropriate components of the refrigeration unit and analyze the effect of different refrigerants on environment

CO2: Differentiate various refrigeration cycles and its applicability

CO3: Apply knowledge of psychrometry for air conditioning & various food processing operations

CO4: Apply the knowledge of refrigeration and air conditioning in persevering foods using domestic and industrial refrigeration systems

CO5: Choose and design appropriate cold storage system for ensuring the product quality

TEXT BOOKS:

T1 C. P. Arora, Refrigeration and Air Conditioning, Tata McGraw Hill Publishing Company Private Limited, New Delhi, 2008

T2 Langley and C. Billy, Refrigeration and Air conditioning, Ed. 3, Engle wood Cliffs (NJ), Prentice Hall of India, New Delhi, 2009.

REFERENCE BOOKS:

R1 N. F Stoecker and Jones, Refrigeration and Air Conditioning, Tata McGraw Hill, New Delhi, 2008

R2 Manohar Prasad, Refrigeration and Air Conditioning, Wiley Eastern Ltd., 2007

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

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Programme	Course Code	Name of the Course	L	T	P	C
B.Tech.	22AG6001	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	Instructional Hours
1	Study on Basics of engineering drawing (Scale, Views and Projections)	3
2	Study of Drafting Software (AutoCAD)	3
3	Drawing of Objects in 2D with general steps	3
4	Drawing of objects in 3D with general steps	3
5	Design and Drawing of bolt and nut,	3
6	Design and Drawing of Keys and Hubs.	3
7	Design and Drawing of Shaft Coupling	3
8	Design and Drawing of connecting road.	3
9	Design and Drawing of different Gears	3
10	Design and Drawing of Underground pipeline system	3
11	Design and Drawing of Check dam	3
12	Design and Drawing of Biogas plant	3
13	Design and Drawing of Disk plough	3
14	Design and Drawing of Mould board plough.	3
15	Introduction & demonstration on 3D modeling softwares like Pro/E, Creo, Solid works, Solid Edge etc	3

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

REFERENCES

R1 Vijay Duggal. "A general guide to Computer Aided Design & Drafting, Mailmax Publications, 2000

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

R1 Srivastava, A.C."Elements of Farm Machinery", Oxford and IBH Publications Co., New Delhi, 1990

COURSE OUTCOMES

CO1 Students shall be understand of basic of engineering drawing and software usage

CO2 The students also will be able to draw the components Shaft Coupling, Keys, connecting road, bolt and nut and gears

CO3 - The student will be able to understand the plan and layout of underground pipe

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Check dam and Biogas plant

CO4 Ability to design internal components of farm implements

CO5 Students will able to draw farm shed in 2 D and 3 D view

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	-	-	2	2	-	-	-	-	3	2
CO2	3	3	2	2	-	2	2	-	-	-	-	-	3	2
CO3	2	1	2	2	-	2	3	-	-	-	-	-	2	3
CO4	3	-	2	-	-	2	-	-	-	-	-	2	2	3
CO5	2	3	3	2	3	-	-	-	-	-	-	2	2	3
Avg	3	2	2	2	3	2	2	2	-	-	-	2	2	3

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Programme	Course Code	Name of the Course	L	T	P	C
B.Tech	22AG6002	POST HARVEST TECHNOLOGY	0	0	4	2

Course Objectives

1. To understand the processing of cereals, pulses, oil seeds and horticultural crops
2. Equip students with the practical skills required for sorting, grading, cleaning, an packaging agricultural products to reduce damage and maintain quality.
3. To understand the importance of minimizing the post-harvest losses through prop handling, storage, and transportation technologies, and to familiarize them wi innovations in loss management systems

Ex.no	List of Experiments	Hours
1	Determination of size, true density, bulk density and porosity of grains	2
2	Determination of coefficient of friction and angle of repose of different grain	2
3	Determination of drying efficiency using fluidized bed dryer	2
4	Performance evaluation of cleaner cum grader	2
5	Determination of shelling efficiency of groundnut decorticator	2
6	Experiment on parboiling of paddy	3
7	Performance evaluation of rubber roll Sheller	3
8	Determination of oil content of oil seeds using soxhlet apparatus	2
9	Study of bucket elevator and its application based on industry	2
10	Identify the maturity index and packaging of various fruits and vegetables	2
11	Report on visit to a modern processing industry	2
	Total hours	30

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COURSE OUTCOMES

The students completing the course will have:

CO1: To understand the different engineering properties of agricultural products and assess their importance

CO2: Classify various methods for drying of the cereals and fruits

CO3: Infer the working principles of grain cleaning and grading devices and select suitable equipment for cereal grains

CO4: Assess the performance of conveying and storage systems used for agricultural products for better processing

CO5: Justify the post-harvest operations for horticultural crops to increase the market value of food products

TEXT BOOKS:

T1 Chakraverty, A. Post Harvest Technology of cereals, pulses and oilseeds. 3rd Edition. Oxford & IBH publishing Co. Ltd., New Delhi.2019 3.

