

DR. BABASAHEB AMBEDKAR MARATHWADA UNIVERSITY**CIRCULAR NO.SU/Engg./B.Tech./70/2022**

It is hereby inform to all concerned that, the syllabi prepared by the Board of Studies & recommended by the Dean, Faculty of Science & Technology, **the Academic Council at its meeting held on 01 November 2021 has accepted revised following syllabus of Bachelor of Technology Third Year (Vth & VIth semester) in accordance with Choice Based Credit & Grading System as per guidelines of AICTE as appended herewith.**

Sr.No.	Syllabi as per CBC & GS
[1]	B.Tech. [Civil Engineering],
[2]	B.Tech. [Mechanical Engineering],
[3]	B.Tech. [Plastic and Polymer Engineering],
[4]	B.Tech. [Electronics and Telecommunication Engineering],
[5]	B.Tech. [Electrical Engineering],
[6]	B.Tech. [Computer Science & Engineering].
[7]	B.Tech.[Agricultural Engineering]

This is effective from the Academic Year 2021-22 and onwards.

All concerned are requested to note the contents of this circular and bring the notice to the students, teachers and staff for their information and necessary action.

University Campus,
Aurangabad-431 004.
REF.NO.SU/2022/ 6330-38
Date:- 07.01.2022.

★
★
★
★

*Deputy Registrar,
Academic Section*

Copy forwarded with compliments to :-

- 1] **The Principal of all concerned Colleges,**
Dr. Babasaheb Ambedkar Marathwada University,
- 2] **The Director, University Network & Information Centre, UNIC, with a request to upload this Circular on University Website.**

Copy to :-

- 1] **The Director, Board of Examinations & Evaluation, Dr.BAMU,A'bad.**
- 2] The Section Officer,[Engg.Unit] Examination Branch,Dr.BAMU,A'bad.
- 3] The Programmer [Computer Unit-1] Examinations, Dr.BAMU,A'bad.
- 4] The Programmer [Computer Unit-2] Examinations, Dr.BAMU,A'bad.
- 5] The In-charge,[E-Suvidha Kendra], Rajarshi Shahu Maharaj Pariksha Bhavan, Dr.BAMU,A'bad.
- 6] The Public Relation Officer, Dr.BAMU,A'bad.
- 7] The Record Keeper, Dr.BAMU,A'bad.

**Dr. Babasaheb Ambedkar Marathwada University,
Aurangabad**



**Revised Syllabus of Third Year (TY) Bachelor of
Technology**

Agricultural Engineering

(V & VI Semester)

Under Choice Based Credit System (CBCS)

Under Faculty of Science and Technology

(Effective from 2021-22 and onwards)

FACULTY OF SCIENCE AND TECHNOLOGY
Syllabus Structure w.e.f. 2021-2022 (Choice Based Credit System)

TY B. Tech. (Agricultural Engineering)

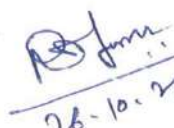
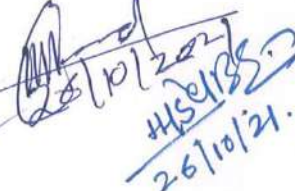
Semester-V

Course Code	Course Name	Teaching Scheme (Hrs/Week)			Examination Scheme and Marks							Credits			
		Theory	Tutorial	Practical	MSE-I	MSE-II	TA	ESE	TW	PR/OR	Total	TH	TUT	TW/PR	Total
AED301	Watershed Hydrology and Management	3	-	-	15	15	10	60	-	-	100	3	-	-	3
AED302	Irrigation and Drainage Engineering	3	-	-	15	15	10	60	-	-	100	3	-	-	3
BSH303	Managerial Economics, Finance & Costing	3	-	-	15	15	10	60	-	-	100	3	-	-	3
AED341-AED343	Professional Elective Course-II	3	-	-	15	15	10	60	-	-	100	3	-	-	3
	Open Elective-I	3	-	-	15	15	10	60	-	-	100	3	-	-	3
AED321	Lab: Watershed Hydrology and Management	-	-	2	-	-	-	-	-	25	25	-	-	1	1
AED322	Lab: Irrigation and Drainage Engineering	-	-	2	-	-	-	-	-	25	25	-	-	1	1
AED323-325	Lab: Professional Elective Courses-II	-	-	2	-	-	-	-	25	-	25	-	-	1	1
AED326	Minor Project	-	-	2	-	-	-	-	25	-	25	-	-	1	1
AED327	Lab: Soil Science and Agricultural Chemistry	-	-	2	-	-	-	-	-	25	25	-	-	1	1
AED328	Lab: Experiential/ Problem Based Learning	-	-	2	-	-	-	-	25	-	25	-	-	1	1
		15	-	12	75	75	50	300	75	75	650	15	-	6	21

Semester-VI

Course Code	Course Name	Teaching Scheme (Hrs/Week)			Examination Scheme and Marks							Credits			
		Theory	Tutorial	Practical	MSE-I	MSE-II	TA	ESE	TW	PR/OR	Total	TH	TUT	TW/PR	Total
AED351	Soil and Water Conservation Engineering	3	-	-	15	15	10	60	-	-	100	3	-	-	3
AED352	Micro Irrigation System Design	3	-	-	15	15	10	60	-	-	100	3	-	-	3
AED353	Drying and Storage Engineering	3	-	-	15	15	10	60	-	-	100	3	-	-	3
AED391-393	Professional Elective Course-III	3	-	-	15	15	10	60	-	-	100	3	-	-	3
	Open Elective-II	3	-	-	15	15	10	60	-	-	100	3	-	-	3
AED371	Lab: Soil and Water Conservation Engineering	-	-	2	-	-	-	-	-	25	25	-	-	1	1
AED372	Lab: Micro Irrigation System Design	-	-	2	-	-	-	-	-	25	25	-	-	1	1
AED373	Lab: Drying and Storage Engineering	-	-	2	-	-	-	-	-	25	25	-	-	1	1
AED 374	Major Project-I	-	-	4	-	-	-	-	-	50	50	-	-	2	2
AED 375	Lab: Renewable Energy and Green Technology	-	-	2	-	-	-	-	25	-	25	-	-	1	1
	Mandatory Non-credit Course (Audit Course)	2													
		17	-	12	75	75	50	300	25	125	650	15	-	6	21

MSE- Mid Semester Exam, ESE- End Semester Examination, TH-Theory, OR- Oral, TA-Teacher Assessment, TW- Term Work, PR- Practical, Tut- Tutorial

 26-10-21
 N. K. P.
 26/10/21
 26/10/21
 26/10/21

Professional Elective Courses-II (Semester-V)

Group A	Group B	Group C
AED341: Green House Technology	AED342: Fundamentals of Renewable Energy	AED343: Food Process and Preservation Engineering

Professional Elective Courses-III (Semester-VI)

Group A	Group B	Group C
AED391: Post Harvest Engineering	AED392: Agricultural Structures and Management	AED393: Food Quality and Packaging

List of Open Elective-I (Semester V)

Sr. No.	Offered by Department	Name of Course	Course Code
1.	Agricultural Engineering	Statistical Methods in Engineering	AED331
2.	Civil Engineering	Environmental Impact Assessment	CED331
3.	Computer Science and Engineering	Artificial Intelligence and its Applications	CSE331
4.	Electrical Engineering	Special Purpose Machines	EED331
5.	Electronics and Telecommunications Engineering	Electronic Product Design	ETC331
6.	Mechanical Engineering	Operations Research	MED331
7.	Plastic and Polymer Engineering	Introduction to Nanotechnology	PPE331

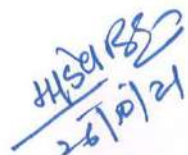
List of Open Elective-II (Semester VI)

Sr. No.	Offered by Department	Name of Course	Course Code
1.	Agricultural Engineering	Fundamentals of Bioenergy	AED381
2.	Civil Engineering	Solid Waste Management	CED381
3.	Computer Science and Engineering	Information & Cyber Security	CSE381
4.	Electrical Engineering	Electrical Materials	EED381
5.	Electronics and Telecommunications Engineering	Internet of Things	ETC381
6.	Mechanical Engineering	Industry 4.0	MED381
7.	Plastic and Polymer Engineering	Polymer Recycling and Waste Management	PPE381

Mandatory Non-Credit Course (Audit Course) (Semester VI)

Sr. No.	Offered by Department	Course	Course Code
1.	First Year	German Language	BSH807
2.	First Year	Japanese Language	BSH808
3.	Civil Engineering	Professional Ethics and Constitution of India	CED801
4.	Computer Science and Engineering	Green Computing	CSE801
5.	Electronics and Telecommunications Engineering	Smart Cities	ETC801
6.	Mechanical Engineering	Research Methodology	MED801
7.	Plastic and Polymer Engineering	Industrial Safety and Management	PPE801




Dr. Babasaheb Ambedkar Marathwada University, Aurangabad (Faculty of Science & Technology) Syllabus of Third Year B. Tech. (Agricultural Engineering) Semester V					
Course Code: AED301 Course: Watershed Hydrology & Management Teaching Scheme: Theory: 03 Hrs/week			Credits: 3-0-0 Mid Semester Examination-I: 15 Marks Mid Semester Examination-II: 15 Marks Teacher Assessment: 10 Marks End Semester Examination: 60 Marks End Semester Examination (Duration): 3 Hrs		
Prerequisite	Basic knowledge about hydrological cycle and catchment				
Objectives	1. To refine the understanding of the patterns and processes of water movement, storage, and transformation in the environment. 2. To study the influence of weather in transformation and movement of water on the earth's surface. 3. To study measurement techniques, data sources, analytical methods and theories used to understand flows of water on the earth's surface for watershed management.				
Unit-I	Introduction- Basic terminologies, scope of hydrology hydrologic cycle, Water balance equation, Instrumentations used for measurement of hydrological data, various hydrological data required for hydrological projects (6 Hrs)				
Unit-II	Precipitation - forms, types of precipitation, rainfall measurement, mass curve, hyetograph, mean rainfall depth estimation methods, DAD curve, frequency analysis of point rainfall, plotting position, estimation of missing data (6 Hrs)				
Unit-III	Water loss Estimation- interception, infiltration, seepage, evaporation, transpiration, Evapotranspiration - estimation and measurement. (6 Hrs)				
Unit-IV	Runoff - factors affecting, measurement, stage and velocity, rating curve, extension of rating curve, estimation of peak runoff rate- rational method, Cook's method, SCS method and volume by Curve Number method (6 Hrs)				
Unit-V	Hydrograph- Basic terminologies, components, base flow separation, unit hydrograph theory - unit hydrograph of different durations, dimensionless unit hydrograph, synthetic unit hydrograph, uses and limitations of unit hydrograph (6 Hrs)				
Unit-VI	Geomorphology of watersheds: Watershed, classifications, basic terminology, Watershed characteristics: stream number, stream length, stream area, stream slope and Horton's laws, Form factor, Circularity ratio, Relief, numerical (6 Hrs)				
Textbook/ Reference Books	Sr. No.	Title	Author	Publication	Edition
	1.	Engineering Hydrology	K. Subramanya, Publisher	Tata McGraw Hill book Co.	4
	2.	Hydrology-Principles, Analysis, Design	H. M. Raghunath	New Age International Pvt. Ltd.	3
	3.	Soil & Water Conservation Engineering	R. Suresh	Standard Publishers, New Delhi	5
	4.	Applied Hydrology	K. N. Mutreja,	Tata McGraw Hill book Co.	4

Dr. Babasaheb Ambedkar Marathwada University, Aurangabad (Faculty of Science & Technology) Syllabus of Third Year B. Tech. (Agricultural Engineering) Semester V	
Course Code: AED302 Course: Irrigation and Drainage Engineering Teaching Scheme: Theory: 03 Hrs/week	Credits: 3-0-0 Mid Semester Examination-I: 15 Marks Mid Semester Examination-II: 15 Marks Teacher Assessment: 10 Marks End Semester Examination: 60 Marks End Semester Examination (Duration): 3 Hrs
Prerequisite	Student must: 1 Required basic knowledge of soil mechanics 2. Understand basics of fluid mechanics
Objectives	Water is required for agriculture. Sometimes this requirement is fulfilled by rain, but there are some dry areas where water application to crop is possible only through irrigation. The present study is designed by keeping following objectives in view 1. To introduce the students about various irrigation practices & irrigation management 2. To analyze and design various irrigation systems 3. To inculcate the knowledge about irrigation structures with design 4. To study soil-water-plant relationship and irrigation scheduling
Unit-I	Irrigation Terminologies, Water resources utilization, purpose of irrigation, sources of irrigation water, present status of development and utilization of different water resources of the country. Measurement of irrigation water-Units, Methods of water measurements, weir, notches, flumes and orifices and other methods (6 Hrs)
Unit-II	Water conveyance and Control- Design of irrigation field channels, underground pipe conveyance system, irrigation structures, channel lining (6 Hrs)
Unit-III	Soil-Plant-water relationships - Properties influencing Irrigation, Soil water relation, soil water movement in different conditions, infiltration, soil moisture Characteristics, measurements, plant structure, Terminologies, Evaporation, Potential Evapotranspiration, Net and gross irrigation requirement, Irrigation Efficiency, Irrigation Scheduling & Water management (6 Hrs)
Unit-IV	Water application Methods- Classification, Surface and Subsurface methods of irrigation with design, adaptabilities, its merits, demerits, selection and Design, cost estimation (6 Hrs)
Unit-V	Irrigated agriculture, soil salinity and drainage. Causes and effect of water logging, water logging prevention and control, need for land drainage. Inter-relation of irrigation and drainage, formulating drainage criteria under steady and unsteady state and on basis of dynamic equilibrium concept. Reuse of drainage water, Drainage problem of the state. (6 Hrs)
Unit-VI	Surface And Subsurface drainage: Surface drainage system and components, factors affecting drainage, types of land requiring drainage, design consideration for surface drainage, design of surface drainage system. Special, Drainage systems: mole drains, vertical drainage, bio drainage. Salt accumulation and its causes, influence of salt on physical properties of soil, Reclamation and management of salt affected soils, Leaching requirement. (6 Hrs)

	Sr. No.	Title	Author	Publication	Edition
Textbook/ Reference Books	1	Irrigation Theory & Practice	A.M. Michael	Vikas pub. House, Delhi	2
	2	Irrigation Hydraulics	Dr.Radhey Lal	Saroj Prakashan, Allahabad	1
	3	Land & Water Management Engineering	V. V. N. Murthy	Kalyani Pub. New Delhi	6
	4	Drainage Engineering	J. N. Luthin	Willey Eastern Publication, New Delhi	2
	5	Agricultural Drainage: principles and Practices	U. S. Kadam, R. T. Thokal, S. D. Gorantiwar& A. G. Powar	Westville Publishing House, New Delhi	1

Dr. Babasaheb Ambedkar Marathwada University, Aurangabad (Faculty of Science & Technology) Syllabus of Third Year B. Tech. (All) Semester-V	
Course Code: BSH303 Course: Managerial Economics, Finance and Costing Teaching Scheme: Theory: 03 Hrs/week	Credits: 3-0-0 Mid Semester Examination-I: 15 Marks Mid Semester Examination-II: 15 Marks Teacher Assessment: 10 Marks End Semester Examination: 60 Marks End Semester Examination (Duration): 3 Hrs
Prerequisite	Basic knowledge of concepts of economics.
Objectives	On the completion of this course, the learner will be able to 1. Correlate various micro and macro-economic variables and solve numerical problems 2. Analyze, interpret the financial statements and decide upon the health of a firm. 3. Appreciate and illustrate Economic/Industrial/Trade policies and their implications and Role played by various financial institutions/banks. 4. Apply costing and accounting and costing practices in solving real life problems
Unit-I	Managerial Economics Part-I: Introduction- Economics, basic concepts - utility, wealth, welfare, price, markets, and opportunity cost. Micro - and macro- economics, economics of growth and development. (4 Hrs.)
Unit-II	Managerial Economics Part-II: Demand and supply analysis: Law and elasticity of demand and supply. Demand function. Market structure - competition, monopoly, oligopoly and imperfect competition. Market imperfections and state interventions. Role of government; monetary, fiscal and trade policies, BOP, industrial policy; instruments of government policy; taxation, incentives, budget. Theory of firm: Production and Cost analysis for short run and long run. Cost-Output Relationship: Cost Function, Cost-Output relationships in Short Run and Long Run. Revenue Analysis and Pricing Policies. (8 Hrs.)
Unit-III	Finance Part-I: Introduction, Basic business function, sources of finance and their relative importance. Long- and short-term finance. Fund allocation, alternative uses of finance. Time value of money. Analysis of financial statements –Ratio analysis using balance sheet, profit and loss account. Capital budgeting decisions- type, nature, and evaluation criteria: NPV, IRR, Payback. (6 Hrs.)
Unit-IV	Finance Part-II: Working capital management. Financial markets: money markets, bill market, discount houses, call loan market, etc., Capital markets; mutual funds, stock markets, industrial banks, world bank, UTI, IDBI SEBI and state finance corporations. (6 Hrs.)
Unit-V	Costing Part-I: Cost classification: Cost ascertainment; allocation, apportionment, absorption of overheads and non-production cost; overhead analysis, absorption methods, general considerations. Job costing; factory job costing, contract cost. Unit costing; output and operating cost, simple process costing, normal and abnormal losses in process, waste, scrap, by-and joint products. Marginal costs and breakdown charges. (6 Hrs.)
Unit-VI	Costing Part-II: Cost planning and control, standard cost and budgetary control, setting standards, variance analysis. Cost reduction; tools, techniques, and productivity. Depreciation; causes and significance, methods of providing for depreciation, book values, taxes and depreciation. (6 Hrs.)

