SHIVAJI UNIVERSITY, KOLHAPUR - 416 004, MAHARASHTRA

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शिवाजी विद्यापीठ, कोल्हापूर - ४१६ ००४, महाराष्ट्र

दूरध्वनी - ईपीएबीएक्स - २६०९०००, अभ्यासमंडळे विभाग दूरध्वनी विभाग ०२३१—२६०९०९३/९४

Estd. 1962
"A⁺⁺" Accredited by NAAC(2021)
With CGPA 3.52

SU/BOS/Sci & Tech/ 651   **Date 31/08/2023**

To,

The Co-ordinator,
Departments of Yashawantrao Chavan School of Rural Development,
Shivaji University,
Kolhapur.

     Subject : Regarding New Syllabus, Guidelines, structure, of **M. Tech. - (Rural Technology) Part - I&II, Mechanical Engineering & Technology** under Faculty of Science and Technology.
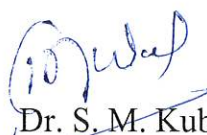
Sir/Madam,

     With reference to the subject mentioned above, I am directed to inform you that the University Authorities have accepted and granted approval to New Syllabus, Guidelines, Structure of **M.Tech. – (Rutal Technology) (Part I & II), Mechanical Engineering & Technology** under Faculty of Science and Technology:

     The revised Syllabus and Rules, Regulation, Guidelines, Structure and equivalence shall be implemented from the academic year 2023- 2024 (i.e. from July 2023) onwards. A soft copy containing syllabus is attached herewith and it is available on university website www.unishivaji.ac.in. (Online Syllabus).

     You are, therefore, requested to bring this to the notice of all students and teachers concerned.

     Thanking you,

                            Yours faithfully,

                            Dr. S. M. Kubal
                            Dy. Registrar

Copy to:

1	The I/c Dean, Faculty of Science & Technology	6	Appointment Section
2	The Chairpersan, Respective Board of Studies	7	Affiliation Section (T.1)
3	Director, Examination and Evaluation	8	Affiliation Section (T.2)
4	Eligibility Section	9	P.G.Admission Section
5	O.E. – 4	100	P.G Seminar Section

SHIVAJI UNIVERSITY, KOLHAPUR

YASHWANTRAO CHAVAN SCHOOL OF RURAL DEVELOPMENT

RULES, REGULATION AND SYLLABUS
For the courses

M. Tech. (RURAL TECHNOLOGY)
(Mechanical Engineering & Technology
Under Faculty of Science and Technology)

Syllabus to be implemented from Academic year 2023-24

Rules and Regulations
Master of Technology
(Rural Technology)

(Semester I, II, III and IV)
(Mechanical Engineering & Technology
Under Faculty of Science and Technology)

1. TITLE: Master of Technology (Rural Technology)

2. YEAR OF IMPLEMENTATION:
A new syllabus of **Master of Technology (Rural Technology),** Yashwantrao Chavan School of Rural Development, Shivaji University, Kolhapur is to be implemented from the academic year 2023-24 onwards.

3. PREAMBLE:
There is an urgent need for developing appropriate technology in Rural Development and imparting proper training to the farmers, which is possible only if the graduates and post graduates produced by the universities are themselves properly educated in the advances in engineering and technology as applicable to Rural Area. This becomes more important at the postgraduate level where they have not only to learn the recent advances in their subjects but also to be trained in the modern and latest techniques in their disciplines so that they can participate and contribute in the Rural development and advancement in their related fields. Therefore restructuring the curricula content and delivery system and recast the same to produce globally competitive man power has gained primacy. Further, the shrinking job opportunities have put additional pressure on our education system to prepare students in tune with the demands of the private sector.

The new and restructured PG programmes in Rural Technology have been designed by taking into consideration demands of private sector harnessing commercial aspects, modern research tools and their applications, supplementary skills required and enhancing the global competitiveness and employability of students.

4. GENERAL OBJECTIVES OF RURAL TECHNOLOGY

a) Creating new trained professionals for rural development with the appropriate values, identities and principles.
b) Ability to analyze and solve complex technical problems through the application of the engineering knowledge.
c) Ability to analyze critically engineering problems by use of multi disciplinary knowledge for creative solutions.
d) Match and develop scientific and technological knowledge in one or more domains of engineering through research and development.
e) Ability to integrate and evaluate wide range of optimal solutions considering public health, safety, cultural societal and environmental factors.
f) Deliver professional and ethical responsibilities.
g) Ability to use the techniques, skills and modern engineering tools necessary for engineering practices.
h) Acquire knowledge of contemporary issues for collaborative multidisciplinary work of national and international repute.
i) Apply engineering, management and financial techniques in real time.
j) Lead independently, technical knowledge based society.
k)

5. DURATION

- The course shall be a Post-Graduate Full Time Course
- The duration of course shall be of Two years /Four Semesters.

6. PATTERN:

The pattern of examination will be Semester with Credit System and Continuous InternalEvaluation [CIE].

7. ADMISSION PROCESS:

Admission process of the course is through DTE and/or through the entrance test conductedby the University in case of admission process not mechanized through D.T.E.

Syllabus for the Entrance Test:

There shall be a separate entrance test for M. Tech course/programme of the YCSRD if theadmission process is not through D.T.E., which will be conducted by the University in the Month of May/June of the academic year. The syllabus for the course programme shall consist of the following areas.