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

REFERENCE BOOKS:

R1 Singh, R. Paul. and Heldman, R.Dennis. Introduction to Food Engineering. 3rd Edition. Academic Press, London. 2004

Co	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P010	PO11	PO12	PSO1	PSO
1	2	1	2	1	2	2	1	-	2	2	1	1	2	3
2	3	3	3	2	3	3	2	-	1	2	2	2	3	2
3	2	2	2	3	2	3	2	-	2	2	2	2	3	2
4	1	3	3	2	2	3	2	-	1	3	3	3	2	2
5	2	3	2	3	2	2	1	-	2	2	1	2	2	3
Avg	2	2.4	2.4	2	2.2	2.6	1.6	-	2.2	2.2	1.6	2	2.4	2.4

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Programme	Course Code	Course Title	L	T	P	C
BE/BTECH	22HE6071	SOFT SKILLS - V	0	0	0	1

Course Objectives:

1. To make the students aware of the importance, the role and the content of soft skills through instruction, 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 - Team Building– Mock Presentations & Feedback	10
II	**Interview Skills and Personality Skills:** Interview handling Skills – Self preparation checklist – Grooming tips: do's & don'ts – mock interview & feedback - Leadership Skills - Interpersonal skills-creative thinking-problem solving-analytical skills	10
III	**Business Etiquette & Ethics:** Etiquette – Telephone & E-mail etiquette – Dining etiquette – do's & Don'ts in a formal setting – how to impress - Crisis Management - Ethics – Importance of Ethics and Values – Choices and Dilemmas faced – Discussions from news headlines.	10
	Total Instruction Hours	30

Course Outcome:

CO1: Students will have learnt to keep going according to plan, coping with the unfamiliar, 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

REFERENCE BOOKS:

R1: Bridging the Soft Skills Gap: How to Teach the Missing Basics to Todays Young Talent- Bruce Tulgan

R2: BPB Publications Soft Skills Personality Development For Life Success-Prashant Sharma

R3: Soft Skills and Employability Skills by Sabina Pillai-*

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Programme	Course Code	Name of the Course	L	T	P	C
B.Tech.	22AG6401	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 the 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, levelling, 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

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CO1	To Understand the various principles of agriculture and gardening
CO2	To develop and Effectively install and maintenance of roof gardening and develop as a small agri-business enterprise.
CO3	To Understand the concept of organic farming
CO4	To gain the knowledge on certification process in organic farming
CO5	To develop and select appropriate model to improve the business opportunity

TEXT BOOKS:

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

T2 P L Maliwal, Principles of Organic Farming Textbook, Publishing by Bio-Green Books, January 1, 2020, ISBN10: 9389184509

REFERENCE BOOKS:

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

R2 E Somasundaram; D Udhaya Nandhini; M Meyyappan, Principles of Organic Farming: (With Theory and Practicals), Nipa Genx Electronic Resources and Solns Pvt Ltd., July, 2019

R3 April Philips, Designing Urban Agriculture: A Complete Guide to the Planning, Design, Construction, Maintenance and Management of Edible Landscapes, Wiley, April 22, 2013.

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

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VI SEMESTER

NEW COURSES INTRODUCED

Programme	Course Code	Name of the Course	L	T	P	C
B.Tech	22AG6002	POST HARVEST TECHNOLOGY	0	0	4	2

Course Objectives

1. To understand the processing of cereals, pulses, oil seeds and horticultural crops
2. Equip students with the practical skills required for sorting, grading, cleaning, an packaging agricultural products to reduce damage and maintain quality.
3. To understand the importance of minimizing the post-harvest losses through prop handling, storage, and transportation technologies, and to familiarize them wi innovations in loss management systems

Ex.no	List of Experiments	Hours
1	Determination of size, true density, bulk density and porosity of grains	2
2	Determination of coefficient of friction and angle of repose of different grain	2
3	Determination of drying efficiency using fluidized bed dryer	2
4	Performance evaluation of cleaner cum grader	2
5	Determination of shelling efficiency of groundnut decorticator	2
6	Experiment on parboiling of paddy	3
7	Performance evaluation of rubber roll Sheller	3
8	Determination of oil content of oil seeds using soxhlet apparatus	2
9	Study of bucket elevator and its application based on industry	2
10	Identify the maturity index and packaging of various fruits and vegetables	2
11	Report on visit to a modern processing industry	2
	Total hours	30

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COURSE OUTCOMES

The students completing the course will have:

CO1: To understand the different engineering properties of agricultural products and assess their importance

CO2: Classify various methods for drying of the cereals and fruits

CO3: Infer the working principles of grain cleaning and grading devices and select suitable equipment for cereal grains

CO4: Assess the performance of conveying and storage systems used for agricultural products for better processing

CO5: Justify the post-harvest operations for horticultural crops to increase the market value of food products

TEXT BOOKS:

T1 Chakraverty, A. Post Harvest Technology of cereals, pulses and oilseeds. 3rd Edition. Oxford & IBH publishing Co. Ltd., New Delhi.2019 3.