	Sr. No.	Title	Author
Reference Books/ Research Articles:	1	Economics, Tata McGraw Hill.	Paul Samuelson and William Nordhaus
	2	Financial Management, McGraw Hill.	Prasanna Chandra
	3	Cost Accounting, Tata McGraw Hill (TMH).	Jawaharlal
	4	Finance Sense - Text and Cases Tata McGraw Hill	Prasanna Chandra
	5	Managerial Economics, Sultan Chand and Sons, New Delhi.	Varshney and Maheshwari
	6	Indian Economy, S. Chand Publication	Ruddar Datt and Sundaram
	7	Financial institutions and markets, McGraw Hill Education.	L.M. Bhole and Jitendra Mahakud
	8	Managerial Economics, Pearson Publication	Paul Keat, Philip Young and Sreejata Banerjee
Web Resources:	1	www.nptel.ac.in	

Dr. Babasaheb Ambedkar Marathwada University, Aurangabad (Faculty of Science & Technology) Syllabus of Third Year B. Tech. (Agricultural Engineering) Semester V					
Course Code: AED341 Course: Professional Elective Courses-II (Green House Technology) Teaching Scheme: Theory: 03 Hrs/week			Credits: 3-0-0 Mid Semester Examination-I: 15 Marks Mid Semester Examination-II: 15 Marks Teacher Assessment: 10 Marks End Semester Examination: 60 Marks End Semester Examination (Duration):3 Hrs		
Prerequisite	Basic knowledge about soil- plant -water relationship.				
Objectives	In view of day- by day increasing population and decrease in cultivated land, it is very important to enhance the agricultural production. In this sense it is important to apply advance technology like greenhouse for getting more from same piece of land. Present syllabus dealing with 1. Design & Construction of Greenhouse 2. Cost estimation for Greenhouse 3. Techno-economic feasibility of Greenhouse				
Unit-I	Introduction- History and development of greenhouse, scope of greenhouse technology, its applications in various field, Classifications of green house, advantages of greenhouse. (Descriptive) (6 Hrs.)				
Unit-II	Design of Greenhouse-site selection and orientation, structural design, planning and layouts, requirements for construction, green house covering materials (6 Hrs.)				
Unit-III	Design-construction of typical greenhouse, design criteria of construction, Construction of typical glass greenhouse, construction of pipe framed greenhouse. (Descriptive & Analytical) (6 Hrs.)				
Unit-IV	Systems in greenhouse- Greenhouse irrigation, rules of watering, hand watering, perimeter watering, overhead sprinklers, boom watering, drip irrigation, advanced protected agricultural systems such as plastic mulches, row cover, liquid hydroponics and aggregate hydroponics, fertigation, humidification. (Descriptive &Analytical) (6 Hrs)				
Unit-V	Environmental factors-plant response to greenhouse environment, light, temperature relative humidity, carbon dioxide, greenhouse ventilation and computerized control system. Environmental requirements- Greenhouse cooling, greenhouse heating, temperature requirement of horticultural crops.(Descriptive &Analytical) (6 Hrs)				
Unit-VI	Instrumentation and automation for greenhouses, Economics of green house production for vegetable crops, different flowers, exotic crop, Cost benefit ratio. (6 Hrs)				
Text Book/ Reference Books	Sr. No.	Title	Author	Publication	Edition
	1	Greenhouse-Technology and Management	K. Radha Manohar and C. Igathinathane	B. S. Publications, Hyderabad	2
	2	Greenhouse technology and applications	Vilas M. Salokhe and Ajay K. Sharma	Agrotech publishing acade.)my Udaipur (Raj	1

	3	Greenhouse operation management	Paul V. Nelson	Resort publication Co. Inc, Vergnina	7
	4	Greenhouse technology for controlled environment	G. N. Tiwari	Narosa publishing house, New Delhi / Mumbai	1
	5	Greenhouse management	J. J. Hanan, W. D. Holley & K. L. Glodberry	Berilin Hidelherge New York	-

Dr. Babasaheb Ambedkar Marathwada University, Aurangabad (Faculty of Science & Technology) Syllabus of Third Year B. Tech. (Agricultural Engineering) Semester V						
Course Code: AED342 Course: Professional Elective-II: (Fundamentals of Renewable Energy) Teaching Scheme: Theory: 03Hrs/week			Credits: 3-0-0 Mid Semester Examination-I: 15 Marks Mid Semester Examination-II: 15 Marks Teacher Assessment: 10 Marks End Semester Examination: 60 Marks End Semester Examination (Duration):3 Hrs			
Prerequisite		Basic knowledge of Renewable Energy Sources and biomass utilization				
Objectives		1. Agricultural Engg. Students must be introduced with various renewable energy sources. 2. Utilization of these sources can be increased in agriculture field. 3. Understand various forms of renewable energy, bio-conversion processes, production of the biomass and various energy potential with current status				
Unit-I		Introduction to conventional and nonconventional energy sources, status of energy related to India & world. Solar energy: Classification of RES, Solar, Wind, Geothermal, Biomass, Ocean energy sources, Comparison of renewable energy sources with nonrenewable sources. (6 Hrs)				
Unit-II		Biogas: types of biogas plants, biogas generation, factors affecting biogas generation and usages, design consideration Advantages and disadvantages of biogas spent slurry. (6 Hrs)				
Unit-III		Solar Photo voltaic: p-n junctions. Solar cells, PV systems, Stand alone, Grid connected solar power station, advantages, disadvantages, applications (6 Hrs)				
Unit-IV		Gasifiers: introduction, types of Gasifiers, Applications, limitations (6 Hrs)				
Unit-V		Wind Energy: wind energy potential, measurement & various types of wind mills (6 Hrs)				
Unit-VI		Bioenergy: Pyrolysis of Biomass to produce solid, liquid and gaseous fuels. Solar cooker, Solar water heater, Solar Distillation Solar Dryer (6 Hrs)				
Text Book/ Reference Books		Sr. No.	Title	Author	Publication	Edition
		1.	Fundamentals of Renewable Energy Sources	G. N. Tiwari and M. K. Ghosal	Alpha Science International Limited	1
		2.	Solar Energy Utilization	G.D. Rai	Khanna Publishers	5
		3.	Renewable Energy Sources	J. W. Twidell and A. Weir	Taylor & Francis,	2
		4.	Solar Energy: Principles of thermal collection and Storage	S. P. Sukhatme, J. Nayak	McGraw-Hill Education	4
		5.	Nonconventional energy Sources	G.D. Rai	Khanna Publishers	3

Dr. Babasaheb Ambedkar Marathwada University, Aurangabad (Faculty of Science & Technology) Syllabus of T. Y. B. Tech. (All) Semester V					
Course Code: AED 331 Course: Open Elective Course-I (Statistical Methods in Engineering) Teaching Scheme: Theory: 03 Hrs/week			Credits: 3-0-0 Mid Semester Examination-I: 15 Marks Mid Semester Examination-II: 15 Marks Teacher Assessment: 10 Marks End Semester Examination: 60 Marks End Semester Examination (Duration):03 Hrs		
Prerequisite	Basics of Statistics and Probability Distribution				
Objectives	1. To introduce different techniques involved in statistical analysis 2. To learn and practice various statistical methods for data analysis				
Unit-I	Sampling Distribution: Population and Sample, Sampling Distribution, Standard Error Sampling Distribution of Means, Sampling Distribution of Variance, Sampling Distribution of Proportions\6 Hrs				
Unit-II	Theory of Estimation: Estimation Theory, Point Estimation – Basic Concept & Notion, Interval Estimation – Interval Estimation for Large Samples, Confidence Limits for Mean, Proportion, Standard Deviation, Difference of Means, Difference of Proportions6 Hrs				
Unit-III	Testing of Hypothesis: Statistical Hypothesis, Tests of Significance, Null Hypothesis, Alternative Hypothesis, Types of Errors in Testing of Hypothesis, Level of Significance, Critical Region, One-Tailed and Two-Tailed Tests, Critical Values and Critical Region, P-value of Test Statistic, Procedure for testing of hypothesis6 Hrs				
Unit-IV	Large Sample Tests: Sampling of Attributes – Test for Single Proportion, Test of Significance for Difference of Proportions, Sampling of Variables - Test of Significance for a Single Mean6 H				
Unit-V	Non- Parametric Tests: Parametric Tests and Non-Parametric Tests, Sign Test, Wilcoxon Signed-Rank Test, Mann-Whitney Test6 Hrs				
Unit-VI	Analysis of Variance (ANOVA): Introduction, Analysis of Variance, Assumptions for ANOVA test, One-Way Classification6 Hrs				
Text Book/ Reference Books	Sr. No.	Title	Author	Publication	Edition
	1.	Statistics for Engineers and Scientists	William Navidi	McGraw	4 th Edition
	2.	Probability & Statistics for Engineers & Scientists	Walpole, Myers, Myers Ye	Prentice Hall	9 th Edition
	3.	Fundamentals of Statistics	S.C. Gupta	Himalaya Publishing	7 th Edition

				House	
	4.	Statistical Methods	S. P. Gupta	Sultan Chand & Sons	1 st Edition

Dr. Babasaheb Ambedkar Marathwada University, Aurangabad (Faculty of Science & Technology) Syllabus of Third Year B. Tech. (Agricultural Engineering) Semester V						
Course Code: AED343 Course: Professional Elective Course-II (Food Process and Preservation Engineering) Teaching Scheme: Theory: 03Hrs/week			Credits: 3-0-0 Mid Semester Examination-I: 15 Marks Mid Semester Examination-II: 15 Marks Teacher Assessment: 10 Marks End Semester Examination: 60 Marks End Semester Examination (Duration):3 Hrs			
Prerequisite		Basic Knowledge of Food Processing.				
Objectives		1. To study Preservation Methods 2. To prepare Processed food 3. To observe preservation techniques				
Unit-I		Introduction: Defining food; classification of food; food processing; food preservation. Food preservation and processing; principles and methods of food preservation; blanching. High Temperature Preservation; canning; principle of canning (6 Hrs)				
Unit-II		Low temperature preservation: Introduction; methods of low temperature preservation; chilling; effect of freezing on constituents of foods; factors affecting refrigerated & frozen storage of foods; refrigeration and cold storage (6 Hrs)				
Unit-III		Introduction; purpose; water activity and relative humidity; factors affecting rate of drying and dehydration; drying methods; changes during drying and dehydration; different driers; concentration- methods of concentration, changes; Drying, dehydration and concentration; type of irradiation; factors affecting food irradiation; effect of irradiation (6 Hrs))				
Unit-IV		Sugar – Introduction, factors affecting osmotic pressure of sugar solution, foods preserved using sugar; salt: introduction, antimicrobial activity of salt, estimation of salt, food products preserved using salt; Preservation using sugar, salt and acids: mechanism, common foods preserved using acids. (6 Hrs)				
Unit-V		Preservation by use of chemicals: Introduction; objectives; factors affecting antimicrobial activity of preservatives; type of chemical preservatives; sulphur dioxide, benzoic acid, etc; use of other chemicals like antioxidants, mold inhibitors, antibodies, Food fermentation; Introduction, methods, common fermented foods. (6 Hrs)				
Unit-VI		Effect of processing on nutritional value of food: Introduction; consuming raw foods; changes during meat grilling; effect of processing on vitamins; effect of processing on minerals; effect of processing on carbohydrates; effect of processing on lipids (6 Hrs)				
Text Book/ Reference Books		Sr. No.	Title	Author	Publication	Edition
		1.	Preservation of Fruits & Vegetables, Indian	Girdhari Lal, G. S. Siddappa, G. L.Tandon	Council of Agricultural Research, pub 1986	2
		2.	Food Processing and Preservation	B. Sivasankar	PHI Learning Pvt. Ltd., 2002	3
		3.	Introduction to Food Processing.	Jelen P	Prentice Hall, 1985	2
		4.	Food Processing Handbook	Brennan JG	John Wiley & Sons, 2012 ISBN:	4

	5.	Essentials of Food Science	Vickie AV	Springer Science & Business Media, 2013 ISBN: 9781461491385	2
--	----	----------------------------	-----------	---	---