A) General Knowledge and Aptitude, for 25 marks. (Multiple Choice Questions)
B) General Communication in English and Soft Skills, for 25 marks. (MCQs)
C) Course Specific Subject Knowledge/Aptitude, for 50 marks. (MCQs)

8. FEE STRUCTURE:

i) **Entrance Examination:**
The fees for the Entrance Test shall be as per the rules and regulations of theUniversity applicable from time to time.

ii) **Fee Structure For M. Tech (RURAL TECHNOLOGY)**

Sr. No.	Particulars	M. Tech Part –I	
		PAYING	SC/ST
1	Admission Fee	20	0
2	Registration Fee	100	0
3	Tuition Fee	8100	0
4	Library Fee	500	0
5	Library Deposit	500	0
6	Laboratory Fee *	0	0
7	Laboratory Deposit	0	500
8	Tutorial Fee	0	0
9	Placement Fee	0	0
10	Computerised Library Membership Card Fee	30	30
11	Internet Fee	300	0
12	E-Service Fee	50	50
13	Medical Fee	150	150
14	Fund for National Disaster Fee	10	10
15	Gymkhana Fee	150	0
16	Ashwamedha Fee	30	0

17	Identity Card	50	0
18	Accidental & Medical Aid	20	20
19	Vikas Nidhi	150	0
20	Student Aid Fund	25	0
21	Yuvak Mahotsav	75	0
22	Youth Hostel Nidhi	50	50
23	Kalyan Nidhi	50	0
24	Self Finance Unit-NSS	10	10
25	Alumni Association Fee	50	50
26	Eligibility Fee	50	50
27	Magazine Fee	100	0
28	Cultural Fee	100	0
29	Prorata Fee	25	0
30	Jubilee Fund	25	25
31	Receipt for student parents teacher and admin staff welfare fund	100	0
	Total	**10770**	**945**

* For foreign students Tuition Fee will be five times (as per Govt. norms).

9. COURSE CENTER AND INTAKE:

i) Centre: Yashwantrao Chavan School of Rural Development, Shivaji University, Kolhapur.
ii) Intake: **18**.

10. ADMISSION COMMITTEE:

The composition of Admission Committee is as mentioned below:
1. Director, Yashwantrao Chavan School of Rural Development, Chairman.
2. Coordinator of Rural Technology Course.
3. One Senior Associate Professor in the Rural Technology Course.
4. One Senior Assistant Professor in the Rural Technology Course.
5. One Assistant Professor from Backward Community.

11. MERIT LIST FOR ADMISSION ROUNDS:

1. Merit list will be prepared on the basis of written test.
2. In case there are two or more candidates with the equal marks in entrance Test, the total marks obtained by these students in the *Bachelors degree* examination (qualifying examination) shall be considered.
3. Even after this, if the students continued to obtain equal position/ merit then the marks obtained by the students in the H.S.C. shall be considered.
4. Even after this, if the students continued to obtain the same merits/ marks, then the marks scored in S.S.C. shall be considered.

12. RESERVATION:

Reservation quota for admission will be as per the rules of the State Government of Maharashtra and Shivaji University, Kolhapur.

13. IMPLEMENTATION OF FEE STRUCTURE:

The revision will be implemented in phase wise with approval of the University bodies.

14. ELIGIBILITY:
- B.E. / B. Tech. (all branches)
- M.Sc.(all branches) AMIE / IETE or any equivalent degree, MCA, (with minimum 50%aggregate marks for open category and 45% of marks for reservation category.

15. MEDIUM OF INSTRUCTION:
- English.

16. SCHEME OF EXAMINATION: SEMESTER

The system of examination would be Semester with credit system. The examination shall be conducted at the end of each semester. The ATKT rules framed by the University applies to thecourse.

17. STANDARD OF PASSING:
1) In theory and practical examination scheme (CIE, ESE, Tearmwork) a candidate should obtain a minimum of 40 %of total marks in each head.
2) Other details regarding standard of passing, credits, Grade-points and Grades have beengiven under Credit System.

18. CREDIT SYSTEM:
1. What is a credit system?
A credit system is a systematic way of describing an educational programme by attaching credits to its components. The definition of credits in higher education systems may be based on differentparameters, such as student workload, learning outcomes and contact hours.

2.1 Curriculum

Every program with specialization has a prescribed course structure which in general termsis known as Curriculum. It prescribes courses to be studied in each semester; the relevant information containing course structure along with detail syllabus for each course of each program is updated periodically and is uploaded on the website.

2.2 Semesters:

Yashwantrao Chavan School of Rural Development implements a credit based curriculum and grade based evaluation system. P.G. program is of four semesters. The academic courses are delivered in the first two semesters and during the period of vacation after second semester; the student has to undergo 8 weeks industrial training. Dissertation work is carried out by a student in the third and fourth semester.

2.3 Course Credit

Education at Yashwantrao Chavan School of Rural development is organized around the semester-based credit system of study. The prominent features of the credit system are a processof continuous evaluation of a student's performance/progress and flexibility to allow a student to progress at an optimum pace suited to his/her ability or convenience, subject to fulfilling minimumrequirements for continuation.

A student's performance/progress is measured by the number of credits that he/she has earned, i.e. completed satisfactorily. Based on the course credits and grades obtained by the student,grade point average is

calculated. A minimum grade point average is required to be maintained for satisfactory progress and continuation in the program. Also a minimum number of earned credits and a minimum grade point average should be acquired in order to qualify for the degree. All programs are defined by the total credit requirement and a pattern of credit distribution over coursesof different categories.

2.4 Course credits assignment

Each course, except a few special courses, has a certain number of credits assigned to it depending upon its lecture, tutorial and laboratory contact hours in a week. This weightage is also indicative of the academic expectation that includes in-class contact and self-study outside of classhours.

2.5 Earning credits

At the end of every course, a letter grade is awarded in each course for which a student had registered. On obtaining a pass grade, the student accumulates the course credits as earned credits. A student's performance is measured by the number of credits that he/she has earned and by the weighted grade point average.