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Co	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P010	PO11	PO12	PSO1	PSO2
1	2	1	2	1	2	2	1	-	2	2	1	1	2	3
2	3	3	3	2	3	3	2	-	1	2	2	2	3	2
3	2	2	2	3	2	3	2	-	2	2	2	2	3	2
4	1	3	3	2	2	3	2	-	1	3	3	3	2	2
5	2	3	2	3	2	2	1	-	2	2	1	2	2	3
Avg	2	2.4	2.4	2.2	2.2	2.6	1.6	-	2.2	2.2	1.6	2	2.4	2.4

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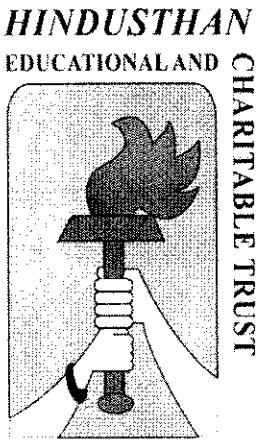

HINDUSTHAN

COLLEGE OF ENGINEERING AND TECHNOLOGY

(An Autonomous Institution)

Coimbatore– 641032

DEPARTMENT OF AGRICULTURAL ENGINEERING

Revised Curriculum and Syllabus for the

Batch 2021 – 2025 (EVEN SEMESTER)

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
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

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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	21AG6001	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	Modern Agricultural Practices	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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Dean - Academics

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Principal

PRINCIPAL
Hindusthan College of Engineering and T
COIMBATORE - 641 032.

Programme	Course Code	Name of the Course	L	T	P	C
B.E.	21AG8301	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	**COMPONENTS OF ABM** 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	**OPERASTIONS AND HRM** Operations management - planning and scheduling - supply chain management in agribusiness -Human resource management - job analysis, recruitment and selection process	9
IV	**MARKETING AND FINANCIAL MANAGEMENT** 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

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Total Instructional Hours 45

Course Outcome

CO1: To analyze agribusiness situations, formulate strategies, implement plans and manage strategic change.

CO2: To learn the concepts and process of planning , organizing and SWOT analysis of business

CO3: To understand the role of supply chain management and human resource development

CO3: To understand the principles and role of marketing and financial management of business

CO5: To gain knowledge on innovation, incubation and entrepreneurial traits

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 & AgribusinessManagement", 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.

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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.	21AG8309	MICRO IRRIGATION SYSTEM	3	0	0	3

Course Objective

- To expose the students to basic conceptual differences in the design of Pressure Irrigation systems viz., Drip, Sprinkler, Surge and Capillary modes
- To help the students gain a thorough design and layout understanding based on the Hydraulics of pipe-flow coupled with friction loss calculations
- To impart technical confidence in the minds of students in making choice based and corrections imbibed layout designs with cost economics.
- To infer about the merits and demerits of modern irrigation practices with conventional ones
- Gain knowledge about Urban agriculture and its scope in the modern world

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	**DESIGNANDLAYOUTOFDRIPIRRIGATION** 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	9

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	Discharge requirements–Emitter types–Daily Irrigation Duration – PermissibleFrictionLossvariations–DripperPressureVsDischarge–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	
III	**DESIGNANDLAYOUTOFSPRINKLERIRRIGATION** 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
IV	**DESIGNANDLAYOUTOFSURGEIRRIGATION** 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	**DESIGNANDLAYOUTOFSUB-SURFACEIRRIGATION** 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 -Gain confidence with the exposure to different water saving micro irrigation system along side the field oriented designs and layouts.

CO2-Gain fundamental knowledge on the concepts and design of drip irrigation system

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CO3-Make the students understand the concepts and design of sprinkle rirrigation system

CO4-Gain fundamental knowledge on the concepts and design of surge irrigation system

CO5 -Able to design cost effective micro-irrigation layouts benefitting them for sustained productivity alongside optimal water usage even under scarcity situations.

TEXT BOOKS:

T1 Dilip Kumar Majumdar., "Irrigation Water Management", Prentice-Hall of India, New Delhi, 2008.

T2 Michael, A.M., "Irrigation Engineering", Vikas Publishers, NewDelhi,2008

REFERENCE BOOKS:

R1 Basak, N.N., "Irrigation Engineering", Tata McGraw- Hill Publishing Co, New Delhi, 2008.

R2 G Murthy, V .V. N. Land and water management ,Kalyani publishing, NewDelhi,1998

PO & PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PS
CO1	2	2	2	-	-	-	-	-	-	-	-	2	3	
CO2	3	3	3	3	-	-	2	-	2	1	1	2	3	
CO3	3	3	3	3	-	-	2	-	2	1	1	2	3	
CO4	1	-	2	2	-	-	-	-	-	-	-	2	3	
CO5	1	-	-	-	-	-	-	-	-	-	-	2	3	
Avg	2	1.6	2	1.6		-	0.8	-	0.8	0.4	0.4	2	3	

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B. TECH (HONS) AGRICULTURAL ENGINEERING (2022 Batch)

(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**
Off-Road Vehicle Engineering	Open Channel Flow	Industrial Processing of Foods and Beverages	Solar radiation and measurements	Big Data Processing
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
Tractor Systems Design -I	Watershed Management and Modelling	Food Plant and Equipment Design	Basics of Agronomic practices and components	Deep Learning Foundations and Applications
Tractor Systems Design -II	Water Systems' Simulation And Modelling	Robotics In Food Processing And Handling	Analysis of Agrivoltaics system for Energy food and water production	Graph Machine Learning: Foundations and Applications
Energy Conservation and Management in Farm Power and Machinery	Modelling Soil Erosion Processes	Food Process Modelling	Design and installation of Agrivoltaics System	AI Applications in Agriculture
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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Valley Campus, Coimbatore - 641 032