Dr. Babasaheb Ambedkar Marathwada University, Aurangabad					
(Faculty of Science & Technology)					
Syllabus of Syllabus of Third Year B. Tech. (All) Semester-V					
Course Code: CED331 Course: Open Elective Course-I (Environmental Impact Assessment) Teaching Scheme: Theory: 03 Hrs/week			Credits: 3-0-0 Mid Semester Examination-I: 15 Marks Mid Semester Examination-II: 15 Marks Teacher Assessment: 10 Marks End Semester Examination: 60 Marks End Semester Examination (Duration): 03 Hrs		
Prerequisite		Environmental Engineering			
Objectives		1. Student would overview the concepts, methods, issues and various forms and stages of EIA process. 2. Student will be able to examine the development of EIA in India and highlight the diversity of approach and impact of the EIA process.			
Unit-I		Introduction and Evolution of EIA: Introduction to Environmental Impact Assessment, Origin of EIA, Stages in EIA, thorough discussion of steps in EIA. Establishments of Procedure: Legislative Option, Project Screening for EIA, Public Participation in EIA process. (6 Hrs.)			
Unit-II		Impact assessment: Background information, IA methods, environmental impact assessment methodology, documentation and selection process, environmental indices, and indicators for describing affected environment, Life cycle assessment. (6 Hrs.)			
Unit-III		Air and noise environment: Prediction and assessment of impact for air and noise environment, Basic information of air quality, identification of type and quantity of air pollutant, existing air quality and air quality standards, impact prediction and assessment, mitigation. Basic information of noise, existing noise levels and standards, prediction of noise levels and assessment of impact, mitigations. (6 Hrs)			
Unit-IV		Water and soil environment: Prediction and assessment of impact for water and soil environment, Basic information of water quality (Surface water and ground water), water quality standards, identification of impact, prediction of impact and assessment, mitigations. Background information of soil environment, soil and ground water standards, prediction, and assessment of impact for ground water and soil, mitigations. (6 Hrs)			
Unit-V		Decision Methods for Evaluation of Alternative: Public participation in environmental decision making, Regulatory requirements, environmental impact assessment process, objectives of public participation, verbal communication in EIA studies. (6 Hrs)			
Unit-VI		Environmental Impact Assessment Report: Rapid and Comprehensive EIA, general structure of EIA document, Environmental management plan; post environmental monitoring. Latest EIA notification by Ministry of Environment and Forest (Govt. of India): Provisions in the EIA notification, Procedure for public hearing, post environmental monitoring, Procedure for obtaining Environmental clearance for construction projects. (6 Hrs)			
Text Book/ Reference Books		Sr. No.	Title	Author	Publication Edition
		1.	Environmental Impact Assessment	Canter R.L.,	Mc Graw Hill International 2
		2.	Environmental Impact Assessment Theory and Practice	Peter Watten (Eds.)	Unwin Hyman 1

	3.	Environmental Impact Assessment	R.R. Barthwal	New Age International Publishers	1
	4.	Environmental Impact Analysis Handbook	John G. Rau and David C. Wooten	McGraw Hill Book Company	1

Dr. Babasaheb Ambedkar Marathwada University, Aurangabad (Faculty of Science & Technology) Syllabus of Third Year B. Tech. (All) Semester V					
Course Code: CSE331 Course: Open Elective Course-I (Artificial Intelligence and its Applications) Teaching Scheme: Theory: 03 Hrs/week			Credits: 3-0-0 Mid Semester Examination-I: 15 Marks Mid Semester Examination-II: 15 Marks Teacher Assessment: 10 Marks End Semester Examination: 60 Marks End Semester Examination (Duration):03 Hrs		
Prerequisite	Data Structures and Algorithms				
Objectives	1. To introduce different techniques involved defining and simulating an intelligence. 2. To learn and practice various Artificial Intelligence methods, algorithms, and knowledge representation schemes.				
Unit-I	Introduction to AI, AI Problems and AI techniques, solving problems by searching, Problem formulation. Application of AI techniques in different branches of engineering, Basic Sciences, Medical Science and equipment, Economy and Finance. (6 Hrs)				
Unit-II	Searching techniques in AI, DFS, BFS, Uniform cost search, Depth Limited Search, Iterative Deepening, Bidirectional search, Comparing Different Techniques. (6 Hrs)				
Unit-III	Heuristic functions, Hill Climbing, Simulated Annealing, Best First Search, A*, IDA*, SMA*, Crypto-Arithmetic Problem. (6 Hrs)				
Unit-IV	Structure of Intelligent agents, Types of Agents, Agent Environments PEAS representation for an Agent. A Knowledge Based Agent, Environment, Types of Environments WUMPUS WORLD Environment Case Study: Automated Taxi, Vacuum Cleaner (6 Hrs)				
Unit-V	Concept of an Expert System. Characteristics of an Expert System, Components of expert System, Concept of Knowledge Base, Components of Knowledge base, Knowledge Representation methods. Case Study: DENDRAL, MYCIN, PXDES, CaDeT (6 Hrs)				
Unit-VI	Propositional Logic introduction, First Order Predicate Logic, Forward and Backward Chaining, Resolution., Introduction to PROLOG and LISP 6 Hrs)				
Text Book/ Reference Books	Sr. No.	Title	Author	Publication	Edition
	1.	Artificial Intelligence: A Modern Approach	Stuart Russell and Peter Norvig	Pearson Education	2
	2.	Artificial Intelligence	Elaine Rich, Kevin Knight, Shivshankar B Nair	McGraw Hill,	3
	3.	Artificial Intelligence	Elaine Rich, Kevin Knight	Tata McGraw Hill	2

Dr. Babasaheb Ambedkar Marathwada University, Aurangabad (Faculty of Science & Technology) Syllabus of Third Year B. Tech. (All) Semester-V	
Course Code: EED331 Course: Open Elective-I (Special Purpose Machines) Teaching Scheme: Theory: 3 Hrs/week	Credits: 3-0-0 Mid Semester Examination-I: 15 Marks Mid Semester Examination-II: 15 Marks Teacher Assessment: 10 Marks End Semester Examination: 60 Marks End Semester Examination (Duration): 3Hrs
Prerequisite	They should have basic knowledge about all basic laws and construction / working principle of DC and AC motors and generators,
Objectives	1. To differentiate between generalized machines and control machines. 2. To understand principle and working of different control machines. 3. To be able to identify and implement control machines.
Unit-I	Hysteresis Motors: Magnetic field production & nature of torque, Applications. Reluctance Motors: F. H. P. Reluctance motors, switched reluctance motors, Principle of working & operation, Applications. (6 Hrs)
Unit-II	Control Motors: D C servomotors, transfer function of Armature and field-controlled motors their applications, Construction of F. H. P. Induction two-phase servomotors, production of torque, Torque-speed curves-characteristics & features-dynamic equations, Methods of control, Applications. Numerical on DC and AC servos. (6 Hrs)
Unit-III	Eddy Current Devices: Construction & operation of eddy current couplings & dynamometers, merits & limitations. (4 Hrs)
Unit-IV	Tacho-Generators: Basic requirements of tacho-generators, Ideal characteristics, classification. i) D.C. Tacho Generators: Output characteristics, Deviation from no load Characteristics, Dead-zone, Tooth ripples, Temperature effect, Accuracy class. ii) Induction Tacho-generators: Operating principle, Output characteristics, Equivalent circuit, Reasons for deviation from desired characteristics, Corrective means, Advantages. iii) A. C. Tacho-generators: Construction & operation, Output characteristics, non-linearities & tooth ripples, Advantages over other tacho-generators. Dynamic characteristics of techno-generators, Applications of tacho-generators. (8 Hrs)
Unit-V	Synchro & Synchro Transformers: Different types of single phase & three-phase synchro, Differential synchros, Synchro-indicators, Their constructional features, Characteristics & applications, Synchro transformers principle, Characteristics error, applications of synchro transformers. (6 Hrs)
Unit-VI	Linear Motors: Construction, Theory of operation of a linear induction motor, System with two-dimensional & three-dimensional field patterns, Performance of linear induction motors, Effect of variation in the air gap, Effect of width & thickness of the reaction plate, Thrust of linear induction motors, Applications. (6 Hrs)

Text Book/ Reference Books	Sr. No.	Title	Author	Publication	Edition
	1.	Electrical Machine and Power Electronics'	Bhimbhra P. S	Tata McGraw Hill Publication.	2
	2.	Modem control Engineering'	Ogata K.	Prentice Hall.	2
	3.	Principles of Electrical Machines	V.K. Mehta	Chand Publication	2
	4.	Electrical Machines	Ashfaq Hussain		3
	5.	Electrical Machines	Nagnath Kothari	TATA McGraw Hill.	5
	6.	Electrical Technologies	Edward Hughes Elbs	Pearson Education	2

Dr. Babasaheb Ambedkar Marathwada University, Aurangabad					
(Faculty of Science & Technology)					
Syllabus of Third Year B. Tech. (All) Semester V					
Course Code: ETC331 Course: Open Elective-I (Electronic Product Design) Teaching Scheme: Theory: 03 Hrs/week			Credits: 3-0-0 Mid Semester Examination-I: 15 Marks Mid Semester Examination-II: 15 Marks Teacher Assessment: 10 Marks End Semester Examination: 60 Marks End Semester Examination (Duration): 3 Hrs		
Prerequisite		Students should be familiar with Circuit design and PCB design			
Objectives		1. To understand stages of product (hardware/software) design and development. 2. To be acquainted with methods of PCB design and different tools used for it. 3. To understand the importance of testing in product design cycle. ' 4. To understand the processes and importance of documentation.			
Unit-I		Introduction to Electronic product Design: Product development basics, Product development stages, Redundancy, Ergonomics and Aesthetic Design consideration (6 Hrs)			
Unit-II		Packaging, Noise and Heat management: Introduction to product packaging, Noise in electronic circuits, Grounding, Shielding, Enclosure Sizing, Thermal management (6 Hrs)			
Unit-III		Fundamentals of PCB and PCB design: Important terms related to PCB, Types of PCBs, PCB Design elements, PCB design Steps, Requirements of artwork, Layout rules, Grounding, Shielding, Design issues related to supply and ground conductors (6 Hrs)			
Unit-IV		Software Design: Waterfall model of software development, Phases of Software design, Goals of software design, Design of structured program, Testing and debugging of program (6 Hrs)			
Unit-V		Product Testing: Environmental Testing, Temperature testing Humidity testing, Various test on enclosures, EMI and EMC related testing, Importance of standards, Classification of standards, IEC standards (6 Hrs)			
Unit-VI		Product Documentation: Need of documentation, Types of documentation, Manual, Types of manuals, Study of one typical manual, Bill of Material-examples. (6 Hrs)			
Text Book/ Reference Books	Sr. No.	Title	Author	Publication	Edition
	1.	Electronic Product Design	R.G. Kaduskar	Wiley-India	Second
	2.	Integrated Circuits	K.R. Botkar	Khanna Publisher	Tenth
	3.	Embedded System: A contemporary design Tool	James Peckol	Wiley	Second

Dr. Babasaheb Ambedkar Marathwada University, Aurangabad					
(Faculty of Science & Technology)					
Syllabus of Third Year B. Tech. (All) Semester V					
Course Code: MED331 Course: Open Elective-I (Operations Research) Teaching Scheme: Theory: 03 Hrs/week			Credits: 3-0-0 Mid Semester Examination-I: 15 Marks Mid Semester Examination-II: 15 Marks Teacher Assessment: 10 Marks End Semester Examination: 60 Marks End Semester Examination (Duration): 3 Hrs		
Prerequisite	Fundamental knowledge and understanding of Engineering mathematics Understanding of concepts of costing and management concepts				
Objectives	1. To familiarize the students with formal quantitative approach to problem solving 2. To formulate real life engineering problems 3. To solve engineering problems using various Operations Research Techniques				
Unit-I	Introduction to Operations Research: Basics definition, scope, objectives, phases, models, applications, and limitations of Operations Research. (2 Hrs)				
Unit-II	Linear Programming Problem: Formulation of LPP, Graphical solution of LPP, Simplex Method, Artificial variables, Big-M method, two-phase method, degeneracy, and unbound solutions. (2 Hrs)				
Unit-III	Transportation Model: Transportation Problem: Formulation, solution, unbalanced Transportation problem. Finding basic feasible solutions – Northwest corner rule, least cost method, and Vogel's approximation method. Optimality test – the steppingstone method or MODI method. Degeneracy in Transportation Problem. Assignment Problem: Hungarian Method to solve Assignment Problem, Travelling Salesman as an Extension of Assignment Problem. (2 Hrs)				
Unit-IV	Inventory Control, Replacement Analysis and Theory of Games: Inventory Models: Economic Order Quantity Models, Quantity Discount Models, Stochastic Inventory Models, Multi Product Models, Inventory Control Models in Practice. Replacement Analysis: Replacement of Items that Deteriorate, Replacement of Items that Fail Suddenly. Theory of Games: Introduction, Minimax and Maximin Principle. Solution of Game with Saddle Point, Solution by Dominance. (2 Hrs)				
Unit-V	Queuing model and Sequencing model: Queuing Systems and Structures, Notation Parameters, Single Server and Multi Server Models, Poisson Input, Exponential Service, Constant Rate Service, Infinite Population Sequencing Model: Introduction, n jobs through two machines, n jobs through three machines, two jobs through m machines and n jobs through m machines. (6 Hrs)				
Unit-VI	Network Models: Fulkerson 's rule, concept and types of floats, float calculations, CPM and PERT, crashing cost and crashing Network. (6 Hrs)				
	Sr. No.	Title	Author	Publication	Edition
	1	Operations Research	Taha H.A.	Prentice Hall Of India.	9

Textbook/ Reference Books	2	Introduction to Operations Research	Frederick S. Hillier and Gerald J. Lieberman	Tata McGraw-Hill	7
	3	Operations Research	P.K. Gupta, D.S Hira	S. Chand & Co.	4
	4	Operations Research	Man Mohan, P. K. Gupta, Kanti Swarup	S. Chand & Co.	12
	5	Operations Research Principles and Practice	Ravindran, Phillips and Solberg	Mc. WSE Willey	2
	5.	Operations Research: Applications and Algorithms	Wayne L. Winston, Jeffrey B. Goldberg	Thomson Brooks	4
	6.	Operations Research: Theory, Methods & Applications	S. D. Sharma, Himanshu Sharma	Kedar Nath Ram Nath	4
	7.	PERT and CPM: Principles & Applications	L. S. Srinath	East-West Press Private Limited,	3
	8.	Project Planning & Control with PERT & CPM	Dr. B.C. Punmia & K.K. Khandelwal	Firewall Media	4

Dr. Babasaheb Ambedkar Marathwada University, Aurangabad (Faculty of Science & Technology) Syllabus of Third Year B. Tech. (All) Semester V	
Course Code: PPE331 Course: Open Elective-I: (Introduction to Nanotechnology) Teaching Scheme: Theory: 03 Hrs/week	Credits: 3-0-0 Mid Semester Examination-I: 15 Marks Mid Semester Examination-II: 15 Marks Teacher Assessment: 10 Marks End Semester Examination: 60 Marks End Semester Examination (Duration): 3 Hrs
Objectives	1. To study the introduction to nanomaterials and the factors affecting it. 2. To study the types and synthesis methods of nanomaterials. 3. To study the characterizations and properties of nanomaterials. 4. To study the different applications of nanomaterials.
Unit-I	Introduction Intro. to nanotechnology, conventional micro vs. nano-material properties, role of size in properties of nanomaterials, length scale and surface to volume concept, and uniqueness of nanostructured materials; health hazards and handling of nanomaterials. (4 Hrs.)
Unit-II	A) Synthesis Bottom-up and top-down approach for nano materials synthesis, methods: ball milling, chemical vapor deposition, pressure vapor deposition, ultrasound assisted, minimulsion, microemulsion, nanoemulsion, hydrothermal, sol-gel, miscellaneous techniques. (4 Hrs.) B) Types of Nanomaterials Natural and synthetic clays – Montmorillonite and layered double hydroxide (LDH); carbon nanofibers (CNFs), carbon nanotubes, graphene nanosheets, nano silica, nano aluminium oxide, nano titanium oxide, nano-hybrids. (4 Hrs.)
Unit-III	Properties of Nan materials in terms of Structure Property Relationship Thermal properties, mechanical properties, gas barrier properties, flame retardant properties, Electrical and electrochemical properties, electronic properties, optical properties, magnetic properties, biodegradable properties, antimicrobial properties, catalytic properties. (6 Hrs.)
Unit-IV	Preparation of Polymer Nan composites Solution intercalation, melt intercalation, roll milling, emulsion polymerization, in-situ polymerization. (6 Hrs.)
Unit-V	Characterization of Nanomaterials and Nano composites X-ray diffraction (XRD), dynamic light scattering (DLS), scanning electron microscopy (SEM), Transmission electron microscopy (TEM), energy dispersive X-ray spectroscopy (EDS), atomic force microscopy (AFM), small angle X-ray scattering (SAXS), differential scanning calorimetry (DSC), thermo gravimetric analysis (TGA). (6 Hrs.)
Unit-VI	Application of Nanomaterials and Nano composites Biomedical-drug delivery, bone replacement; sensors – gas sensor, metal adsorption and recovery, bio-molecule detectors; energy storage and conversion - super capacitors, solar cells, energy generators; electronics; self-cleaning and self-healing paints, nano-engineering of cement-based materials, agricultural nanotechnologies. (6 Hrs.)