The credit system enables continuous evaluation of a student's performance, and allows the students to progress at an optimum pace suited to individual ability and convenience, subject to fulfilling minimum requirement for continuation.

Theory Paper/Project work, Grade Points: Conversion

The marks obtained by a candidate in each Theory paper and CIE (out of 100) and project work or any fractions like 80 : 20 shall be converted into grades on the basis of the following table.

Grade points	Range of marks obtained out of 100 or in any fractions	
0	from 00	To 39
1	40	44
2	45	49
3	50	54
4	55	59
5	60	64
6	65	69
7	70	74
8	75	79
9	80	84
10	85	89
11	90	94
12	95	100

19.   **NATURE OF QUESTION PAPER AND SCHEME OF MARKING:-**

Theory question paper:

1. Total FIVE questions, 20 marks each.
2. Attempt any FOUR questions.

20.   **EQUIVALENCE IN ACCORDANCE WITH TITLES AND CONTENTS OF PAPERS- (FOR REVISED SYLLABUS):** As per Rules

21. TEACHERS' QUALIFICATIONS:-
    (i)   As prescribed by AICTE.
    (ii)   Work load of teachers in the department as per Apex body/UGC/StateGovt./University norms.
22. LIBRARY:
     A list of Text Books, Reference Books, Journals and Periodicals, required for the new course is through departmental YCSRD library and central University Library.

LABORATRY AND EQUIPMENTS FOR M.TECH .Rural Technology:
1. Computer Lab with Internet connection to ALL PCs. CAD/CAM/CAE and other necessary softwares.
2. Subject wise Laboratories
3. Research Laboratory

     A Copy Of New Syllabus For M-Tech(Rural Technology) Course (Part-I & II) is enclosed herewith.

COURSE CURRICULUM

	Name of the Paper	Total Marks
Semester – I		
	Rural Energy Sources	125
	Design of Experiment and Research Methodology	125
	Environmental Pollution, Monitoring and Control	125
	Elective – I	100
	Field Work	100
	Seminar-I	25
Semester – II		
	Rural WasteManagement	125
	Recent Trends in Engineering andTechnology	125
	Power Plant Engineering	125
	Elective – II	100
	Minor Project	100
	Seminar-II	25
Semester – III		
	Industrial Training	50
	Comprehensive Viva	50
	Dissertation Phase – I	100
Semester – IV		
	Course	
	Dissertation Phase – II	100
	Dissertation Phase – III	200

Structure of M-Tech(Rural Technology) and Scheme of Examination

Semester – I, II, III and IV

SEMESTER-I

Course Code	Course	Teaching Scheme			Examination Scheme				
		Contact Hrs./week			Theory		Practical	Term work	Total Marks
		Lectures	Practical	Credits	CIE	ESE			
PCCRT01	Rural Energy Sources	3	2	4	30	70		25	125
PCCRT02	Design of Experiment and Research Methodology	3	2	4	30	70		25	125
PCCRT03	Environmental Pollution, Monitoring and Control	3	2	4	30	70		25	125
PECRT04	Elective-I	3		3	30	70			100
PCCRT05	FieldWork		5	5			50	50	100
PCCRT06	Seminar-I		2	2				25	25
	Total	12	13	22	120	280	50	150	600

Elective-I
1. Rural Planning and Development
2. Watershed Management
3. Remote Sensing and GIS for Rural Planning
4. Crop Production Technology
5. Irrigation Techniques

CourseCode	Course	Teaching Scheme			Examination Scheme				
		Contact Hrs./week			Theory		Practical	Term Work	Total Marks
		Lectures	Practical	Credits	CIE	ESE			
PCCRT07	Rural Waste Management	3	2	4	30	70		25	125
PCCRT08	Recent Trends in Engineering and Technology	3	2	4	30	70		25	125
PCCRT09	Power Plant Engineering	3	2	4	30	70		25	125
PECRT10	Elective-II	3		3	30	70			100
PCCRT11	Minor Project		5	5			50	50	100
PCCRT12	Seminar-II		2	2				25	25
Total		12	13	22	120	280	50	150	600

Elective-II

1. Statistical Analysis and Information Technology for Rural Development
2. Thermodynamics, Fluid and Electrical Engineering applied to rural development
3. Food Processing Technology
4. Greenhouse Technology
5. Numerical Methods and Optimization

Semester-III

CourseCode	Course	Teaching Scheme			Examination Scheme				
		Contact Hrs./week			Theory		Practical	Term Work	Total Marks
		Lectures	Practical	Credits	CSE	ESE			
PCCRT13	IndustrialTraining	-	-	5	-	-		50	50
PCCRT14	Comprehensive Viva		-	5			25	25	50
PCCRT15	Dissertation Phase – I	-	5	10			50	50	100
Total			5	20			75	125	200

Note: Teaching Scheme: P: 5 Hrs../week/ student

Course code	Course	Teaching Scheme			Examination Scheme					
		Contact Hrs./week			Theory		Practical	Term Work	TotalMarks	
		Lectures	Practical	Credits	CIE	ESE				
PCCRT16	Dissertation Phase – II	-	5	10				100	100	
PCCRT17	Dissertation Phase – III	-	5	10			100	100	200	
	Total	-	10	20			100	200	300	

Note: Teaching Scheme: P: 5 Hrs../week/ student

11

PCCRT01 Rural Energy Sources

Teaching Scheme	Examination Scheme
Theory:3 Hrs../Week	Theory:ESE 70 Marks, CIE 30 Marks
	Term Work: 25 Marks
Practical: 2 Hrs../Week	Practical:-