B. E (HONS) AGRICULTURAL ENGINEERING (2021 Batch)

(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	**21AG7204**	**21AG7205**	**21AG7206**	**21AG7207**
Tractor Systems Design -II	Water Systems Simulation And Modelling	Robotics In Food Processing And Handling	Analysis of Agrivoltaics system for Energy food and water production	Graph Machine Learning: Foundations and Applications
21AG7252	**21AG7253**	**21AG7254**	**21AG7255**	**21AG7256**
Energy Conservation and Management in Farm Power and Machinery	Modelling Soil Erosion Processes	Food Process Modelling	Design and installation of Agrivoltaics System	AI Applications in Agriculture
21AG8208	**21AG8209**	**21AG8210**	**21AG8211**	**21AG8212**
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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scheduling of operations

CO4 To analysis and predict the future state of a system based on the current state of farm power availability and resource utilization

CO5 To design and invent a new strategies for selection of power units and to optimize the mechanization system

TEXT BOOKS

T1: Carville LA. 1980. Selecting Farm Machinery. Louisiana Cooperative Extn. Service Publication.

T2: Culpin C & Claude S.1950. Farm Mechanization; Costs and Methods. McGraw Hill

T3: Culpin C & Claude S. 1968. Profitable Farm Mechanization

T4: Crosby Lockwood & Sons. FAO.1984. Agricultural Engineering in Development: Selection of Mechanization Inputs. Agricultural Service Bulletin.

T5: Waters WK. 1980. Farm Machinery Management Guide. Pennsylvania Agric. Extn. Service Spl. Circular No.1992.

REFERENCE BOOKS

R1: Hunt D. 1977. Farm Power and Machinery Management. Iowa State University Press

R2: Kepner RA, Bainer R & Berger EL. 1978. Principles of Farm Machinery. AVI Publ. Co.

R3:Getzlaff GE. 1993. Comparative Studies on Standard Plough Body. Engineering Principles of Agricultural Machines. ASAE Text Book No. 6

R4:Klenin NI, Popov IF & Sakoon VA. 1987. Agricultural Machines. Theory of Operations, Computing and Controlling Parameters and the Condition of Operation. Amrind Publ. Co.

R5: Santhosh Gupta. 1979. Research Methodology and Statistical Techniques. Khanna Publ.

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

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Programme	Course Code	Name of the Course	L	T	P	C
B.E	21AG8208	OPERATIONS RESEARCH IN FARM POWER & MACHINERY MANAGEMENT	3	0	0	3

Objective

To acquaint and equip with the mechanization status in the country and management techniques for future requirements.

Unit	Description	Instructional Hours
I	**SCOPE OF OPERATIONAL RESEARCH** Nature, methods, impact and scope of operational research; linear programming and integer programming models and applications. Network terminology, shortest route and minimal spanning tree problems, maximal flow problem, project planning and control with PERT and CPM.	9
II	**SELECTION PROCEDURE FOR FARM MACHINERY** System approach in farm machinery management and application of programming techniques to the problems of farm power and machinery selection.	9
III	**MAINTENANCE AND SCHEDULING OF FARM OPERATIONS-I** Maintenance and scheduling of operations. Replacement of old machines, repair and maintenance of agricultural machinery, inventory control of spare parts, work study, productivity, method study.	9
IV	**MAINTENANCE AND SCHEDULING OF FARM OPERATIONS-II** First order Markov chains and their applications in sales forecasting and in problems of inventory control and modeling of workshop processes and quality control.	9
V	**TIME AND MOTION STUDY FOR FARM OPERATION** Time and motion study. Man-machine task system in farm operations, planning of work system in agriculture. Computer application in selection of power units and to optimize mechanization system.	9
	Total Instructional Hours	45

Course Outcomes

The students will be able

CO1 To understand the scope of operational research and project planning and control in farm power management during the crop production

CO2 To understand the selection Procedure of machinery for various farm operation

CO3 To apply their knowledge on maintenance of farm machinery and

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Course Outcome

CO1: To understand the crop weather relationship for structuring the models

CO2: To gain the knowledge on different types of crop models with remote sensing inputs

CO3: To apply the weather and physiology based approaches to simulate the yield prediction models

CO4: To analyze the crop weather simulation models for different types of crops

CO5: To assess the application of plant growth simulation models for future trends and advances.

TEXT BOOKS:

T1 M. Mohanty, 2015, Crop Growth Simulation Modeling and Climate Change, Scientific Publishers India.

T2 Ria Biswas and Banjul Bhattacharyya, 2020, Statistical Study on Weather Based Crop Modelling & Yield Forecasting, LAP Lambert Academic Publishing.

REFERENCE BOOKS:

R1 Bishnoi OP. 2007. Principles of Agricultural Meteorology. Oxford Book Co.

R2 Hanks RJ. 1974. Model for Predicting Plant Yield as Influenced by Water Use. Agron. J. 66: 660- 665.

R3 Allen R. Overman et al, 2002, Mathematical Models of Crop Growth and Yield, CRC Press Inc; 1st edition.

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

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Programme	Course Code	Name of the Course	L	T	P	C
B.E	21AG8209	PLANT GOWTH MODELLING AND SIMULATION	3	0	0	3

Course Objective

- To learn to formulate mathematical models representing various plant growth processes and their interactions.
- To develop proficiency in using simulation software to model plant growth and analyses simulated outcomes.