Textbook/ Reference Books	Sr. No.	Title	Author	Publication	Edition
	1.	Polymer Nanocomposites Processing, Characterization, and Applications	Joseph H. Koo	McGraw-Hill Nanoscience and Technology Series	1 st
	2.	Encyclopaedia of Nanoscience and Nanotechnology	Hari Singh Nalwa	American Scientific publishers	-
	3.	Chapter: Advanced Hybrid Nanostructures: Preparation, Properties and Applications, Book: Encyclopaedia of Nanoscience and Nanotechnology	Aniruddha Chatterjee et al	American Scientific publishers	2018
	4.	Nanoparticle Technology Handbook	M Hosokawa, K Nogi, M Naito, T Yokoyama	Elsevier	-
	5.	The Science of Nanotechnology: An introductory text	Luanne Tilstra et al	Nova Science Publishers, Inc.	-
	6.	Polymer-Layered Silicate and Silica Nanocomposites	Y.C. Ke, P. Stroeve	Elsevier	2005
	7.	Nanotechnology in concrete – A review	Florence Sanchez, Konstantin Sobolev	Construction and Building Materials, Elsevier	24 (2010) 2060–2071
	8.	Agricultural Nanotechnologies: What are the current possibilities?	Claudia Parisi et al	Nano Today, Elsevier	2014

Dr. Babasaheb Ambedkar Marathwada University, Aurangabad (Faculty of Science & Technology) Syllabus of Third Year B. Tech. (Agricultural Engineering) Semester V	
Course Code: AED321 Course: Lab: Watershed Hydrology and Management Teaching Scheme: Practical: 2 Hrs/week	Credits: 0-0-1 Practical: 25 Marks
Objectives	1. To study the measurements techniques of Hydro-meteorological parameters. 2. To study the fundamental requirement of hydrological projects 3. The subject also intends to make the student familiar about watershed parameters, development, and management
List of Practical/ Assignments	1. Study of different types of rain gauges. 2. Determination of Average depth of Rainfall 3. Analysis of rainfall data from rainfall records 4. Estimation of rate of evaporation in a catchment area 5. Determination of infiltration capacity of soil 6. Estimation of Peak runoff rate by Rational method 7. Estimation of peak runoff rate by CN method 8. Development of DRH from runoff data 9. Development of UH from DRH 10. Study of Stage level recorder and Current meter 11. Study of various catchment characteristics 12. Visit to meteorological observatory
(Any 10 number of practical to be performed from the given list)	

The assessment of term work shall be done on the basis of the following.

- Continuous assessment
- Performing the experiments in the laboratory
- Oral examination conducted on the syllabus and term work mentioned above.

Dr. Babasaheb Ambedkar Marathwada University, Aurangabad (Faculty of Science & Technology) Syllabus of Third Year B. Tech. (Agricultural Engineering) Semester V		
Course Code: AED322 Course: Lab: Irrigation and Drainage Engineering Teaching Scheme: Practical: 2 Hrs/week		Credits: 0-0-1 Practical: 25 Marks
Objectives	:	To inculcate the practical knowledge of student regarding measurement, scheduling, methods and efficiencies of irrigation.
List of Practical/ Assignments	:	1. Measurement of irrigation water 2. Design of underground pipeline system 3. Measurement of infiltration rate 4. Measurement of soil moisture by different soil moisture measuring instruments 5. Computation of evaporation and transpiration 6. Estimation of irrigation efficiencies 7. Study of border irrigation system 8. Study of furrow irrigation system design 9. Field visit for Irrigation water resources and methods of irrigation 10. Determination of chemical properties of soil and irrigation water 11. Design of surface drainage systems and subsurface drainage systems. Determination of drainage coefficient
(Any 10 number of practical to be performed from the given list)		

The assessment of term work shall be done on the basis of the following.

- Continuous assessment
- Performing the experiments in the laboratory
- Oral examination conducted on the syllabus and term work mentioned above.

Dr. Babasaheb Ambedkar Marathwada University, Aurangabad (Faculty of Science & Technology) Syllabus of Third Year B. Tech. (Agricultural Engineering) Semester V	
Course Code: AED323 Course: Lab: Professional Elective-II (Green House Technology) Teaching Scheme: Practical: 2 Hrs/week	Credits: 0-0-1 Term Work: 25 Marks
Objectives	To inculcate the practical knowledge of student regarding measurement, scheduling, methods and efficiencies of irrigation.
List of Practical/ Assignments	1. Study of different type of greenhouses based on shape. 2. Determine the rate of air exchange in an active summer winter cooling system. 3. Determination of drying rate of agricultural products inside green house. 4. Study of greenhouse equipments. 5. Visit to commercial greenhouse complex / structure 6. To measure greenhouse environment parameters (temp., RH, Solar radiations, CO₂, air velocity etc) and prepare profiles of these parameters. 7. Problems on greenhouse light requirements 8. Problems on calculation of greenhouse heat 9. Problems on design of fan pad system. 10. Problems on greenhouse root media. 11. Structural design of simple rectangular gable type GI pipe greenhouse structure (i.e. To find sizes of purlins, rafters and columns for desired wind speed pressure).
(Any 10 number of practical to be performed from the given list)	

The assessment of term work shall be done on the basis of the following.

- Continuous assessment
- Performing the experiments in the laboratory
- Oral examination conducted on the syllabus and term work mentioned above.

Dr. Babasaheb Ambedkar Marathwada University, Aurangabad (Faculty of Science & Technology) Syllabus of Third Year B. Tech. (Agricultural Engineering) Semester V		
Course Code: AED324 Course: Lab-Professional Elective-II (Fundamentals of Renewable Energy) Teaching Scheme: Practical: 2 Hrs/week		Credits: 0-0-1 Term Work: 25 Marks
Objectives	:	Basic knowledge of Renewable Energy Sources and biomass utilization
List of Practical/ Assignments	:	1. Analysis of current renewable energy sources utilization and distribution 2. Design of floating digester type biogas plant 3. Study of solar photovoltaic system 4. Study of classifications of gasifiers 5. Study of parabolic solar cooker system 6. Study of different types of windmills 7. Performance evaluation of solar distillation unit 8. Study of solar pond system 9. Determination of calorific value of biomass sample 10. Determination of proximate analysis of biomass sample 11. Visit to roof-top solar panel system for electricity generation
(Any 10 number of practical to be performed from the given list)		

The assessment of term work shall be done on the basis of the following.

- Continuous assessment
- Performing the experiments in the laboratory
- Oral examination conducted on the syllabus and term work mentioned above.

Dr. Babasaheb Ambedkar Marathwada University, Aurangabad (Faculty of Science & Technology) Syllabus of Third Year B. Tech. (Agricultural Engineering) Semester V	
Course Code: AED325 Course: Lab: Professional Elective Course-II (Food Process and Preservation Engineering) Teaching Scheme: Practical: 2 Hrs/week	Credits: 0-0-1 Term Work: 25 Marks
Objectives	1) To study Preservation Methods 2) To prepare Processed food 3) To observe preservation techniques
List of Practical/ Assignments	1) Preservation by high concentration of sugar 2) Preservation by using salt 3) Preservation by using chemicals 4) Drying and dehydration of vegetables 5) Demonstration of effect of blanching on quality of foods 6) Fermentation of food 7) Preparation of Jelly 8) Preparation of Sauce 9) Preparation of Cheese 10) Preparation of fermented product 11) Processing of Ice-cream 12) Preservation by using Heat
(Any 10 number of practical to be performed from the given list)	

The assessment of term work shall be done on the basis of the following.

- Continuous assessment
- Performing the experiments in the laboratory
- Oral examination conducted on the syllabus and term work mentioned above.

Dr. Babasaheb Ambedkar Marathwada University, Aurangabad (Faculty of Science & Technology) Syllabus of Third Year B. Tech. (Agricultural Engineering) Semester V	
Course Code: AED326 Course: Lab: Minor Project Teaching Scheme: Practical: 2 Hrs/week	Credits: 0-0-1 Term Work: 25 Marks
Objectives	1. To plan for various activities of the project and distribute the work amongst team members. 2. To develop the ability to define and design the problem and lead to its accomplishment with proper planning. 3. To understand the importance of document design by compiling Technical Report on the Minor Project work carried out. 4. To develop student's abilities to transmit technical information clearly and test the same by delivery of Seminar based on the Minor Project.
Guidelines	1. Students should select a problem which addresses some basic home, office or other real-life applications. 2. Projects which will address the social issues will be given due weightage. 3. It is desirable that the systems developed by the students have some novel features. 4. The batch size shall not exceed TWO students per batch. 5. The students have to select a suitable problem, design, prepare the drawings, produce the components, assemble and commission the project. 6. Institute may arrange demonstration with poster presentation of all mini projects developed by the students at the end of semester. 7. At the end of the semester, the students have to prepare and present 20-25 pages project report. 8. Final evaluation shall be based on continuous internal assessment followed by Viva-Voce.

Dr. Babasaheb Ambedkar Marathwada University, Aurangabad (Faculty of Science & Technology) Syllabus of Third Year B. Tech. (Agricultural Engineering) Semester V				
Course Code: AED327 Course: Lab: Soil Science and Agricultural Chemistry Teaching Scheme: Practical: 2 Hrs/week			Credits: 0-0-1 Practical: 25 Marks	
Objectives	1. To Know the soil texture and structure 2. To know different properties of soil 3. To identify and find various soil parameters.			
List of Practical/ Assignments	1. Identification of rocks and minerals 2. Study of soil profile 3. Determination of bulk density, particle density and porosity of soil 4. Determination of pH and EC of the soil 5. Determination of soil texture 6. Determination of water holding capacity of soil (1/3 and 15 bar) 7. Determination of calcium carbonate and organic carbon content of soil 8. Determination of available nitrogen and potassium from soil 9. Determination of available phosphorus from soil 10. Analysis of irrigation water for pH, EC, cations and anions 11. Determination of organic carbon from soil. 12. Determination of gypsum/ lime requirement of soil			
(Any 10 number of practical to be performed from the given list)				
Sr. No.	Title	Author	Publication	Edition
1.	Fundamentals of Soil Science	Shivanand Tolanur	CBS Publication	2
2.	Introductory Soil Science	Dilip Kumar Das	Kalyani Publishers	1

The assessment of term work shall be done on the basis of the following.

- Continuous assessment
- Performing the experiments in the laboratory
- Oral examination conducted on the syllabus and term work mentioned above.

Dr. Babasaheb Ambedkar Marathwada University, Aurangabad (Faculty of Science & Technology) Syllabus of Third Year B. Tech. (Agricultural Engineering) Semester V					
Course Code: AED328 Course: Experiential/Problem Based Learning Tractor Repair and Maintenance Teaching Scheme: Practical: 2 Hrs/week			Credits: 0-0-1 Term Work: 25 Marks		
Objectives	To enable the students for acquiring knowledge of different tractor systems like power transmission system, fuel, lubrication, cooling, electrical, etc. and to understand the steps in tractor repair and maintenance.				
List of Practical/ Assignments	1.Familiarization with different makes and models of 4-wheeled tractors 2.Introduction to various systems of tractor viz. fuel, lubrication, cooling 3.Introduction to various systems of tractor viz. electrical, transmission, hydraulic and final drive system 4. Familiarization with tractor controls 5 Familiarization with service schedule, periodical service, 10 Hrs service schedule. 6 Maintenance after 50 Hrs of tractor operation 7 Maintenance after 125 Hrs of operation 8 Maintenance after 250 Hrs of operation 9 Maintenance after 500 Hrs of operation 10. Familiarization with tractor driving safety rules 11. Familiarization with power tiller and its components				
(Any 10 number of practical to be performed from the given list)					
Text Book/ Reference Books	Sr. No.	Title	Author	Publication	Edition
		Farm tractor Maintenance and Repair	S.C. Jain and C.R. Rai	Tata Mc Graw Hill Pub. Co. Ltd	4
	2	Farm Power Machinery Management	Donel Hunt	Lowa state Univ. Press. Ames Low	2
	3	Design of Agricultural Tractor	Sharma D N. & S. Mukesh	Jain Brothers, New Delhi	3

The assessment of term work shall be done on the basis of the following.

- Continuous assessment
- Performing the experiments in the laboratory
- Oral examination conducted on the syllabus and term work mentioned above

Dr. Babasaheb Ambedkar Marathwada University, Aurangabad (Faculty of Science & Technology) Syllabus of Third Year B. Tech. (Agricultural Engineering) Semester VI					
Course Code: AED351 Course: Soil & Water Conservation Engineering Teaching Scheme: Theory: 03 Hrs/week			Credits: 3-0-0 Mid Semester Examination-I: 15 Marks Mid Semester Examination-II: 15 Marks Teacher Assessment: 10 Marks End Semester Examination: 60 Marks End Semester Examination (Duration): 3 Hrs		
Prerequisite	Basic knowledge about watershed hydrology and watershed				
Objectives	1. Study of soil erosion problems caused by natural erosive agents 2. To study various agronomical and mechanical measures for control soil & water conservation				
Unit-I	Soil erosion – problems of soil erosion, basic terminologies, causes, types and agents of soil erosion, Factors affecting, water and wind erosion, mechanics of water erosion, classification of water erosion, splash, sheet, rill, gully & stream bank erosion. (6 Hrs)				
Unit-II	Soil loss estimation - universal soil loss equation and modified soil loss equation, determination of their various parameters rainfall erosivity and erodibility, sedimentation in reservoirs and streams, estimation and measurement, sediment delivery ratio, trap efficiency (6 Hrs)				
Unit-III	Gully Erosion - gullies and their classification, stages of gully development, principles of gully control, gully control measures, temporary and permanent gully control structures for control measures (6 Hrs)				
Unit-IV	Erosion control measures- Agronomical measures - contour cropping, strip cropping, mulching, wind erosion- mechanics, wind breaks and shelter belts, mechanical measures - bunds - contour bunds, graded bunds (6 Hrs)				
Unit-V	Terracing – functions, classifications, level and graded broad base terraces and their design, bench terraces, layout procedure, terrace planning (6 Hrs)				
Unit-VI	Grassed water ways- basic terminologies, uses, applicability, design aspects, various cross sections, specifications and their design, numerical (6 Hrs)				
Textbook/ Reference Books	Sr. No.	Title	Author	Publication	Edition
	1	Manual of Soil & Water Conservation Engineering	Gurmel Singh, C. Venkataramanan, G. Sastry & B. P. Joshi,	Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi.	6
	2	Soil & Water Conservation Engineering	R. Suresh	Standard Publishers, New Delhi	4
	3	Soil & Water Conservation Engineering	G. O. Schwab, D.D. Fangmeier, W. J. Elliot & R. K. Frevert,	John Wiley & Sons, Inc. New York	3