Unit No.	Details	No. of Lectures
1	Introduction to Energy: Definition and units of energy, power, Forms of energy, Conservation of energy, second law of thermodynamics, Energy flow diagram to the earth. Origin and time scale of fossil fuels, Conventional energy sources, Role of energy in economic development and social transformation. Global Energy Scenario: Energy consumption in various sectors, projected energy consumption for the next century, exponential increase in energy consumption, energy resources, coal, oil, natural gas, nuclear and hydroelectric power, impact of exponential rise in energy usage on global economy. Energy demand and Energy trilemma index, Classification of energy resources, Conventional-Nonconventional, Renewable-Nonrenewable, Green energy, Clean energy (Definitions and examples), Green footprint, Carbon footprint, Ecological footprint concepts,	08 Hrs.
2	Indian Energy Scene: Energy resources available in India, urban and rural energy consumption, energy consumption pattern and its variation as a function of time, nuclear energy - promise and future, energy as a factor limiting growth, need for use of new and renewable energy sources. National Green Tribunal (NGT) act, NGT activities. Environmental Effects : Environmental degradation due to energy production and utilization, air and water pollution, depletion of ozone layer, global warming, biological damage due to environmental degradation. Environmental effects of thermal power station, nuclear power generation, hydroelectric power, Geothermal power, Ocean energy harvesting, Wind energy harvesting, Solar energy harvesting	10Hrs.
3	Solar constant, Solar Radiation spectrum, Classification of Solar cells, First generation and Single crystalline, Poly crystalline, Second Generation and Thin film, CdS, CIGs, Third Generation and Polymer based, DSSC, Parasites, Hybrid, Quantum Dots, Multi Junction Tandem cells. (And/Or) Organic, Inorganic and Hybrid cells. Key elements of Silicon Solar cell, PV Solar cell, Module, panel and array. Solar thermal systems types, applications of Solar PV and Solar Thermal systems. Wind Energy: Introduction, Principle of wind energy conversion, Advantages and disadvantages of wind mills, Applications of wind energy.	10Hrs.

4	Geothermal energy: Introduction and Estimates of Geothermal Power and Nature of geothermal fields and Geothermal resources and Hydrothermal (convective) Resources Geo pressured resources and Hot dry rock resources of petro-thermal systems and Magma resources-Interconnection of geothermal fossil systems and Advantages and disadvantages of geothermal energy over other energy forms Ocean Energy: Introduction, Principle of ocean thermal energy conversion (OTEC), Tidal power generation, Tidal energy technologies, Energy from waves, Wave energy conversion, Wave energy technologies, advantages and disadvantages. Bio-Energy Energy from biomass and sources of biomass and Different species and Conversion of biomass into fuels and Energy through fermentation and Pyrolysis, gasification and combustion. Biogas plants and Properties and characteristics of biogas.	12Hrs.

Term Work:-Any 10 Assignments/Case Studies/Seminars/Quiz/Group Discussions etc based on above syllabus.

References: -
1. Duffie, J. A., & Beckman, W. A. (2013). Solar engineering of thermal processes. John Wiley & Sons.
2. Goswami, D. Y. (2015). Principles of solar engineering. CRC Press.
3. Green, M. A. (1982). Solar cells: Operating Principles, Technology, and System Applications. Prentice Hall.
4. Pandikumar, A., & Ramaraj, R. (2018). Rational design of solar cells for efficient solar energy conversion. John Wiley & Sons.
5. Rai, G. D. (2009). Non- conventional sources of energy.
6. Sukhatme, S. P., & Nayak, J. K. (2008). Solar energy: Principles of Thermal Collection and Storage.
7. Twidell, J., & Weir, T. (2006). Renewable energy resources. Taylor & Francis.

PCCRT02 Design of Experiment and Research Methodology

Teaching Scheme	Examination Scheme
Theory: 3 Hrs../Week	Theory:ESE 70 Marks, CIE 30 Marks
	Term Work: 25 Marks
Practical: 2 Hrs../Week	Practical:

Unit No.	Details	No. of Lectures
1	Introduction: Defining Research, Scientific Enquiry, Hypothesis, Scientific Method, Types of Research, Research Process and steps in it. Research Proposals – Types, contents, sponsoring agent's requirements, Ethical, Training, Cooperation and Legal aspects. Research Design: Meaning, Need, Concepts related to it, categories; Literature Survey and Review, Dimensions and issues of Research Design, Research Design Process – Selection of type of research, Measurement and measurement techniques, Selection of Sample, Selection of Data Collection Procedures, Selection of Methods of Analysis, Errors in Research.	10Hrs.
2	Research Problem: Problem Solving – Types, Process and Approaches – Logical, Soft System and Creative; Creative problem-solving process, Development of Creativity, Group Problem Solving Techniques for Idea Generation – Brain storming and Delphi Method.	10Hrs.
3	Experimentation: Objective, Strategies, Factorial Experimental Design, Applications of Experimental Design, Basic Principles – Replication, Randomization and Blocking, Guidelines for designing experiments; Laboratory Experiments, Methods of manipulating Variables, Errors in Experiments, Steps in Design of Experiments, Basis.	10Hrs.
4	Report Writing: Pre-writing Considerations, Principles of Thesis Writing, Formats of Report Writing & Publication in Research Journals, Oral Presentations (Briefing)	10Hrs.

Term Work: -Any 10 Assignments/Case Studies/Seminars/Quiz/Group Discussions etc. based on above syllabus.