Unit	Description	Instructional Hours
I	**INTRODUCTION TO PLANT GROWTH MODELS** Evaluation of crop responses to weather elements - impact of natural and induced variability of climate on crop production - steps in modeling - importance and usage of models - types of models - Basic Structure of the Model	9
II	**CROP MODELS TYPES I** Concepts of mechanistic and deterministic models - empirical and statistical crop weather models - regression models-incorporating weather, soil, plant and other environmental related parameters and remote sensing inputs	9
III	**CROP MODESL TYPES II** Growth and yield prediction models - general features of dynamic and statistical modeling techniques - weather data and physiology based approaches to modeling of crop growth and yield -stochastic models.	9
IV	**CROP WEATHER SIMULATION MODELS** Application – advantages and limitations of Crop simulation models – CERES – WOFOST – DSSAT – APSIM –CropSyst - verification, calibration and validation of models.	9
V	**FUTURE TRENDS** Use of crop simulation model in determining climatic change - greenhouse effect - CO_2 increase - global warming and their impact on agriculture – future trends	9
	Total Instructional Hours	45

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Programme	Course Code	Name of the Course	L	T	P	C
B.E	21AG8210	MARKETING OF FOOD AND AGRICULTURAL MARKETING	2	0	0	2

Course Objectives

1. Define agricultural marketing and understand its scope and importance in economic development.
2. Examine the roles of buyers, sellers, and intermediaries in agricultural markets and their impact on pricing, product quality, and market access.
3. Identify the role and importance of regulated markets in improving agricultural marketing practices, focusing on their features, functions, progress, and defects.
4. Analyze the operational processes of warehouses, including storage, handling, and distribution, and evaluate their advantages in reducing post-harvest losses.
5. Explore measures to minimize risks in agricultural marketing, including insurance, futures trading, hedging, and diversification.

Unit	Description	Instructional Hours
I	**Agricultural Marketing** Agricultural Marketing – Meaning – Definition – Scope – Subject matter – Importance of Agricultural Marketing in economic development - Classification of markets – On the basis of location, Area of coverage, time span, volume of transaction, nature of transaction, number of commodities, degree of competition, nature of commodities, stage of marketing	9
II	**Marketing functions** Marketing functions – Meaning – Assembling – Grading and standardization – Transportation – Storage – Processing – Packing – Distribution – Buying and Selling – Financing – Risk bearing – Marketing intelligence- Market functionaries – Producers – Middlemen (Merchant middlemen, Agent middlemen, Speculative middlemen, Processors, Facilitative middlemen)- problems in marketing of agricultural commodities	9
III	**Remedial measures** Remedial measures-Regulated markets-definition-important features of regulated markets, functions, progress and defects - Cooperative marketing-meaning-structure- Functions of cooperative marketing societies-National Agricultural Cooperative Marketing Federation (NAFED) and State Agricultural Cooperative Marketing Federations (MARKFED)- State Trading-objectives-Types of state trading.	9

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IV	**Warehousing** Warehousing-meaning- warehousing in India- Central Warehousing Corporation(CWC)- working of warehouses -advantages- State Warehousing Corporations (SWC)- Food Corporation of India(FCI)- objectives- functions- Quality control-Agricultural products-AGMARK-CODEX Need of CODEX certification- Relevance	9
V	**Risks on marketing** Risks on marketing-meaning-types of risks- measures to minimize risks-future trading-meaning-commodities for future trading -contract farming/contract farming- Price forecasting- The General Agreement on Trade and Tariffs (GATT) - World Trade Organization (WTO) Agreement on Agriculture (AOA)	9
	Total Instructional Hours	**45**

COURSE OUTCOMES

The students completing the course will have:

CO1: Define agricultural marketing, explain its significance, and outline its scope and subject matter in the context of economic development.

CO2: Understand the specific roles and importance of each type of market functionary in the marketing chain for agricultural commodities.

CO3: Explain the primary functions of regulated markets, such as price discovery, quality control, and dispute resolution.

CO4: Analyze the role of warehousing in improving the efficiency of agricultural marketing in India.

CO5: Analyze the role of technology and data analytics in reducing risks in agricultural marketing.

TEXT BOOKS:

T1 Acharya S.S and Agarwal NL, 2006, Agricultural Marketing in India. Oxford & IBH Publishing Co.Pvt.Ltd. New Delhi

T2 Kahlon, A.S and Tyagi.D S, 1983 Agricultural Price Policy in India. Allied Publishers Pvt. Ltd., New Delhi.

T3 Kulkarni, K R.1964, Agricultural Marketing in India. The Co-operators Books Depot, Mumbai.

REFERENCE BOOKS:

R1 Mamoria, C.B. and Joshi. R L.1995, Principles and Practices of Marketing in India, Kitab Mahal, Allahabad

R2 Subba Reddy, S., P.Raghu Ram, P. Sastry, T.V.N. and Bhavani Devi I. 2010.