Dr. Babasaheb Ambedkar Marathwada University, Aurangabad (Faculty of Science & Technology) Syllabus of Third Year B. Tech. (Agricultural Engineering) Semester VI					
Course Code: AED352 Course: Micro Irrigation System Design Teaching Scheme: Theory: 03 Hrs/week			Credits: 3-0-0 Mid Semester Examination-I: 15 Marks Mid Semester Examination-II: 15 Marks Teacher Assessment: 10 Marks End Semester Examination: 60 Marks End Semester Examination (Duration):3 Hrs		
Prerequisite	Student must: 1 Required basic knowledge of soil mechanics 2.Understand basics of fluid mechanics				
Objectives	1. To stress the importance of micro-irrigation methods, design, and operation of sprinkler & drip irrigation methods. 2. To emphasis the adoption of micro-irrigation in field & the economics aspects of management				
Unit-I	Past, present and future need of micro-irrigation systems, Role of Govt. for the promotion of micro irrigation in India, Merits and demerits of micro-irrigation system, (Descriptive & Analytical) (6 Hrs.)				
Unit-II	Types and components of micro-irrigation system, Micro-irrigation system- design, design synthesis, Installation, and maintenance. (Descriptive &Analytical (6 Hrs.)				
Unit-III	Sprinkler irrigation - types, planning factors, uniformity and efficiency, Layout Design-laying pipeline, hydraulic lateral, sub mains and main line design, pump and power unit selection. (Descriptive & Analytical) (6 Hrs.)				
Unit-IV	Drip irrigation – potential, automation, crops suitability. Fertigation – Fertilizer application criteria, suitability of fertilizer, compounds, fertilizer mixing, injection duration, rate and frequency, capacity of fertilizer tank. (Descriptive & Analytical) (6 Hrs.)				
Unit-V	Quality control in micro-irrigation components, design and maintenance of polyhouse, prospects, waste land development –hills, semi-arid, coastal areas, water scarce areas, Benefit and Cost analysis (Descriptive & Analytical) (6 Hrs.)				
Unit-VI	Design of micro-irrigation system for orchard, row crop, hilly terraced land. (Descriptive &Analytical) (6 Hrs.)				
Text Book/ Reference Books	Sr. No	Title	Author	Publication	Edition
	1.	Irrigation Theory & Practice	A.M. Michael	Vikas pub. House, Delhi	2
	2.	Sprinkle and Trickle Irrigation	Keller, J. and R.D. Bliesner.	SarojPrakashan, Allahabad	1
	3.	Land & Water Management Engineering	V. V. N. Murthy	Kalyani Pub. New Delhi	4

Dr. Babasaheb Ambedkar Marathwada University, Aurangabad (Faculty of Science & Technology) Syllabus of Third Year B. Tech. (Agricultural Engineering) Semester VI					
Course Code: AED353 Course: Drying and Storage Engineering Teaching Scheme: Theory: 03Hrs/week			Credits: 3-0-0 Mid Semester Examination-I: 15 Marks Mid Semester Examination-II: 15 Marks Teacher Assessment: 10 Marks End Semester Examination: 60 Marks End Semester Examination (Duration):3 Hrs		
Prerequisite	Student should know about basic concepts of drying and dehydration techniques, moisture contents of various agricultural produce. Students should be aware about traditional storage methods used for long term preservation of agricultural produce				
Objectives	1.To learn the principles of drying of crops 2.To develop practical insights into the layout of on-farm drying and storage facilities 3.To understand different storage techniques				
Unit-I	Moisture content and methods for determination, principle of drying, theory of diffusion, mechanism of drying- falling rate, constant rate, thin layer, deep bed and their analysis, critical moisture content, different methods of drying including puff drying, foam mat drying, freeze drying, etc, (6 Hrs)				
Unit-II	Study of different types of dryers- performance, energy utilization pattern and efficiency, study of drying and dehydration of agricultural products (6 Hrs)				
Unit-III	Types and causes of spoilage in storage, conditions for storage of perishable products, functional requirements of storage, control of temperature and relative humidity inside storage (6 Hrs)				
Unit-IV	Storage of grains: destructive agents, respiration of grains, moisture and temperature changes in stored grains; conditioning of environment inside storage through natural ventilation, mechanical ventilation, artificial drying, grain storage structures such as Bukhari, Morai, Kothar, silo, CAP, warehouse (6 Hrs)				
Unit-V	Storage of cereal grains and their products, storage of seeds, hermetically sealed and air-cooled storages-refrigerated, controlled atmosphere, modified atmospheric and frozen storages (6 Hrs)				
Unit-VI	Storage condition for various fruits and vegetables under cold and CA storage system. Economic, aspects of storage (6 Hrs)				
Text Book/ Reference Books	Sr. No.	Title	Author	Publication	Edition
	1.	Automatic control of food manufacturing	McFarlane Ian	Applied Science Publishers, London	2
	2.	Food Science	Norman and Potter	International Thomson Publishing	5.
	3.	Post-harvest technology of Cereals, Pulses and Oilseeds	Chakravarti A	OxfordPublishing	3
	4.	Unit Operations of Agricultural Processing	Sahay K.M. and Singh K.K.	Vikas Publishing House Pvt. Ltd.	2
	5.	Controlled atmosphere storage of grains	Shejbal, J.	Elsevier Scientific Publishing Co.	2

Dr. Babasaheb Ambedkar Marathwada University, Aurangabad (Faculty of Science & Technology) Syllabus of Third Year B. Tech. (Agricultural Engineering) Semester VI					
Course Code: AED391 Course: Professional Elective-III (Post- Harvest Engineering) Teaching Scheme: 03 Hrs/week Theory: 03 Hrs/week			Credits: 3-0-0 Mid Semester Examination-I: 15 Marks Mid Semester Examination-II: 15 Marks Teacher Assessment: 10 Marks End Semester Examination: 60 Marks End Semester Examination (Duration):3 Hrs		
Prerequisite	Student must have basic knowledge about available post-harvest processing techniques for different agricultural produce. Students should have vision about implementation post-harvest engineering practices for entrepreneurship development and in order to achieve this present course will help students for getting knowledge about modern practices				
Objectives	1. To familiarize students with the current commercial methods used to harvest, pack, transport, and market fresh agricultural produce 2. To prepare students to systematically evaluate and critically analyze operations involved in post-harvest engineering of agricultural produce				
Unit-I	General Introduction: Importance, status and scope of post-harvest technology, Structure and composition of biological tissue, Pre-harvest factors affecting quality, Post-harvest losses and factors responsible for deterioration of agricultural produce (6 Hrs)				
Unit-II	Harvesting and Physiology: Maturity indices of agricultural crops, methods of judging maturity, methods of harvesting, post-harvest handling, postharvest physiological and biochemical changes in biological tissue (6 Hrs)				
Unit-III	Post-harvest treatments: Pre-cooling, cleaning, washing and trimming, sorting, grading and sizing, High temperature – Curing / Drying / Hot water treatments / Vapor heat treatment /Degreening, Chemical treatment - Disinfestations/ Sprout suppressants/Mineral application/ethylene inhibitors(1-MCP), waxing, irradiation (6 Hrs)				
Unit-IV	Threshing and milling: Need and objective of threshing, different types of threshers, thresher performance, milling of paddy, wheat milling, milling of pulses (6 Hrs)				
Unit-V	Storage of Agricultural crops: Modified atmosphere storage, controlled atmosphere storage, hypobaric storage, zero energy cool chamber, Storage structures for grains- Morai bukhari, kothar, muda, kanaj, kuthla and other improved storage structures (6 Hrs)				
Unit-VI	Packaging of agricultural commodity: Package requirements/Functions, shipping containers, consumer packages, types of packaging materials, containers, barrier properties of packaging material, individual seal packaging, edible film (6 Hrs)				
Textbook/ Reference Books	Sr. No.	Title	Author	Publication	Edition
	1.	Handbook of Postharvest Technology	A. Chakraverty A. S. Mujumdar	Marcel Dekker, Inc	1
	2.	Post-Harvest Technology of Cereals and Pulses	A. Chakraverty	Oxford, IBH	3
		Postharvest: An introduction to the physiology & handling of fruit, vegetables & ornamentals	R. B. H. Wills	UNSW Press	
	3.				2

Dr. Babasaheb Ambedkar Marathwada University, Aurangabad (Faculty of Science & Technology) Syllabus of Third Year B. Tech. (Agricultural Engineering) Semester VI					
Course Code: AED392 Course: Professional Elective Course-III (Agricultural Structures and Management) Teaching Scheme: Theory: 03 Hrs/week			Credits: 3-0-0 Mid Semester Examination-I: 15 Marks Mid Semester Examination-II: 15 Marks Teacher Assessment: 10 Marks End Semester Examination: 60 Marks End Semester Examination (Duration): 3 Hrs		
Prerequisite	Farmsteads, Building Material, Animal shelters, Sources of water				
Objectives	In continuation with application of knowledge of other engineering fields, an 'Agroneer' should be aware with the design of various agricultural structures. Keeping this in view, current subject is designed for 1. Familiarization with agricultural structure requirement in field 2. Design of various farmsteads like farmhouse, septic tanks, dairy barns, poultry houses and various storage structures.				
Unit-I	Planning and layout of farmstead-Introduction, location arrangement, size, Farm residence planning, Design, construction and cost estimation of agricultural structures. (6 Hrs)				
Unit-II	Animal shelters- Dairy barn, types, barn equipment's, Poultry house, requirements, types, poultry equipments, Sheep housing, Construction details, building material and their properties (6 Hrs)				
Unit-III	Storage structures- silo, types, design, Feed storage, storage structures for semi perishables, Farm machinery storage and space requirement, Farm workshop properties. (6 Hrs)				
Unit-IV	Design consideration for grain storage godowns, Bag storage structures, Shallow and Deep bin, Calculation of pressure in bins, Storage of seeds. Rural living and development, rural roads, their construction cost and repair and maintenance (6 Hrs)				
Unit-V	Site and orientation of building regarding sanitation, community sanitation system; sewage system and its design, cost and maintenance, design of septic tank for small family, Estimation of domestic power requirement, source of power supply and electrification of rural housing. (6 Hrs)				
Unit-VI	Sources of water supply- norms of water supply for human being and animals, drinking water standards and water treatment suitable to rural community (6 Hrs)				
Textbook/ Reference Books	Sr. No.	Title	Author	Publication	Edition
	1.	Principles of Agricultural Engineering, Vol.-I	T. P. Ojha & A. M. Michael	Jain Brothers Publication, New Delhi	7
	2.	Farm Structures in India	A. A. Vasavada	ICAR Publication.	2
	3.	Farm Structures	Karl John, Theodore Ekblaw	Macmillan Co. Publication	3

Dr. Babasaheb Ambedkar Marathwada University, Aurangabad (Faculty of Science & Technology) Syllabus of Third Year B. Tech. (Agricultural Engineering) Semester VI					
Course Code: AED393 Course: Professional Elective Course-III (Food Quality and Packaging) Teaching Scheme: Theory: 03 Hrs/week			Credits: 3-0-0 Mid Semester Examination-I: 15 Marks Mid Semester Examination-II: 15 Marks Teacher Assessment: 10 Marks End Semester Examination: 60 Marks End Semester Examination (Duration):3 Hrs		
Prerequisite	Basic Knowledge of Food Science				
Objectives	To study food quality and its role in food industry. To study Food packaging and its function, need of packaging. To study classification of package materials.				
Unit-I	Definition of quality, Quality specifications and quality attributes of different foods, Quality Factors: appearance, texture and flavor, Taste panels. (4 Hrs.)				
Unit-II	Food quality and its role in food industry need of quality control, factors affecting quality control. (4 Hrs.)				
Unit-III	Definition of packaging, Packaging situations in world and India, Need of packaging, Plastic consumption/use in world, India etc. Package requirements, Package functions, Hazards acting on package during transportation, Storage and atmospheric package, Labeling laws material. (8 Hrs.)				
Unit-IV	Package materials: Classification packages, paper as package material its manufacture, types, advantages, corrugated and paper board boxes etc. Glass as package material, manufacture, advantages, disadvantages, metal as package material-manufacture, advantages, disadvantages, aluminum as package material, Its advantages and disadvantages, plastic as package material, classification of polymers, properties, uses and chemistry of each plastic such as polyethylene, polypropylene, polystyrene, polycarbonate, PVC, PVDC, cellulose acetate, nylon etc (8 Hrs.)				
Unit-V	Biodegradable and edible packaging, aseptic packaging-need, advantages, process, comparison of conventional & aseptic packaging. system of aseptic packaging and materials used in aseptic packaging machineries used in packing foods. (8 Hrs.)				
Unit-VI	Packaging of specific foods with its properties like bread, biscuits, coffee, milk powder, carbonated beverages, snack foods etc. (4 Hrs.)				
Textbook/ Reference Books	Sr. No.	Title	Author	Publication	Edition
	1.	Fundamentals of Quality Control for Food Industry	Krammer and Twigg	Avi Publishing Company ,1966	3
	2.	Plastic Packaging: Properties, Processing and Applications	Culter JD and Hernandez RJ	Hanser, 2004 ISBN: 9783446229082	2
	3.	Food Packaging	Sacharow and Griffin	AVI Publishing Company, 1980 ISBN: 9780870553479	4

	4.	Fundamentals of Packaging	F.A. Paine	Institute of Packaging, 1981 ISBN: 9780950756707	2
	5.	Food Packaging: Principles and Practice, Third Edition	Robertson G.L	CRC Press, 2012 ISBN: 9781439862414	3

Dr. Babasaheb Ambedkar Marathwada University, Aurangabad (Faculty of Science & Technology) Syllabus of Third Year B. Tech. (All) Semester VI					
Course Code: AED381 Course: Open Elective-II (Fundamentals of Bioenergy) Teaching Scheme: Theory: 03Hrs/week			Credits: 3-0-0 Mid Semester Examination-I: 15 Marks Mid Semester Examination-II: 15 Marks Teacher Assessment: 10 Marks End Semester Examination: 60 Marks End Semester Examination (Duration):3 Hrs		
Prerequisite		Basic knowledge of Bioenergy sources and biomass utilization			
Objectives		1. Understand Bioenergy technologies, processes, reactions and energy conversion rates for Anaerobic Digestion, gasification, Pyrolysis (fast, intermediate, and slow) and combustion 2. Know what constitutes a suitable feedstock for Bioenergy applications			
Unit-I		Introduction to Bioenergy- Introduction, Unit of Energy and Introduction of Bioenergy, How Biomass Formed on the Earth, , Basic Biomass Technology (Resources and Production) Biomass Production: Wastelands, classification and their use through energy plantation, selection of species, methods of field preparation and transplanting. (6 Hrs)			
Unit-II		Bioethanol- Biofuels: Introduction, Ethanol production process, Biodiesel production process, Environmental Benefits, Bio-oil: Pyrolysis or Destructive distillation. (6 Hrs)			
Unit-III		Biogas- Biogas: Introduction, process description, Constituents of biogas, main features of biogas plant, Classification & Popular designs, Applications, factors considered for selection of biogas plant, advantages, disadvantages (6 Hrs)			
Unit-IV		Biodiesel- Biodiesel production processes, Biodiesel characterization, Biodiesel feedstock's, Environmental permitting and safety considerations for biodiesel production (6 Hrs)			
Unit-V		Thermo Chemical Processes: Basic concepts in gasification and Pyrolysis, chemistry of gasification, Gasification Types - Up Drift Gasifiers, downdraft, cross draft, applications, difference (6 Hrs)			
Unit-VI		Biomass utilization: Biomass densification technique (briquetting, palletization, and cubing), environmental aspect of bio-energy, waste to energy conversion. (6 Hrs)			
Textbook/ Reference Books	Sr. No.	Title	Author	Publication	Edition
	1	Introduction to Bioenergy (Energy and the Environment)	Vaughn C. Nelson, Kenneth L. Starcher	CRC Press	1
	2	Bioenergy: Biomass to Biofuels	Anju Dahiya	Elsevier Science	2
	3	Bioenergy: Principles and Applications	Yebo Li and Samir Kumar Khanal	Wiley	2