References:-
1. Krishnaswamy, K.N., Sivakumar, Appa Iyer &Mathirajan M., (2006) - Management Research Methodology: Integration of Principles, Methods & Techniques (New Delhi, Pearson Education)
2. Montgomery, Douglas C. (2004) – Design & Analysis of Experiments, 5/e. (New York, John Wiley & Sons)
3. Kothari, C.K. (2004) – Research Methodology, Methods & Techniques, 2/e. (New Delhi, New Age International Ltd. Publishers)
4. Ross, Phillip J. (1996) – Taguchi Techniques for Quality Engineering, 2/e. (New York, McGraw Hill)
5. Rao S. S. (2004) – Engineering Optimization Theory & Practices, 3/e (New Delhi, New Age International Ltd., Publishers)

PCCRT03 Environmental Pollution, Monitoring and Control

Teaching Scheme	Examination Scheme
Theory: 3 Hrs../Week	Theory:ESE 70 Marks, CIE 30 Marks
	Term Work: 25 Marks
Practical: 2 Hrs../Week	Practical:-

Unit No.	Details	No. of Lectures
1	Air pollution: Definition, sources and classification of air pollutants. Transport anddiffusion of pollutants, effect of air pollution on man and climate. Ambient air qualitystandards and air pollution indices. Air sampling and monitoring techniques – settleable and suspended particulate matter - dust fall jar and impingement method, highvolume air sampler	10Hrs.
2	Noise Pollution: Definition, sources and terminology; types of noise; Measurement ofnoise; Noise indices, noise exposure level and impact on Human beings and climate.Noise control and abatement measures.	10Hrs.
3	Aquatic and Soil Pollution: Definition, sources and classification of aquaticpollutants. Consequences of pollution on surface, subsurface and mariner watersources. Soil Pollution – definition, sources and classification of soil pollutants andtheir impact on soil and plants. Bacteriological sampling and analysis of soil quality	10Hrs.
4	Radioactive Pollution: Definition, radioactivity, radionuclides, radiation emissions,sources, radioactive decay and build up. Biological effects of radiation andecosystem. Radiation exposure standards, radioactive pollution and pollution controlmeasures. Biological dosimetry.	10Hrs.

Term Work: -Any 10 Assignments/Case Studies/Seminars/Quiz/Group Discussions etc based on above syllabus.

References: -
1. Gurjar, B. R., Molina, L. T., & Ojha, C. P. (2010). Air pollution: Health and Environmental Impacts. CRC Press.
2. Khitoliya, R. K. (2017). Environmental impact assessment and management. Discovery Publishing House Pvt Limited.
3. Narayanan, V., & Srivatsa, S. (2016). Environmental Studies: Experiments, Projects, Activities: Book 1. The Energy and Resources Institute (TERI).
4. Noor, M. (2012). Environment and water pollution: Cause, Effect and Control.
5. Prasad, P. N., & Amarnath, P. N. &. T. R. (2010). Environmental Law And Pollution Control.
6. Shafi, S. (2005). Environmental pollution. Atlantic Publishers & Dist.
7. Singh, R. M., Shukla, P., & Singh, P. (2020). Environmental processes and management: Tools and Practices. Springer Nature.

PECRT04 Elective-I
Rural Planning and Development

Teaching Scheme	Examination Scheme
Theory: 3 Hrs../Week	Theory:ESE 70 Marks, CIE 30 Marks
Practical:NA	Practical: NA

Unit No.	Details	No. of Lectures
1	Introduction: Meaning and Scope and Overview of Rural Development: Historical Perspective – Rural Development Programs in India. Problem / Perception And Identification; Rural Area Planning – Programs / Policies / Schemes For Rural Development, Their Coverage And Outcomes; Technology Missions: Water, Sanitation, Etc. Five Year Plans On Rural Planning And Development, Various Sectoral Development Programs, Interdependence And Efficacy Of Socio-Economic And Infrastructural Sectors.	8Hrs.
2	Rural Infrastructure Development: Bharat Nirman – A Business Plan For Rural Infrastructure, Rural Building Centers, Pmgsy, Iay, Rajiv Gandhi Technology Mission, Central Rural Sanitation Programme, Pura. Rural Employment Schemes: Mahatma Gandhi National Rural Employment Guarantee Act, 2005, Sampoorna Grameen Yojana, National Food For Work Programme, Swarna Jayanty Gram Swarozgar Yojana, National Social Assistance Programme. Programmes: Command Area Programme, Drought Prone Area Programme, Backward Area Development Programme, North Eastern Development Programme. Impacts And Implications Of Rural Policies On Rural And Urban Development	10Hrs.
3	Profile of Rural Settlements: Definitions Need Growth, Distribution and Classification of Rural Settlements, Size from Function and Morphology Of Rural Settlements. Rural Settlement Analysis: Types, Activity, Environment and Economic Interface in Rural Habitat, Technology in Rural Settlement; Mobility Between Rural and Urban Areas. Land Utilization: Types Of Land Utilization And Its Relevance To Planning; Land Conversions And Its Regulation / Facilitation In Peri-Urban Areas; Land Utilization Analysis; Common Property And Its Use, Tenancy And Ownership, Holding Size And Its Relevance, Irrigated And Non-Irrigated And Land Values; Changing Profile Of The Rural Areas Of India: Consumption Pattern Changes, Land Utilization Changes, Cropping Pattern Changes, Holding Size Change, Living Standard Changes, Changes In Asset Ownership – Its Implication In The Planning Process. Internal and External Structure of Change. 47 Planning of Village Center. Planning and Management of Village Clusters. Low Cost and Vernacular Building Technology for The Development of Rural Area. Concept of Ru-Urban	12Hrs.
4	Technology in Rural Development: ICT in Rural Development, Rural Information System, Weather Forecasting, Disaster Minimization, Market Information, Etc. E-Panchayats, Energy Efficient Technologies and	10Hrs.