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Agricultural Economics., Oxford & IBH Publishing Company Private Ltd., New Delhi, 2010

R3 Mamoria, C.B., 1973., Agricultural Problems in India, Kitab Mahal, Allahabad

Co No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P010	PO11	PO12	PSO1	PSO2
1	2	3	2	3	2	2	2	2		1	1	1	2	3
2	3	3	3	2	3	3	2	1	1	3	1	2	3	2
3	2	3	2	3	2	3	2	2		2	2	2	3	2
4	1	3	3	2	2	3	2	2	1	1	2	3	2	2
5	2	3	2	3	2	2	3	1		2	1	2	2	3
Avg	2	3	2.4	2.6	2.2	2.6	2.2	1.8	1	1.8	1.4	2	2.4	2.4

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	21AG8314	Cost Analysis and Standards	3	0	0	3

Course Objective

The students will be able

- To acquire a comprehensive understanding of the various cost components associated with Agri-Voltaics
- To gain knowledge of international and national standards relevant to Agri-Voltaics systems

S.No	Description	Instructional Hours
1.	**Economic Analysis** Cash flow analysis - Net Present Value (NPV) - Internal Rate of Return (IRR) - Payback period- Levelized Cost of Energy (LCOE)- Sensitivity Analysis	9
2.	**Financing Analysis** Loans and debt financing - Equity financing - Government subsidies and incentives - Power Purchase Agreements (PPAs)	9
3.	**Agrivoltaics system cost analysis** Initial Capital Costs - Land Acquisition and Preparation - Soil testing and improvement - System Installation Costs - Civil Works - Monitoring and Control System Costs	9
4.	**Introduction to Standards and Regulations** Standards and regulations in the renewable energy sector - International standards: IEC, IEEE- -National and local regulations Building codes, electrical safety standards, and land use regulations Grid connection requirements and net metering policies	9
5.	**Standards for PV Systems** Module performance and testing standards: IEC 61215, IEC 61701 Inverter standards: UL 1741, IEC 62109 - Racking and mounting system standards: Local building codes and industry standards - Cable and wiring standards: NEC, IEC standard	9
	Total Instructional Hours	45

Course Outcome

During this course, students have the ability

CO1 To provide with comprehensive understanding of the economic aspects of Agri-Voltaics systems

CO2 To conduct detailed cost analysis, financial modeling, and economic evaluation of Agri-Voltaics projects.

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CO3 To apply cost analysis techniques in real-world Agri-Voltaics projects
CO4 To familiarize students with national and international standards for agri-voltaic systems.
CO5 To understand and comply with safety, electrical, and structural standards to ensure the safe and reliable operation of Agri-Voltaics systems.

TEXT BOOKS:

T1 Wulfmeyer, Volker, et al., "Agri-Photovoltaics: Synergy of Agriculture and Solar Energy", Springer, 2021

T2 "Standards for Solar Photovoltaic Systems", International Electrotechnical Commission (IEC), 2022

REFERENCE BOOKS:

R1 Solanki, Chetan Singh, "Solar Photovoltaics: Fundamentals, Technologies and Applications", PHI Learning, 2011.

R2 Friedrich, Theodor, and Moore, John Kenneth, "Renewable Energy in Agriculture: A Sustainable Development Perspective", FAO, 2019.

PO & PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO
CO1	1	3	2	1	-	1	1	1	1	1	1	1	2	1
CO2	2	3	3	2	2	1	1	1	1	1	1	2	3	2
CO3	2	3	3	2	2	1	1	1	1	1	1	2	3	2
CO4	1	2	1	1	-	1	1	1	1	1	1	1	2	1
CO5	1	1	1	1	-	1	1	1	1	1	1	1	1	1
Avg	1.4	2.4	2	1.4	2	1	1	1	1	1	1	1.4	2.2	1.

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Programme	Course Code	Name of the Course	L	T	P	C
B.Tech.	22AG6371	Design of Farm machinery and System	3	0	0	3

Course Objective

- To understand the interaction of tillage tools with soil.
- To understand design the components of the tillage tools based on their requirement
- To learn how the systems of planting machinery are designed.

Unit	Description	Instructional Hours
I	**FARM MACHINERY DESIGN** Farm machinery design: Modern trends, tasks and requirements, economic considerations of durability, reliability and rigidity. Physico-mechanical properties of soils. Mechanics of tillage – Wedge theory. Working process of mould board plough, determination of basic parameters. Design of coulters, shares, mould boards	9
II	**CONSTRUCTING OF MOULD BOARD AND PLOUGH** Constructing of mould board working surface. Design of landside, frog, jointer. Forces acting on plough bottom and their effect on plough balance: Trailed, semi mounted and mounted plough. Draft on ploughs, resistance during ploughing. Design disk ploughs: Concave disk working tools, forces acting	9
III	**MACHINES AND IMPLEMENTS** 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
IV	**METHODS OF SOWING** Methods of sowing and planting: Machines, agronomic specifications. Sowing inter- tilled crop. Grain hoppers: Seed metering mechanism, furrow openers and seed tubes	9
V	**FERTILIZER AND PLANTING** 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
	Total Instructional Hours	45

Course Outcome

CO1: The student will be able to appreciate the principles behind the design of tillage tools
CO2: Apply knowledge of constructing of mould board and plough
CO3: Able to arrive at Machines and implements for surface and inter row tillage
CO4: Apply the knowledge of methods of sowing
CO5: Choose and design appropriate planting machinery and fertilizer.