Dr. Babasaheb Ambedkar Marathwada University, Aurangabad (Faculty of Science & Technology) Syllabus of Syllabus of T.Y.B. Tech. (All) Semester-VI					
Course Code: CED381 Course: Open Elective-II (Solid Waste Management) Teaching Scheme: Theory: 3 Hrs/week			Credits: 3-0-0 Mid Semester Examination-I: 15 Marks Mid Semester Examination-II: 15 Marks Teacher Assessment: 10 Marks End Semester Examination: 60 Marks End Semester Examination (Duration): 3Hrs		
Prerequisite	Knowledge about Environmental Engineering				
Objectives	1. To get introduced to the generation, collection, and management of the various types of solid waste and different waste management techniques.				
Unit-I	Introduction to Solid Waste Management (SWM): Need and Objectives, Waste Management Hierarchy, Functional elements, Environmental impact of mismanagement. Solid waste: Sources, types, Composition, Quantities, Physical, chemical and biological properties. (6 Hrs)				
Unit-II	Generation of solid waste: Factors affecting. Storage and collection: General considerations for waste storage at source, Types of collection Systems, Transfer station: Meaning, Necessity, Transportation of solid waste: Means and Methods, Routing of vehicles. (6 Hrs)				
Unit-III	Segregation and Material Recovery: Objectives, Stages of segregation, sorting operations, Guidelines for sorting for materials recovery, E waste management, Biomedical waste management. (6 Hrs)				
Unit-IV	Waste processing: processing technologies: Composting, thermal conversion technologies incineration, treatment of biomedical wastes. Energy recovery from solid waste: Parameters affecting energy recovery, Bio-methanation, Fundamentals of thermal processing, Pyrolysis, Incineration, Advantages and disadvantages of various technological options. (6 Hrs)				
Unit-V	Disposal: Landfills and its introduction, Definition, Essential components, Site selection, Land filling methods, Leachate analysis and landfill gas management, treatment & disposal. Determination of capacity of landfill disposal site. (6 Hrs.)				
Unit-VI	Hazardous waste management (HWM): Types of hazardous waste (such as nuclear, biomedical, and industrial waste), problems and issues related to HWM, Need for HWM, Legislations on management and handling of HW, Hazardous Characteristics, reduction of wastes at source, Recycling, and reuse, labeling and handling of hazardous wastes, incineration, solidification & stabilization of hazardous waste. (6 Hrs.)				
Textbook/ Reference Books	Sr. No.	Title	Author	Publication	Edition
	1.	Integrated Solid Waste Management	Hilary Theisen and Samuel A, Vigil, George Tchobanoglous	McGraw- Hill, New York	1993
	2.	Manual on Municipal Solid waste management	CPHEEO, Central Public Health and	Government of India, New Delhi	2000

			Environmental Engineering Organization		
	3.	Environmental Resources Management and Hazardous waste Management,	Michael D. LaGrega, Philip L Buckingham, Jeffrey C. Evans	Mc-Graw Hill International edition, New York	2001
	4.	Solid waste Engineering	Vesilind P.A., Worrell W and Reinhart	Thomson Learning Inc., Singapore	2002
	5.	Hazardous Waste Management	Charles A. Wentz	McGraw Hill International Edition, New York	1995 Second Edition

Dr. Babasaheb Ambedkar Marathwada University, Aurangabad (Faculty of Science & Technology) Syllabus of Third Year B. Tech. (All) Semester VI	
Course Code: CSE381 Course: Open Elective-II (Information & Cyber Security) Teaching Scheme: Theory: 3 Hrs/week	Credits: 3-0-0 Mid Semester Examination-I: 15 Marks Mid Semester Examination-II: 15 Marks Teacher Assessment: 10 Marks End Semester Examination: 60Marks End Semester Examination (Duration):3 Hrs
Prerequisite	Knowledge of Computer Networking is necessary to understand the concepts.
Objectives	- To understand the foundations of Information Security. - To learn various types of algorithms and its applications of Cyber Security - To identify insights on how to apply Cyber Security
Unit-I	Introduction The History of Information Security, Balancing Information Security and Access, Introduction and Security Trends, General Security Concepts, and introduction to what is an “infosphere”, Operational Security and People’s Role in Information Security. (6 Hrs)
Unit-II	Security Needs The Need for Security, Business Needs, needs to protect against Threats and Attacks, Security in Emails. Secure Software Development. Essential Terminologies: CIA, Risks, Breaches, Threats, Attacks, Exploits. (6 Hrs)
Unit-III	Cryptography Concepts Concepts of Data encryption, Introduction, Plaintext & Cipher text, Substitution Techniques, Transposition Techniques, Encryption & Decryption, Symmetric & Asymmetric key Cryptography. Public Key Infrastructure (PKI), Different attacks on Cryptosystems. (6 Hrs)
Unit-IV	Internet Standards and Authentication Basic concepts of Internet Standards and Physical Security, Network Security and Infrastructure, Authentication Basics, Password, Authentication Token, Certificate based Authentication, Basics of authentication in Wireless Networks, Need of authentication in Wireless Communication. (6 Hrs)
Unit-V	Security in Evolving Technology Biometrics, Mobile Computing and Hardening on android and iOS, IOT Security, Web server configuration and Security. Introduction, Basic security for HTTP Applications and Services, Basic Security for Web Services like SOAP, REST etc., Identity Management and Web Services, Authorization Patterns, Security Considerations, Challenges. Open Source/ Free/ Trial Tools: adb for android, xcode for ios. (6 Hrs)
Unit-VI	Cyber Security Vulnerabilities& Safeguards Vulnerabilities-Overview, vulnerabilities in software, System administration, Open Access to Organizational Data, Weak Authentication, Authorization, Unprotected Broadband communications, Poor Cyber Security Awareness. Cyber Security Safeguards- Overview, Access control, IT Audit, Authentication. Open Web Application Security Project (OWASP), Web Site Audit and Vulnerabilities assessment. Open Source/ Free/ Trial Tools: Win Audit, Zap proxy (OWASP), burp suite, DVWA kit. (6 Hrs)

	Sr. No.	Title	Author	Publication	Edition
Textbook/ Reference Books	1	Cryptography and Network Security	William Stallings	Pearson Education/PHI	7
	2	Cryptography and Network Security	V.K. Jain	Khanna Publishing House.	1
	3	Principles of Information Security	Michael E Whitman and Herbert J Mattord	Vikas Publishing House, New Delhi.	
	4	Handbook of Information Security Management	Micki Krause, Harold F. Tipton,	CRC Press LLC	
	5	Information and Cyber Security	Gupta Sarika	Khanna Publishing House, Delhi.	
	6	Cryptography and Network Security	Atul Kahate	McGraw Hill.	

Dr. Babasaheb Ambedkar Marathwada University, Aurangabad (Faculty of Science & Technology) Syllabus of Third Year B. Tech. (All) Semester VI	
Course Code: EED381 Course: Open Elective-II (Electrical materials) Teaching Scheme: Theory: 03 Hrs/week	Credits: 3-0-0 Mid Semester Examination-I: 15Marks Mid Semester Examination-II: 15 Marks Teacher Assessment: 10 Marks End Semester Examination: 60 Marks End Semester Examination (Duration): 3Hrs
Prerequisite	Basics of Electrical and Electronics Engineering, Physics, Chemistry
Objectives	1.To understand Basic Electrical and electronics engineering. 2.To understand Electromagnetism and its laws. 3.To study the conducting and superconducting materials 4.To study the dielectric and nano materials
Unit-I	Crystallography Crystal directions and planes, Diatomic Crystal (CsCl, NaCl, Diamond, BaTiO ₃) Crystal imperfection, Point defects, Line defects, Surface and Volume defects, Structure properties relationship, structure determination by X-ray diffraction. (8 Hrs)
Unit-II	Magnetic Materials Origin of magnetization using atomic theory, classification of magnetic materials and properties, Laws of magnetism, comparison of Electrical and magnetic circuits theory of Dia, Para and ferromagnetism, Soft and Hard magnetic materials and their uses, Domain theory of ferromagnetism, Hysteresis loss, Antiferromagnetic and Ferrimagnetic materials, Ferrites and Garnets. (5 Hrs)
Unit-III	Conducting and Superconducting Materials Band theory of solids, Classical free electron theory of metals, Quantum free electron theory, Density of energy states and carrier concentration, Fermi energy, Temperature and Fermi energy distribution, Superconductivity, Factor affecting Superconductivity, Meissner effect, Type-I and Type-II superconductors, BCS theory, Josephson effect, High temperature superconductors, Application of superconductors. (5 Hrs)
Unit-IV	Semiconducting Materials Band structure of semiconductor, Charge carrier concentration, Fermi level and temperature, Electrical conductivity, Hall effect in semiconductors, P-N junction diode, Preparation of single crystals, LED, Photovoltaic cell. (6 Hrs)
Unit-V	Dielectric Materials Dielectric constant and polarizability, types of polarization, temperature and frequency dependences of Dielectric parameter, internal fields in solids, Clausius-Mosotti equation, dielectric loss, dielectric breakdown, ferroelectric, pyroelectric and piezoelectric materials, applications of dielectric materials. (6 Hrs)
Unit-VI	Nano Materials Nanomaterials: Introduction and properties, synthesis of nanomaterials, Carbon Nano Tubes, Characterization techniques of nanomaterials- SEM, TEM, EDAX, FMR, XRD. Applications of nanomaterials. (6 Hrs)

	Sr. No.	Title	Author	Publication	Edition
Textbook/ Reference Books	1.	Electrical engineering materials	J. Dekkar	McGraw Hill Publication	2
	2.	Science of Engineering Materials and Carbon Nanotubes	C.M. Srivastava and C. Srinivasan	New Academic Science	3
	3.	Material Science and Engineering	V. Raghavan	PHI Learning	5
	4.	Solid State Physics	J. Dekkar	Laxmi publication	3

Dr. Babasaheb Ambedkar Marathwada University, Aurangabad					
(Faculty of Science & Technology)					
Syllabus of Third Year B. Tech. (All) Semester VI					
Course Code: ETC381 Course: Open Elective-II (Internet of Things) Teaching Scheme: Theory: 3 Hrs/week		Credits: 3-0-0 Mid Semester Examination-I: 15 Marks Mid Semester Examination-II: 15 Marks Teacher Assessment: 10 Marks End Semester Examination: 60 Marks End Semester Examination (Duration): 3Hrs			
Prerequisite	Python Fundamentals, basics of electronics, Networking fundamentals, WWW Terminology				
Objectives	1. To understand IOT value chain structure (device, data cloud), application areas and technologies involved 2. To understand IOT sensors and technological challenges faces by IoT devices. 3. Explore and learn about Internet of things with the help of projects				
Unit-I	Unit-I: Introduction to IoT: Industry 4.0., Definition of IOT- Evolution of IOT and related terms, hardware, software, network stack for IoT, SAAS Model. (6 Hrs)				
Unit-II	Unit-II: Elements of IoT: Introduction to elements of IOT, Basic Architecture of an IOT application sensors, and Actuators, WPAN and LPWAN, 6LoPAN, Sigfox. (6 Hrs)				
Unit-III	Unit-III: IoT Sensors: Node MCU ESP 8266- hardware specification, GPIO programming, WIFI connectivity programming, Access Point Programming, Introduction to basis looping and conditional statements, basics of HTML. (6 Hrs)				
Unit-IV	Unit-IV: Communication and Connectivity Technologies: Introduction to: TCP/IP, UDP, NTP, MQTT, Network and Sockets, Cloud Computing in IOT, IOT Communication Model. (6 Hrs)				
Unit-V	Unit-V: Data Analytics and IOT Platforms: Basics of statistics, Descriptive statistics, and probability distributions. Big Data Analytics, Hadoop, Data Visualization, IOT Platforms Things speak, Microsoft Azure and Amazon Web Services, IBM Watson, Google Home and Amazon's Alexa. (6 Hrs)				
Unit-VI	Unit-VI: Preparing IoT Projects Creating the sensor project with Node MCU ESP 8266, Sensor libraries, Internal representation of sensor values, External representation of sensor values, exporting sensor data, Creating the actuator project. (6 Hrs)				
Textbook/ Reference Books/ Web	Sr. No.	Title	Author	Publication	Edition
	1.	The Internet of Things: Applications and Protocols,	Oliver Hersent, David Boswarthick, Omar Elloumi	Wiley publications	
	2.	Architecting the Internet of Things,	Dieter Uckelmann, Mark Harrison, Florian Michahelles	Springer publications.	

	3.	Internet of Things with Arduino	Marco Schwatz	Cookbook, Packt Publications	
	4.	<u>Introduction to internet of things - Course (nptel.ac.in)</u>			

Dr. Babasaheb Ambedkar Marathwada University, Aurangabad (Faculty of Science & Technology) Syllabus of Third Year B. Tech. (All) Semester VI					
Course Code: MED381 Course: Open Elective II (Industry 4.0) Teaching Scheme: Theory: 03 Hrs/week			Credits: 3-0-0 Mid Semester Examination-I: 15 Marks Mid Semester Examination-II: 15 Marks Teacher Assessment: 10 Marks End Semester Examination: 60 Marks End Semester Examination (Duration): 3Hrs		
Prerequisite	1.Computer fundamentals and understanding of basics of information technology. 2.Understanding of basic concepts of production and manufacturing technology				
Objectives	1. To make students aware of the structure and role of Industry 4.0, in current evolving industrial environment. 2. To give learners overview of Industry 4.0 technologies and their integration.				
Unit-I	Introduction- Four industrial revolutions, Digital transformation of Industry and the fourth industrial revolution, Scope of Industry 4.0, Automation pyramid and Industry 4.0, Principles of Industry 4.0. (6 Hrs)				
Unit-II	Internet of Things (IoT)– Concept of IoT, IoT Architecture – Sensing layer, Network layer, Data processing layer, Application layer, Applications of IoT – for automobiles, homes, etc. Internet of Service (IoS), Internet of Energy (IoE). (6 Hrs)				
Unit-III	Technologies in Industry 4.0 (1)- Augmented reality and Virtual Reality, 3D Printing, Collaborative robots, Smart material handling, Smart sensors, Concept of smart products. (6 Hrs)				
Unit-IV	Technologies in Industry 4.0 (2)- Machine learning, Introduction to Cyber Physical Systems (CPS), Components of Cyber Physical Systems, Digital twins, Machine vision, Smart factory, Artificial intelligence. (6 Hrs)				
Unit-V	Data in Industry 4.0- Big Data, Data Mining, Data Analytics, Cloud computing, Data – anew resource of organization, Data analysis for optimal decision making, Digitalization of the entire value chain. (6 Hrs)				
Unit-VI	Applications of Industry 4.0- Industry 4.0 in Manufacturing – Predictive maintenance, Real-time supply-chain optimization, Digital performance management, Smart energy consumption, Challenges in implementing Industry 4.0. (6 Hrs)				
Textbook/ Reference Books	Sr. No.	Title	Author	Publication	Edition
	1.	Industry 4.0_ the Industrial Internet of Things	Industry 4.0_ the Industrial Internet of Things	Industry 4.0_ the Industrial Internet of Things	
	2.	Industry 4.0_ Managing the Digital Transformation	Alp Ustundag, Emre Cevikcan	Springer	
	3.	Automated Manufacturing System	Hugh Jack	-	
	4.	Industry 4.0 Opportunities Behind The Challenge	Dr. Mirjana Stankovic, Ravi Gupta and Dr. Juan E. Figueroa	UNIDO General Conference 2017	
	5.	Handbook of Ind. Automation	Richard L. Shell Ernest L. Hall	Marcel Dekker	