| | Alternative Technologies Agricultural Development: Allied Activities, Agriculture Land Use Economic System and Occupation Productivity, Expenditure and Framing System Impact of Modern Technology, Transport Facilities, Media and Communication and Trends at National and International Level On Agriculture and Consequently On Rural Settlement Their Planning Development. Rural Institutions and Organizations: Rural Bank, Co-Operatives, Marketing and Public Administration Zila Parishad, Block Semity And Gram-Panchayat, Powers and Function of Recently Proposed Panchayat Raj Bill. Panchayati Raj Institution (Pri) Various Programs, Hierarchy Of Panchayati Raj Institution, White Revolution and Economy Change In Rural Development. | |

References: -
1. Karalay, G. (2005). Integrated Approach to Rural Development: Policies, Programmes and Strategies. Concept Publishing Company.
2. Mathew, G. (1994). Panchayati Raj from Legislation to Movement. Concept Publishing Company.
3. Nath. (2010). Rural Development And Planning In India. Concept Publishing Company.
4. Ramachandran, H. (1980). Village clusters and rural development. New Delhi: Concept.
5. Shah, S. M. (1977). Rural Development, Planning, and Reforms. New Delhi : Abhinav Publications.
6. Maheshwari, S. (1985). Rural development in India: A Public Policy Approach. SAGE Publications Pvt. Limited.
7. Mosse, D., & Cooke, B. (2001). People's knowledge, participation and patronage: Operations and Representations in Rural Development.
8. Government of India, "Constitution (73rd Amendment) Act 1992" GoI, New Delhi
9. Government of India, "Constitution (74th Amendment) Act 1992" GoI, New Delhi
10. Planning Commission "Manual of Integrated District Planning 2006", Planning Commission, New Delhi
11. Government of India, "Various Five-Year Plans (1st to 12th)" Planning Commission, New Delhi
12. Govt. of Kerala "Kollam Perspective Plan 2009" Department of Town & Country planning, Thiruvananantpuram.

PECRT04 Elective-I
Watershed Management

Teaching Scheme	Examination Scheme
Theory: 3 Hrs../Week	Theory: ESE 70 Marks, CIE 30 Marks
Practical:NA	Practical: NA

Unit No.	Details	No. of Lectures
1	Watershed Management: Definition, size, concept of watershed, effect of watershed on the community, watershed characteristics, objectives of watershed management, selection of watershed, watershed management plan, monitoring and evaluation in watersheds, participatory rural appraisal watershed program (PRA), watershed map, Format for watershed management Plan	12 Hrs..
2	Natural Resources and Climates: Units of Measurement of water & land, Needs & availability in watershed, size & shape of watershed, Norms of Government, Qualities & standards for human being & agriculture, meteorological lab, rainfall, rainfall intensity, rainfall patterns rain gauges, evaporation, Evapourimeter, wind, anemometer, humidity, dry & wet bulb thermometer, sunshine recorder, water budgeting. Steps in watershed management.	10 Hrs.
3	Hydrology and Geo-hydrology of Watershed: Precipitation, forms of precipitation, Rainfall pattern in India, Rain fall parameter, Rainfall measurement, Selection of rain gauge sites, estimation of runoff, measurement of stream discharge. Availability of ground water, Distribution of subsurface water, soil moisture, aquifer, water table, springs, Ground water recharge, recharges structure, Water harvesting.	10 Hrs.
4	Soil and amp; Water Conservation, Treatment on land: Erosion & their types, soil & amp; water conservation, treatments, drainage line treatments, gully plugs, brushwood dams, Vanarai bandhara,loose boulder dams, gabian bandhara, underground bandhara earthen nalla bund, cement nallabund, Kadia pattern, shirpur pattern, Soil conservation on wastelands, contour and staggere dtrenching, gully control structures, Tree plantation, grasses, contour trenches, compartment bunding, land leveling, grading, smoothening, farm ponds, recharging of wells bores, Mapping, Scales, Symbols, drawings. Land capability & land use planning.	8 Hrs.

References: -
1. Goyal, M. K. (2016). ENGINEERING HYDROLOGY. PHI Learning Pvt. Ltd.
2. Jain, S. K., Agarwal, P. K., & Singh, V. P. (2007). Hydrology and Water Resources of India. Springer Science & Business Media.
3. König, K. W. (2001). The Rainwater Technology Handbook: Rainharvesting in Building [international Fundamentals, Practical Aspects, Outlook ; Includes Materials and Tools for Planning and Design!].
4. Mahnot, S., Chaplot, P., & Singh, P. (2012). Soil and water conservation and watershed

management.
5. Modi, P. (1998). Water Supply Engineering: Vol - 2. Rajsons Publications Pvt. Ltd.
6. Murty, J. V. S. (1998). Watershed management.
7. Patra, K. C. (2001). Hydrology and Water Resources engineering. Narosa Publishing House.

PECRT04Elective-I
Remote Sensing and GIS for Rural Planning

Teaching Scheme	Examination Scheme
Theory: 3 Hrs../Week	Theory: ESE 70 Marks, CIE 30 Marks
Practical: NA	Practical: NA

Unit No.	Details	No. of Lectures
1	Introduction to civil engineering, Surveying, Elements of building construction, Water resources development, Transportation engineering	12 Hrs.
2	Concepts of remote sensing; Energy sources and Radiation principles, spectral characteristics of earth's surface and of atmosphere. Sensors and their characteristics; Radiometers, cameras, multi-spectral scanners and microwave systems. Aerial and satellite platforms. Optical, infrared and microwave imagery, Analysis of imagery, Visual and machine interpretation of imagery, Ground truth data, Digital image processing.	10 Hrs.
3	Land use and Land cover mapping, biodiversity, forestry and agriculture, soil erosion, water resources, wetland mapping, Wild life ecology, Environmental assessment, Environmental management, Urban and regional planning, Monitoring natural disasters.	8 Hrs.
4	Fundamentals of GIS: Definition, Components, spatial data, thematic characteristics, raster's and vectors, databases and database management. Data input and Editing: Data stream, data encoding, map digitization and conversion, data analysis, network and surface analysis in GIS, analytical modelling, forms of GIS output, decision support systems, GIS project design and management. GIS applications	10 Hrs.