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TEXT BOOKS:

T1 Bernacki C, Haman J and Kanafajski Cz. 1972. Agricultural Machines Theory and Construction. Vol.I. U.S. Dept. of Commerce, National Technical Information Service, Springfield, Virginia 22151.

T2 Bosoi ES, Verniaev OV, Smirnov II and Sultan-Shakh EG. 1990. Theory, Construction and Calculations of Agricultural Machinery - Vol. I. Oxonian Press Pvt. Ltd. No.56, Connaught Circle, New Delhi.

REFERENCE BOOKS:

R1 Gill R and Vanden Berg GE. 2013. Soil Dynamics in Tillage and Traction. Scientific Publishers (India) ISBN-10: 8172338031

R2 Yatsuk EP 1981. Rotary Soil Working Machines Construction, Calculation and Design. American Publishing Co. Pvt. Ltd, New Delhi.

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	2	3	2
CO2	3	2	3	2	1	2	2	-	2	-	2	3	2	2
CO3	3	2	3	2	2	1	2	-	1	-	1	2	2	2
CO4	3	2	2	3	3	3	3	-	2	-	1	2	2	2
CO5	3	2	3	3	3	3	3	-	3	-	1	2	2	2
Avg	3	2	2.8	2.2	2.2	2	2.2	-	1.8	-	1.2	2.2	2.2	2

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Programme	Course Code	Name of the Course	L	T	P	C
B.Tech.	22AG6372	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

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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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VERTICALS FOR MINOR DEGREE

AGRICULTURAL ENGINEERING OFFERING MINOR DEGREE (2022 Batch)

S. NO	COURSE CODE	COURSE TITLE	COURSE CATEGORY	L	T	P	C	TCP	CIA	ESE	TOTAL
1.	22AG5471	AGRICULTURE FOR ENGINEERS	MDC	3	0	0	3	3	40	60	100
2.	22AG6471	SOIL & WATER CONSERVATION	MDC	3	0	0	3	3	40	60	100
3.	22AG6472	FARM MACHINERY AND EQUIPMENT'S	MDC	3	0	0	3	3	40	60	100
4.	22AG7471	FUNDAMENTALS OF FOOD PROCESS ENGINEERING	MDC	3	0	0	3	3	40	60	100
5.	22AG7472	NON-CONVENTIONAL ENERGY SOURCES	MDC	3	0	0	3	3	40	60	100
6.	22AG8471	INTEGRATED ON FARM	MDC	3	0	0	3	3	40	60	100

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Programme	Course Code	Name of the Course	L	T	P	C
B.Tech.	22AG6471	SOIL & WATER CONSERVATION ENGINEERING	3	0	0	3

Course Objective

- To impart a thorough knowledge and understanding of the basic concepts of soil erosion
- To get a basic idea about the water erosion and its control
- To enable the students to know about the wind erosion and its control applicability of rainwater harvesting systems.
- To study about design of sediment detention tanks

Unit	Description	Instructional Hours
	MECHANICS OF WATER AND WIND EROSION	
I	SoilErosion–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– typesofwatererosion-SpecialformsofErosion.	9
	WATER EROSION AND CONTROL	
II	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
	WIND EROSION , ESTIMATION AND CONTROL	
III	Erosion due to wind – Mechanics of wind Erosion :Inititation of movement , Transportation , Deposition -Estimation of soil loss due to wind erosion - Wind Erosion control – Vegetative measures – Mechanical measures	9
	SEDIMENTATION AND SEDIMENTATION YIELD ESTIMATION	
IV	Sedimentation of water resources - Mechanicsofsedimenttransport– Sediment transport and measurements – stream sediment measurements – reservoir sedimentations -soil loss/ sediment yield estimation – erosivity and Erodibility - Estimation of USLE Parameters - SiltDetention Tanks	9
V	**WATER HARVESTING AND WATER POLLUTION & QUALITY**	9

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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 .

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., "Soi land Water Conservation Engineering", Standard Publication,NewDelhi,2007.

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

T3 "SedimentationEngineering",2006,ASCE manual and Report on Engineering PracticeNo.54,Edited byVito 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 waterconservation.CRCPress;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, NewDelhi,1982.

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

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R4 Sidle RC, Pearce AJ, O' Loughlin CL. Hill slope stability and landuse. American geophysical union;1985.

R5 Ohlig CP, editor. Integrated Land and Water Resources Management in History: Proceedings of the Special Session on History, May16th,2005. BoD–BooksonDemand;2005.

PO&PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PS
CO1	2	-	2	-	-	2	2	-	2	-	2	-	3	
CO2	3	-	2	-	-	2	3	-	2	-	2	-	3	
CO3	3	3	2	-	-	2	3	-	3	-	2	-	2	
CO4	2	-	2	-	-	2	3	-	2	-	2	-	3	
CO5	2	-	2	-	-	3	2	-	2	-	2	-	3	
Avg	2.4	3	2	-	-	2.2	2.6	-	2.2	-	2	-	2.8	

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Programme	Course Code	Name of the Course	L	T	P	C
B.Tech.	21AG6472	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

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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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Programme	Course Code	Name of the Course
B.Tech.	22AGVAC01	NURSERY TECHNOLOGIES

Course Objective

- To learn about nursery techniques propagation structures and equipment's followed for Horticultural crops.
- To learn about sexual and vegetative propagation techniques followed for horticultural crops .