Dr. Babasaheb Ambedkar Marathwada University, Aurangabad (Faculty of Science & Technology) Syllabus of Third Year B. Tech. (All) Semester VI	
Course Code: PPE381 Course: Open Elective-II (Polymer Recycling and Waste Management) Teaching Scheme: Theory: 03 Hrs/week	Credits: 3-0-0 Mid Semester Examination-I: 15 Marks Mid Semester Examination-II: 15 Marks Teacher Assessment: 10 Marks End Semester Examination: 60 Marks End Semester Examination (Duration): 3Hrs
Prerequisite	Basic knowledge of polymeric materials, additives, and their properties. Basic knowledge of polymer rheology and processing.
Objectives	1. To learn the basic concepts used in the recycling of polymers along with learning about solid waste management.
Unit-I	Significance of Recycling Introduction and classification of waste. Global polymer production and consumption, Global polymer waste composition, quantities and disposal, Identification of polymer for recycling. Recycling Process: collection, sorting and segregation of waste, Use of advanced technologies such as artificial intelligence in sorting, Recycling methods: primary, secondary, tertiary, and quaternary recycling, land filling. (6 Hrs.)
Unit-II	Recycling Equipment/Machinery Equipment for primary and secondary recycling: shredder, granulator, pulverized, shredder, cutter, Classification, and types of reactors for tertiary recycling, Case study on waste to energy conversion plant. (5 Hrs)
Unit-III	Recycling of Plastics from Urban Waste Physiochemical, mechanical, and rheological characteristics of recycled plastics, hydrolytic treatment of plastics waste containing paper, mixed plastic waste and its processing, recycling extrusion and additives used in polymer recycling, wood plastic composites, use of x-ray photoelectron spectroscopy (XPS) in recycling, international standards in recycling. (7 Hrs)
Unit-IV	Recycling Techniques PE/PP packaging films and woven sacks, PET bottles and films, PVC products, fiber reinforced plastics (FRP), and rubber products. (6 Hrs)
Unit-V	Municipal Solid Waste Management and Treatment Techniques Collection, storage, transportation, and disposal of municipal solid waste, sorting of MSW, vehicles and equipment for primary collection, secondary collection, and transport. a) Sanitary land filling: Requirements, layout, leach ate management, waste placement and inspection. b) Composting: windrow, aerated static pile, in vessel, decentralized, bin, box and vermicomposting. c) Bio methanation and refuse derived fuel. (7 Hrs)
Unit-VI	Tools for Combating Polymer Waste Combating tools for waste management: Case studies on extended producer responsibility, product stewardship, usage of green products and usage of biodegradable or environmentally degradable polymers, plastic roads. (5 Hrs)

Textbook/ Reference Books	Sr. No.	Title	Author	Publication	Edition
	1.	Plastics Fabrication and Recycling	Manas Chanda and Salil K. Roy	CRC Press	4 th (2007)
	2.	Introduction to Plastics Recycling	Vannessa Goodship	Smithers Rapra	2 nd (2006)
	3.	Recycling of Polymers	Raju Francis	Wiley-VCH	1 st (2016)
	4.	Recycling of Plastic Materials	Francesco Paolo La Mantia	Chemtec Publishing	2 nd (1993)
	5.	Feedstock Recycling and pyrolysis of waste plastics	John Schiers & W. Kaminsky	John Wiley and Sons	1 st (2006)
	6.	Mixed Plastic Recycling Technology	B. Hegberg, G. Brenniman	Noyes Data Corporation	1 st (1992)
	7.	Plastics Waste: Recovery of Economic value	Jacob Leidner	Marcel Decker Inc.	2 nd (2001)
	8.	Management of municipal solid waste	T. V. Ramchandra	TERI Press	1 st (2009)
	9.	Waste Management	Martin F. Lehmann	I. A. Publishers	1 st (2008)
	10.	Environmental Waste Management	Ram Chandra	CRC Press	1 st (2015)
	11.	Plastic Waste	Jacob Leidner	Marcel Decker Inc.	1 st (1981)

Dr. Babasaheb Ambedkar Marathwada University, Aurangabad (Faculty of Science & Technology) Syllabus of Third Year B. Tech. (Agricultural Engineering) Semester VI		
Course Code: AED371 Course: Lab: Soil & Water Conservation Engineering Teaching Scheme: Practical: 2 Hrs/week		Credits: 0-0-1 Term Work: 0 Marks Practical: 25 Marks
Objectives	:	1. Various soil loss estimation methods caused due to erosion 2. Study and design of various agronomical and mechanical erosion control measures
List of Practical/Assignments	:	1. Study of soil loss measurement techniques. 2. Estimation of soil loss by Universal Soil Loss Equation (USLE) 3. Computation of erosion index from rainfall data 4. Determination of sediment concentration through oven dry method 5. Study of various gully erosion control structures 6. Study of agronomical erosion control measures (Shelter belts & Wind Breaks) 7. Design of contour bunding system 8. Design of graded bunding system 9. Design of various types of bench terracing systems 10. Design of vegetative waterways 11. Study of water harvesting techniques 12. Field visit to soil erosion conservation site / water harvesting structures
(Any 10 number of practical to be performed from the given list)		

The assessment of term work shall be done on the basis of the following.

- Continuous assessment
- Performing the experiments in the laboratory
- Oral examination conducted on the syllabus and term work mentioned above.

Dr. Babasaheb Ambedkar Marathwada University, Aurangabad (Faculty of Science & Technology) Syllabus of Third Year B. Tech. (Agricultural Engineering) Semester VI	
Course Code: AED372 Course: Lab: Micro Irrigation System Design lab Teaching Scheme: Practical: 2 Hrs/week	Credits: 0-0-1 Practical: 25 Marks
Objectives	: 1. Familiarization with various components of micro-irrigation systems with their functions 2. To study the design of micro-irrigation system for row, orchard, terraced crops 3. To study the repair & maintenance of components of trickle & sprinkler irrigation system of micro-irrigation
List of Practical/ Assignments	: 1. Study of different types of micro-irrigation systems and components 2. Field visit of micro-irrigation system 3. Study of water filtration unit; Discharge measurement study of different micro Irrigation systems. 4. Design of micro-irrigation system for an orchard. 5. Design of micro-irrigation system for row crops 6. Design of spray type micro-irrigation system. 7. Design of micro-irrigation system for hilly terraced land. 8. Study of automation in micro-irrigation system. 9. Study of micro-climate inside a Polyhouse. 10. Study of maintenance and cleaning of different components of various systems. 11. Design of sprinkler irrigation system; Design of landscape irrigation system. 12. Measurement of irrigation water
(Any 10 number of practical to be performed from the given list)	

The assessment of term work shall be done on the basis of the following.

- Continuous assessment
- Performing the experiments in the laboratory
- Oral examination conducted on the syllabus and term work mentioned above.

Dr. Babasaheb Ambedkar Marathwada University, Aurangabad (Faculty of Science & Technology) Syllabus of Third Year B. Tech. (Agricultural Engineering) Semester VI		
Course Code: AED373 Course: Lab: Drying and Storage Engineering Teaching Scheme: 2Hrs/week Practical: 2 Hrs/week		Credits: 0-0-1 Practical: 25 Marks
Objectives	:	1. To learn about various Drying and storage characteristics of grains 2. To study the grain handling during storage 3. To study design of various storage structures
List of Practical/ Assignments	:	1. Study of mechanics of bulk solids affecting cleaning, drying and storage of grains 2. Measurement of moisture content during drying and aeration 3. Measurement of relative humidity during drying and aeration using different techniques 4. Measurement of air velocity during drying and aeration 5. Drying characteristic and determination of drying constant 6. Determination of EMC and ERH 7. Study of various types of dryers 8. To study the effect of relative humidity and temperature on grains stored in gunny bags 9. Design and layout of commercial bag storage facilities 10. Design and layout of commercial bulk storage facilities 11. Study of different domestic storage structures 12. Visit to commercial handling and storage facilities for grains.
(Any 10 number of practical to be performed from the given list)		

The assessment of term work shall be done on the basis of the following.

- Continuous assessment
- Performing the experiments in the laboratory
- Oral examination conducted on the syllabus and term work mentioned above.

Dr. Babasaheb Ambedkar Marathwada University, Aurangabad (Faculty of Science & Technology) Syllabus of Third Year B. Tech. (Agricultural Engineering) Semester VI	
Course Code: AED374 Course: Lab: Major Project-I Teaching Scheme: Practical: 2 Hrs/week	Credits: 0-0-2 Practical: 50 Marks
Objectives	: The Projects in the undergraduate study of engineering aims at developing in the student, knowledge, and skills to match the current and projected needs of industry, society or user systems and to create social awareness and professional attitudes. Apart from monitoring the engineering processes and maintenance of engineering work, machines and equipment's, an engineer must do investigate survey, collect data, refer handbooks/datasheets, prepare estimates and design the systems.
Guidelines	: • The completion of project is to be carried out in two semesters i.e. in T.Y. Sem. VI and final year B. Tech Sem. VII. • The students shall form project group of maximum 3 students for within department projects and maximum of 6 students in case of interdepartmental projects of their choice. • The students' groups shall collect the information on the topic/area of interest and submit brief synopsis to Project Coordinator. • The Project Coordinator shall allot the Project Guide depending upon the area or specialization of eligible faculty members from the department. • The individual student from the project group shall maintain the project diary and update weekly by taking remark of respective guide. • The industry sponsored projects and inter departmental projects shall be encouraged and in case of inter departmental projects, students of maximum 3 different departments/disciplines shall work together by forming the group. The guide allotment and internal/external assessment of such groups shall be done by the respective departments. • The projects addressing issues related to environmental, rural development and societal issues shall be preferred. • The selected project shall help to promote participation in government approved schemes like Unnat Maharashtra Abhiyaan (UMA) and Unnat Bharat Abhiyaan (UBA). • The students shall aim to promote their project work in project exhibitions/competitions, paper presentation/publication in reputed journals and conferences. • The relevance of project and implementation including details of attainment of POs and PSOs addressed through the projects with justification must be clearly stated. Phases of Major Project Part- I: Phase I: Problem Identification, Literature survey, data collection, deciding scope of topic and objectives of the project.

	Phase II: Confirmation of block diagram or layout of the proposed project. Phase III: Submission of small report of project work.
--	---

Dr. Babasaheb Ambedkar Marathwada University, Aurangabad (Faculty of Science & Technology) Syllabus of Third Year B. Tech. (Agricultural Engineering) Semester VI					
Course Code: AED375 Course: Lab Renewable Energy and Green Technology Teaching Scheme: Practical: 2 Hrs/week			Credits: 0-0-1 Term Work: 25 Marks		
Objectives	Basic knowledge about renewable energy utilization and green technologies				
List of Practical/ Assignments	1. Study of different types of solar cookers 2. Study of solar water heating system 3. Study of solar photovoltaic system 4. Study of solar distillation unit 5. Study of biogas plants 6. Study of biomass Gasifiers 7. Study of biodiesel production unit. 8. Study of solar dryer 9. Determination of calorific value of biomass sample 10. Study of solar water pumping system 11. Visit to modern greenhouse plant				
(Any 10 number of practical to be performed from the given list)					
Textbook/ Reference Books	Sr. No.	Title	Author	Publication	Edition
	1	Fundamentals of Renewable Energy Sources	G. N. Tiwari and M. K. Ghosal	Alpha Science International Limited	1
	2	Solar Energy Utilization	G.D. Rai	Khanna Publishers	5
	3	Renewable Energy Sources	J. W. Twidell and A. Weir	Taylor & Francis,	2
	4	Solar Energy: Principles of thermal collection and Storage	S. P. Sukhatme, J. Nayak	McGraw-Hill Education	4
	5	Nonconventional energy Sources	G.D. Rai	Khanna Publishers	3

Dr. Babasaheb Ambedkar Marathwada University, Aurangabad (Faculty of Science and Technology) Syllabus of Third B. Tech. (All) Semester-VI				
Code No.: BSH807 Course: Mandatory Non-Credit Course (German Language) Teaching Scheme: Theory: 02 Hrs./ week			Credit- 0-0-0 Total Marks: 50 (Continuous Assessment)	
Objectives		• Students will be able to apply communicative German Grammar in communication. • Students will be able to enhance the level of German vocabulary. • Students will be able to pronounce and articulate words as well as sentences accurately. • Students will be able to understand and apply German language eventually. • Students will be able to develop German language skills. • Students will be able to manage situational communication in German.		
Unit-I		: Introduction - Self –Introduction - Nos. up to 10,000 - Weekdays, Months - Date and Time - Greetings (6 Hrs)		
Unit-II		: Vocabulary - My house - My family - Daily routine - Hobbies - Food (6 Hrs)		
Unit-III		: Grammar - Verb forms (Present Tense) - Articles - Possessive pronouns - Auxiliary verbs - Wh-Questions / Yes-No Questions - Past-Tense of haben and sein (12 Hrs)		
List of Reference	Sr. No.	Title	Author	Publication
Books	1	German Made Simple: Learn to speak and understand German quickly and easily	Arnold Leitner PhD	Namrata's Amazon.in
	2	The Everything Learning German Book: Speak, write, and understand basic German in no time	Edward Swick	Adams Media
	3	Langenscheidt German in	Von Angelika G. Beck	Langenscheidt

		30 Days		
	4	Complete German Beginner to Intermediate Book and Audio Course: Learn to read, write, speak and understand a new language with Teach Yourself	Heiner Schenke	The McGraw Hill
	5	German: How to Speak and Write It (Beginners' Guides)	Joseph Rosenberg	Repro Books
	6	Collins Easy Learning – Collins Easy Learning German Grammar and Practice	Collins	Collins

Dr. Babasaheb Ambedkar Marathwada University, Aurangabad (Faculty of Science and Technology) Syllabus of Third Year B. Tech. (All) Semester-VI				
Course Code.: BSH808 Course: Mandatory Non-Credit Course Japanese Language Teaching Scheme: Theory: 02 Hrs./ week			Credit- 0-0-0 Total Marks: 50 (Continuous Assessment)	
Objectives		1. Students will be able to apply communicative Japanese Grammar in communication. 2. Students will be able to enhance the level of Japanese vocabulary. 3. Students will be able to pronounce and articulate words as well as sentences accurately. 4. Students will be able to understand and apply Japanese language eventually. 5. Students will be able to develop Japanese language skills. 6. Students will be able to manage situational communication in Japanese.		
Unit-I		: Introduction - Introduction - Numbers - Days, Months, Dates (8Hrs)		
Unit-II		: Grammar - Verb and verb forms - Present and Past Tense (8 Hrs)		
Unit-III		: Communication - Introduction of Japanese script - Dialogues (Shopping, in the restaurant) - Themes: Family, my city, my country, my friend (8 Hrs)		
List of Reference	Sr. No.	Title	Author	Publication
Books	1	Japanese Kanji for Beginners	Timothy G. Stout and Kaori Hakone	Tuttle Publishing
	2	Essential Japanese Grammar: A Comprehensive Guide to Contemporary Usage	Masahiro Tanimori and Eriko Sato Ph.D.	Tuttle Publishing
	3	15-Minute Japanese: Learn in Just 12 Weeks	D.K. Goel and Rajesh Goel	Amazon.in
	4	Oxford Japanese Grammar and Verbs (Dictionary)	Bunt Jonathan	Oxford Publication
	5	Read and write Japanese scripts: Teach yourself	Helen Gilhooly	Teach Yourself
	6	Complete Japanese Beginner to Intermediate Book and Audio Course: Learn to read, write, speak and understand a new language with Teach Yourself	Helen Gilhooly	Teach Yourself