References: -
1. Allum, J. a. E. (2013). Photogeology and regional mapping. Elsevier.
2. Bhatta, B. (2011). Remote sensing and GIS. OUP India.
3. Burrough, P. A., McDonnell, R. A., & Lloyd, C. D. (2015). Principles of geographical information systems. Oxford University Press.
4. Elachi, C., & Van Zyl, J. J. (2006). Introduction to the physics and techniques of remote sensing. John Wiley & Sons.
5. Heywood, D. I., Heywood, I., Cornelius, S., & Carver, S. (2011). An introduction to geographical information systems.
6. Lillesand, Kiefer, & Chipman. (2011a). Remote Sensing And Image Interpretation, 6th Edition.
7. Miller, V. C. (1961). Photogeology: By Victor C. Miller, Assisted by Calvin F. Miller.
8. Modi, P. N., & N, P. (2008). Irrigation Water Resources And Water Power Engineering,
9. Pandey, S. N. (1987). Principles and applications of Photogeology. New Age International.
10. Papacostas, C. S., &Prevedouros, P. D. (2001). Transportation Engineering and Planning. Pearson.
11. Punmia, B. C. (2005). Surveying Vol. I. Firewall Media.

PECRT04Elective-I
Crop Production Technology

Teaching Scheme	Examination Scheme
Theory: 3 Hrs../Week	Theory: ESE 70 Marks, CIE 30 Marks
Practical:NA	Practical: NA

Unit No.	Details	No. of Lectures
1	Classification of crops;Effect of different weather parameters on crop growth and development; Principles of tillage; Soil-water-plant relationship , crop rotation, cropping systems, relay cropping and mixed cropping; Crop production technology for major cereal crops viz., paddy, wheat, maize, pearl millet, sorghum, etc.; Major varieties, sowing time, method of sowing, spacing, inter culturing, fertilizer and water requirement, time of harvest, maturity index, yield potential, cost of cultivation, income from production, etc.;	10 Hrs.
2	Crop production technology for major oilseed crops viz., groundnut, sesame, rapeseed, mustard, castor, etc.: Major varieties, sowing time, method of sowing, spacing, inter-culturing, fertilizer and water requirement, time of harvest, maturity index, yield potential, cost of cultivation, income from production, etc.; Crop production technology for major pulse crops viz., pigeon pea, cowpea, gram, green gram, black gram, etc.: Major varieties, sowing time, method of sowing, spacing,inter-culturing, fertilizer and water requirement, time of harvest ,maturity index, yield potential, cost of cultivation, income from production, etc.;	12 Hrs.
3	Crop production technology for major spices and cash crops viz., cumin, coriander, funnel, ginger, garlic, sugarcane, etc.: Major varieties, sowing time, method of sowing, spacing, inter-culturing, fertilizer andwater requirement, time of harvest, maturity index, yield potential, costof cultivation, income from production, etc.; forage crops-sorghum, cowpea, cluster bean and napier. Forage crops-berseem, lucerne and oat. medicinal and aromatic crops-mentha, lemon grass and citronella,	10 Hrs.
4	Horticulture: Scope of horticultural crops. Soil and climatic requirements for fruits and vegetables, nursery raising and management; Crop production technology for major fruit crops viz., mango, banana, sapota, aonla, pomegranate, guava, etc.: Major varieties, time of transplanting, spacing, inter-culturing, fertilizer and water requirement, time and method of harvest, maturity index, yield potential, cost of cultivation, income from production, etc.;	8 Hrs.

References: -
1. Adams, C. R., Bamford, K. M., Brook, J., & Early, M. P. (2014). Principles of horticulture: Level 2.
2. Reddy, S. R. (2011). Principles of agronomy.
3. Singh, S. S. (1991). Principles and Practices of Agronomy.

Irrigation Techniques

Teaching Scheme	Examination Scheme
Theory: 3 Hrs../Week	Theory: ESE 70 Marks, CIE 30 Marks
Practical: NA	Practical: NA

Unit No.	Details	No. of Lectures
1	Measurement of Land, i.e. size, shape, Calculation formulae, Land shaping, Leveling, grading, Measurement of slope &it's methods.	10 Hrs.
2	Measurement of water storage, flows, instruments used, Application methods for different types of crops, Furrows, Basin, Raised beds, Borders.	10 Hrs.
3	Different crops; Horticulture, sericulture, cereals, Pules, cash crops, their stages, crop water requirements, formulae, Evapotranspiration of crops.	10 Hrs.
4	Pressurized irrigation systems, types, Sprinkler irrigation – parts, functioning, Layouts, Evaluation Maintenance & Repairing, Government facilities. Drip irrigation – Parts, layout, functioning, Evaluation, Government. Facilities, underground systems & miscellaneous.	10 Hrs.

References: -
1. D, L. (2005). Irrigation and Drainage.
2. Luthin, J. N. (1978). Drainage Engineering.
3. Michael, A. M. (2009). Irrigation Theory and Practice - 2Nd Edn: Theory and Practice. Vikas Publishing House.
4. Modi, P. (1998). Water Supply Engineering: Vol - 2. Rajsons Publications Pvt. Ltd.
5. Singh, G. (1980). Irrigation engineering. Rajsons Publications Pvt. Ltd.
6. Waller, P., &Yitayew, M. (2015). Irrigation and drainage engineering. Springer.