Unit	Description	Instructional Hours
I	**NURSERY CARE MANAGEMENT** Planning and layout of nurseries – Media for propagating and growing nursery plants – Propagation structures and equipment's – Sanitation – Care and handling of nursery plants – nutrition management for nursery plants - Pest and disease management of nursery plants.	7
II	**SEXUAL PROPAGATION AND ASEXUAL PROPAGATION** Introduction – Advantages and limitations of Sexual propagation and Asexual propagation - Raising nursery for seedlings-techniques, portray nursery. Propagation by specialized vegetative structures: Bulbs – tubers – Tuberous roots and stems – Corms – Rhizomes – Runners – Offsets – Suckers.	7
III	**PROPAGATION TECHNIQUES I** Cuttings - Types of cuttings – use of plant growth regulators in rooting – Layering -Types of layering- Problems of horticulture crops - Factors influencing rooting of cutting and layering.	7
IV	**PROPAGATION TECHNIQUES II** Grafting - Methods of grafting – Budding - Methods of budding – Bud certification programme - Factors affecting graft union and formation - Requirements – Methods of culturing plant tissues and organs – Advantages and Limitations.	7
V	**ENTREPRENEURSHIP** Common possible errors in nursery activities - Economics of nursery development –pricing - record maintenance - Online nursery information and sales systems - Case study on establishment and success of a plant nursery.	7
	Total Instructional Hours	35

Course Outcome

- To understand the planning and lay out of nursery for horticultural crops.
- To understand the propagation by specialized vegetative structures.
- To gain the knowledge on different types of cuttings and layering with examples
- To demonstrate expertise related to various practices in a nursery.
- To comprehend knowledge and skills to get an employment or to become an entrepreneur in plant nursery sector.

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TEXT BOOKS:

T1 Dr. Arun kumar Singh and Abhinav kumar (2020). Propagation and nursery management.

T2 R.R.Sharma and Manish Srivastav (2004). Plant propagation and nursery management.

REFERENCE BOOKS:

R1 B.S. Chundawat (2017). Plant propagation and nursery management.

R2 Ratha Krishnan, M., et.al. (2014) Plant nursery management: Principles and practices

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

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PROGRAMME	COURSE CODE	NAME OF THE COURSE
B.Tech.	22AGVAC03	PRACTICE OF CONSTRUCTION IN WATER HARVESTING STRUCTURE IN FARM LAND

Course Objective

- To understand basic of water harvesting.
- To get acquainted different water harvesting techniques.
- To interpret Rooftop Rainwater Harvesting in Domestic
- To understand different water storage structures, their planning, design and construction
- To interpret the Construction of Water Harvesting Structures

Unit	Description	Instructional Hours
I	**Introduction of water Harvesting** Key Aspects of Harvesting, Timing, Techniques, Post-harvest Handling, Economic Impact.	6
II	**Water Harvesting Techniques in Crop Field** Water Harvesting Techniques-Contour Bunding, Bench Terracing, Contour Trenching, Farm Pond, Percolation pond.	6
III	**Rooftop Rainwater Harvesting in Domestic** Types and Components-Domestic, Filtration and Purification of Water-Container, Perforated plate.	6
IV	**Planning and Design of Water Harvesting Structures** Site Selection, Design Considerations, Storage Capacity-Water Demand, Crop water demand, Loss of Water from the Reservoir Pond, Control of Seepage Loss	6
V	**Construction of Water Harvesting Structures** Construction of Contour Bunding, Bench Terracing, Contour Trenching, - Farm Pond, Percolation pond, Rooftop	6
	Total Instructional Hours	30

Course Outcome

- To get knowledge of basic water harvesting.
- To get acquainted different water harvesting techniques.
- To interpret Rooftop Rainwater Harvesting in Domestic
- To get basic concept different water storage structures, their planning, design and construction
- To get basic Construction of Water Harvesting Structures.

TEXT BOOKS:

T1 Concepts and Practices for Rainwater Harvesting 2001. Central Pollution Control Board, Ministry of Environment and Forest, pp. 36

T2 Michael, A.M., Khepar, S. D. and Sondhi, S. K. 2008. Water Wells and Pumps. Tata McGraw-Hill Publishing Company Ltd, New Delhi, pp. 695.

REFERENCE BOOKS:

R1 Michael, A.M. 2008. Irrigation Theory and Practices. Vikash Publishing House Pvt. Ltd., New Delhi.768p.

R2 Michael, A.M. and Ojha, T.P.2006. Irrigation Theory and Practices. Jain

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Brothers, New Delhi.888p.

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	2	3	2
CO2	3	1	2	1	1	1						1	2	2
CO3	3	2	2	1	1	1						1	2	2
CO4	3	1	2	1	1	1	2				1	1	2	2
CO5	3	2	2	1	2	1	1				1	1	2	2
Avg	3	2	2	1	1	1	1				1	1	2	2

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Syllabus Revision carried out in 2024-2025 ODD Semester

2022 Regulation (2023 Batch) - I semester = 3.2 %

2022 Regulation (2022 Batch) - III semester = 5.3 %

2019 Regulation with amendments (2021 Batch) - VII semester = 7.1 %

Overall Syllabus Revision carried out in 2024-2025 ODD Semester = **15.6 %**

New Courses Introduced = 12

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