Dr. Babasaheb Ambedkar Marathwada University, Aurangabad (Faculty of Science and Technology) Syllabus of Third Year B. Tech. (All) Semester-VI	
Course Code: CED801 Course: Mandatory Non-Credit Course Professional Ethics and Constitution of India Teaching Scheme: Theory: 02 Hrs/week	Credit- 0-0-0 Total Marks: 50 (Continuous Assessment)
Prerequisite	Knowledge of the basic structure of constitution of India.
Objectives	To create awareness of Engineering Ethics and human values, instill moral social values, loyalty, and ethical issues. It will allow the students to assimilate with basic information about Indian Constitution, know its salient features and thus functioning of Democracy in India.
Unit-I	Professional Ethics: Definition of Ethics, Professional Ethics, Business Ethics, Corporate Ethics, Engineering Ethics, Personal Ethics; Profession, Professionalism, Professional Responsibility, Professional Ethics; Conflict of Interest, Gift v/s Bribery, Environmental breaches, Negligence, Deficiencies in state of-the-art; Vigil Mechanism, Whistle blowing, protected disclosures. (4 Hrs.)
Unit-II	Engineering and Professionalism: Positive and Negative Faces of Engineering Ethics, Code of Ethics as defined in the website of Institution of Engineers (India): Profession, Professionalism, and Professional Responsibility. Clash of Ethics, Conflicts of Interest. (4 Hrs)
Unit-III	Responsibility and reliability in Engineering: Responsibilities in Engineering and Engineering Standards, the impediments to Responsibility. Trust and Reliability in Engineering, IPRs (Intellectual Property Rights), Risks, Safety, and liability in Engineering. (4 Hrs)
Unit-IV	Introduction to Indian Constitution: The Necessity of the Constitution, The Societies before and after the Constitution adoption. Introduction to the Indian constitution, The Making of the Constitution, The Role of the Constituent Assembly - Preamble and Salient features of the Constitution of India. Fundamental Rights and its Restriction and limitations in different Complex Situations. Directive Principles of State Policy (DPSP) and its present relevance in our society with examples. Fundamental Duties and its Scope and significance in Nation building. (4 Hrs)
Unit-V	Union Executive and State Executive: Parliamentary System, Federal System, Centre-State Relations. Union Executive – President, Prime Minister, Union Cabinet, Parliament - LS and RS, Parliamentary Committees, Important Parliamentary Terminologies. Supreme Court of India, Judicial Reviews and Judicial Activism. State Executives – Governor, Chief Minister, State Cabinet, State Legislature, High Court and Subordinate Courts, Special Provisions (Articles 370,371,371J) for some States. (4 Hrs)
Unit-VI	Elections, Amendments and Emergency Provisions: Elections, Electoral Process, and Election Commission of India, Election Laws. Amendments - Methods in

	Constitutional Amendments (How and Why) and Important Constitutional Amendments. Amendments – 7,9,10,12,42,44, 61, 73,74, ,75, 86, and 91,94,95,100,101,118 and some important Case Studies. Emergency Provisions, types of Emergencies and its consequences. (4 Hrs)				
Textbook/ Reference Books	Sr. No.	Title	Author	Publication	Edition
	1.	“Engineering Ethics (Including Human Values)	Govindrajan. M, Natrajan S, Senthilkumar V. S	PHI publication	
	2.	Ethics, Integrity and Aptitude	Reddy.N H, Ajmera, Santosh,	Tata McGraw Hill	Latest
	3.	Introduction to the Constitution on India	Durga Das Basu	Prentice –Hall EEE, 19th / 20th Ed.	2008 and latest
	4.	“Constitution of India and Professional Ethics	Shubham Singles, Charles E. Haries, and Et al	Cengage Learning India Private Limited	Edition – 2018
	5.	An Introduction to Constitution of India	M.V.Pylee	Vikas Publishing	2002

Dr. Babasaheb Ambedkar Marathwada University, Aurangabad					
(Faculty of Science and Technology)					
Syllabus of Third Year B. Tech. (All) Semester-VI					
Course Code: CSE801 Audit Course: Mandatory non-credit course (Green Computing) Teaching Scheme: Theory: 2 Hrs /week			Credit- 0-0-0 Total Marks: 50 (Continuous Assessment)		
Prerequisite	Nil				
Objectives	1. To learn the fundamentals of Green Computing. 2. To understand the concepts related to Green IT, Green devices, and hardware along with software methods, green enterprise activities. 3. To study the various laws, standards, protocols for regulating green IT 4. To study various case studies related to the application of Green IT strategies.				
Unit-I	Green IT: An Overview Introduction, Environmental Concerns and Sustainable Development, Environmental Impacts of IT, Green IT, Holistic Approach to Greening IT, Applying IT for enhancing Environmental sustainability, Green IT Standards and Eco-Labeling of IT. (4 Hrs)				
Unit-II	Green Devices and Hardware with Green Software Green Devices and Hardware: Introduction, Life Cycle of a device or hardware, Reuse, Recycle and Dispose. Green Software: Introduction, Energy-saving software techniques. (4 Hrs)				
Unit-III	Green Enterprises and the Role of IT Introduction, Organization and Enterprise Greening, Information systems in Greening Enterprises, Greening Enterprise: IT Usage and Hardware, Inter-Organizational Enterprise activities and Green Issues. (4 Hrs)				
Unit-IV	Managing Green IT: Introduction, Strategizing Green Initiatives, Implementation of Green IT, Information Assurance, Communication, and social media. (4 Hrs)				
Unit-V	Regulating the Green IT: Laws, Standards and Protocols Introduction, The regulatory environment and IT manufacturers, non-regulatory government initiatives, Industry associations and standards bodies, green building standards, green data centers, social movements, and Greenpeace. (4 Hrs)				
Unit-VI	Case Studies The Environmentally Responsible Business Strategies (ERBS) – Case Study Scenarios for Trial Runs – Case Studies – Applying Green IT Strategies and Applications to a Home, Hospital. (4 Hrs)				
Textbook/ Reference Books	Sr. No.	Title	Author	Publication	Edition
	1.	Harnessing Green IT Principles and Practices	San Murugesan, G.R. Gangadharan	Wiley Publication	1
	2.	Green IT Strategies and Applications-Using Environmental Intelligence	Bhuvan Unhelkar	CRC Press	June 2014

	3.	The Greening of IT	John Lamb	Pearson Education	2009
	4.	Green Home computing for dummies	Woody Leonhard, Katherine Murray		2012

Dr. Babasaheb Ambedkar Marathwada University, Aurangabad					
(Faculty of Science and Technology)					
Syllabus of Third Year B. Tech. (All) Semester-VI					
Course Code: ETC801 Course: Mandatory Non-credit Course (Smart Cities) Teaching Scheme: Theory: 02 Hrs/week			Credit- 0-0-0 Total Marks: 50 (Continuous Assessment)		
Prerequisite	Nil				
Objectives	1. To identify urban problems. 2. To study Effective and feasible ways to coordinate urban technologies. 3. To study models and methods for effective implementation of Smart Cities.				
Unit-I	Smart cities: Ideal Smart City loop, Socio-economic and environmental issues, Implications of Urbanization, Urbanization models and global trends, Urbanization in India. (4 Hrs)				
Unit-II	Criteria for smart cities: Smartness - Citizens, Living, Environment, Mobility, Economy, Governance Pillars of Smart cities, Buildings, Utilities, Transportation and road Infrastructure, Health Care, Sustainability issues. (4 Hrs)				
Unit-III	Fundamental Technologies: Ubiquitous computing, Big Data, Networking, Internet of Things, Cloud computing, Cyber security architectures. (4 Hrs)				
Unit-IV	ICT for Smart Cities: Complex Urban systems ICT Infrastructure modelling, Typical Edge Environment, Smart Cities as Systems of Systems, IoT Centric approach, IoT technologies: WiFi, 6LowPAN, Cellular, NFC, LoRa, Bluetooth, RFID, Zigbee. (4 Hrs)				
Unit-V	Smart City: Smart Street lighting, Smart Parking, Environmental pollution monitoring, Vehicular tracking, Smart Traffic Control, Waste Management, Smart Grid, Amenity availability, Heritage Information portal, Mobile application design, development, and Visualization. (4 Hrs)				
Unit-VI	Case Studies of Smart Cities: National and International smart cities, their model, Clusters and Urbanization, Environmental Issues: The Role of Local and Global Climate Change (4 Hrs)				
Textbook/ Reference Books	Sr. No.	Title	Author	Publication	Edition
	1.	The City of Tomorrow: Sensors, Networks, Hackers, and the Future of Urban Life (The Future Series)	Carlo Ratti and Matthew Claudel	Yale University Press	
	2.	The Responsive City: Engaging Communities Through Data-Smart Governance	Stephen Goldsmith, Susan Crawford	Jossey Bass – Wiley	1

Dr. Babasaheb Ambedkar Marathwada University, Aurangabad (Faculty of Science & Technology) Syllabus of T.Y.B. Tech. (All) Semester-VI	
Course Code: MED801 Course: Mandatory non-credit course (Research Methodology) Teaching Scheme: Theory: 02 Hrs/week	Credits: 0-0-0 Marks: 50 (Continuous Assessment)
Prerequisite	No prerequisite as such
Objectives	1.To introduce students to quantitative and qualitative methods for conducting meaningful inquiry and research. 2.Prepare a preliminary research design for projects in their subject matter areas 3.Accurately collect, analyze, and report data 4.Present complex data or situations clearly
Unit-I	Research Problems and Research Design: -Meaning of research, objectives of research, motivation in research, types of research, steps involved in research process, criteria of good research, significance of research, research methods versus methodology, selection of research problem, steps involved in defining research problem, research process, need for research design, types of research designs, basic principles of experimental design, formal and informal experimental design. (4 Hrs)
Unit-II	Sampling Design: -Need for sampling, steps in sampling design, different types of sampling designs, sampling distributions, concept of central limit and standard error, sources of errors, population mean and proportion, sample size calculations, tests of measurements for validity, reliability, and practicality. (4 Hrs)
Unit-III	Data collection, Processing and Analysis: -Methods for collection of data, selection of data collection method, data processing operations, statistics in research, confidence level, measures of central tendency, dispersion, asymmetry and relationship. Spearman's and Pearson's coefficient of correlation, simple & multiple regression analysis, analysis of variance (ANOVA), factor analysis methods. (4 Hrs)
Unit-IV	Hypothesis Test: -Concept of research hypothesis, concept of testing of hypothesis, Procedure for hypothesis testing, Flow diagram for hypothesis testing, Measuring the power of a hypothesis test, Parametric tests (z, t, F and chi-square tests), Hypothesis testing of means and correlation coefficient, Limitations of the tests of hypotheses. (4 Hrs)
Unit-V	Report Writing Interpretation: Meaning of Interpretation, Why Interpretation? Technique of Interpretation, Precaution in Interpretation. Report Writing: Significance of Report Writing, Different Steps in Writing Report, Layout of the Research Report, Types of Reports, Oral Presentation, Mechanics of Writing a Research Report, Precautions for Writing Research Reports, Conclusions. (4 Hrs)

Unit-VI	Ethics: - Ethical Issues, Ethical Committees, Commercialization, copy right, royalty, Intellectual Property rights and patent law, Reproduction of published material, Plagiarism, Citation and Acknowledgement, Reproducibility, and accountability. (4 Hrs)				
Text Book/ Reference Books	Sr. No.	Title	Author	Publication	Edition
	1.	Research Methodology: Methods & Techniques	C. R. Kothari and G. Garg	New Age International	4 th Edition, 2019.
	2.	Research Methodology	R. Pannerselvam	PHI Learning,	2 nd Edition, 2014
	3.	Research Methods and Statistics	Bernard C. Beins & Maureen A. McCarthy	Pearson Education Inc.	2012
	4.	Research Methods Handbook	Stuart MacDonald & Nicola Headlam	CLES	-
	5.	Intellectual Property Rights--Unleashing the Knowledge Economy,	Ganguli Prabuddha.	Tata McGraw-Hill,	2001
	6.	Intellectual Property Rights	Neeraj Pandey and Khushdeep Dharni.	PHI Learning	1st Edition, 2014
	7.	Fundamentals of Intellectual Property Rights,	Ramakrishna B.	Notion Press	1st Edition, 2017
	8.	The Indian Patents Act 1970 (as amended in 2005)	-	-	-

Dr. Babasaheb Ambedkar Marathwada University, Aurangabad (Faculty of Science & Technology) Syllabus of T.Y.B. Tech. (All) Semester-VI					
Course Code: PPE801 Course: Mandatory non-credit (Industrial Safety and Management) Teaching Scheme: Theory: 02 Hrs/week			Credits: 0-0-0 Marks: 50 (Continuous Assessment)		
Objectives	1.To understand the fundamental concepts, and methods in Industrial Safety. 2.To understand the impact of safe industrial operations, its benefits and safety management.				
Unit-I	Introduction to Industrial Safety Introduction, key concepts, terminologies, Need for safety, Safety information system. (4 Hrs)				
Unit-II	Safety Management Safety inspection, procedure, checklist, safety sampling, safety audit, safety survey, accident prevention, training for safety. (4 Hrs)				
Unit-III	Safety in Process Safety in material handling and equipments used, design for safety in process. (4 Hrs)				
Unit-IV	Fire Safety Classification of fires. Common causes of industrial fires. Fire protection systems. (4 Hrs)				
Unit-V	Hazards Occupational health hazards, physical and chemical hazards. (4 Hrs)				
Unit-VI	Hazard Analysis Fault tree and event tree analysis, hazard identification techniques (e.g., HAZOP, HAZAN, OSHAS 18001). (4 Hrs)				
Text Book/ Reference Books	Sr. No.	Title	Author	Publication	Edition
	1.	Industrial Safety, Health and Environment Management Systems	R.K.Jain and Sunil S.Rao	Khanna Publishers, New Delhi	2006
	2.	Industrial Safety Management	Deshmukh L M	Tata McGraw-Hill	
	3.	Handbook of Occupational Safety and Health	Slote.L	John Willey and Sons, New York	
	4.	Safety at Work	Ridley J and Channing J	Butterworth-Heinemann UK	

	5.	Loss of prevention in Process Industries , Vol. 1 and 2	Frank P. Lees	Butterworth-Heinemann Ltd., London	1991
	6.	Safety Management	Grimaldi and Simonds	AITBS Publishers, New Delhi	2001
Website	https://nptel.ac.in/courses/110/105/110105094/				


 ① Dr. Santosh Ghosle
 Chairman (BOS)


 26/10/21
 A.B. Kelkar


 (NAP)


 Dr. R.S. Pawar