PCCRT05 Field Work

Teaching Scheme	Examination Scheme
Theory: NA	Theory: NA
	Teamwork: 50 Marks
Practical: 5 Hrs../Week	Practical: 50 Marks

Prepare a detail project report on any one of the following issues –

1) Health conditions and Services in Rural Areas, Rural Housing and Status of Rural Population

2) Prepare a Report on any of the formal and Non-formal education Programmes

3) Prepare a Report on any one of the following issues - PRIs, Cooperative Societies and Rural Banks

 4) Prepare a Report on any one of the following Agricultural Training Institutions – KVKs, FTCs and NIRDPR.

5) Prepare a Report on any one of the following Community Based Organizations - Watershed Committees -Village Forest Committees -Water User Associations-Village Education Committees -Mothers Committees.

6) Prepare a Report on Renewable Energy

A detailed presentation of field work must be carried out.

PCCRT06 Seminar-I

Teaching Scheme	Examination Scheme
Theory: NA	Theory: NA
Tutorial: NA	Term Work: 25 Marks
Practical: 2 Hrs./Week	Practical: NA

Seminar-I should be based on the literature survey on any topic relevant to Rural Technology (should be helpful for selecting a probable title of the dissertation). Each student has to prepare a write up of about 25-30 pages of "A4" size sheets and submit it in IEEE format in duplicate as the term work. The student has to deliver a seminar talk in front of the faculty of the department and his classmates. The concerned faculty should assess the students based on the quality of work carried out, preparation and understanding of the candidates. Some marks should be reserved for the attendance of a student in the seminars of other students.

PCCRT07 Rural Waste Management

Teaching Scheme	Examination Scheme
Theory: 3 Hrs../Week	Theory: ESE 70 Marks, CIE 30 Marks
Tutorial:	Term Work: 25 Marks
Practical: 2 Hrs../Week	Practical:

Unit No.	Details	No. of Lectures
1	Introduction of Rural waste, Type of waste, Necessity of systematic collection and disposal of waste, Types of sewerage systems. Sewage Treatment concept, Meaning and principle of primary and secondary treatment, constructional details of screening chamber, grit chamber, clarifier, trickling filters, General composition of sewage, importance & method of determination of B.O.D. and C.O.D.	10Hrs.
2	Disposal of night soil, Village latrines- collection and disposal of garbage and refuse. Construction of low cost latrines in rural areas. Septic tanks, cess pools/soak pit, privy pit and bore hole latrines.	10 Hrs.
3	Wastewater management, Drainage, topography, storm water, natural passage, development of drains. Technological options at household level management, leach pit, soakage pit, soak way channel, plantation with intercepting chamber.	12Hrs.
4	Solid waste management, Prospects and problems of solid waste management in rural areas, approach and steps for effective management of solid waste through composting, biogas technology and landfills. Garbage, ash, rubbish, collection methods, transportation, disposal – salvaging, dumping, controlled tipping, incineration, composting, dung disposal – digester, biogas plant.	8 Hrs.
Term Work: -Any 10 Assignments/Case Studies/Seminars/Quiz/Group Discussions etc. based on above syllabus.		
Reference Books: 1. John, S. V. V. K. &. S. (2015). Water supply engineering. Vikas Publishing House. 2. Modi, P. (1998b). Water Supply Engineering: Vol - 2. Rajsons Publications Pvt. Ltd. 3. Rangwala, S. C. (2005). Water Supply and Sanitary Engineering.		

PCCRT08 Recent Trends in Engineering and Technology

Teaching Scheme	Examination Scheme
Theory: 3 Hrs../Week	Theory: ESE 70 Marks, CIE 30 Marks
Tutorial:	Term Work: 25 Marks
Practical: 2 Hrs../Week	Practical:

Unit No.	Details	No. of Lectures
1	Introduction and components of Computer aided design (CAD), Basic concepts of graphics, Rendering; Graphical user interface; Computer aided drafting systems; Geometric modeling systems – wireframe, surface and solid modeling systems.	12 Hrs.
2	Introduction to 3D Modeling and Software. Introduction to 3D printing , History and evolution of 3D printing technology, Basics of 3D printing process (generalized process chain), Design for 3D printing, Overview of 3D printing technologies and printable materials.	10 Hrs.
3	Introduction to Augmented reality and virtual reality technology, 3D, Basics of unity software, Vitoria SDK.	10 Hrs.
4	AR Foundation, Marker-base AR ,Marker- less AR, Basics of Artificial Intelligence, Application of AI in Rural Technology.	8 Hrs.

Term Work: -Any 10 Assignments/Case Studies/Seminars/Quiz/Group Discussions etc based on above syllabus.

Reference Books:
1. Gibson, I., Rosen, D., & Stucker, B. (2014). Additive Manufacturing Technologies: 3D Printing, Rapid Prototyping, and Direct Digital Manufacturing. Springer.
2. Gibson, I., Rosen, D., & Stucker, B. (2016). Additive Manufacturing Technologies: 3D Printing, Rapid Prototyping, and Direct Digital Manufacturing. Springer.
3. Norvig, P. R. (2021). ARTIFICIAL INTELLIGENCE: A Modern Approach, Global Edition.
4. Russell, S., & Norvig, P. (2016). Artificial intelligence: A Modern Approach. Createspace Independent Publishing Platform.
5. Srivastava, M., Rathee, S., Maheshwari, S., & Kundra, T. (2019). Additive manufacturing: Fundamentals and Advancements. CRC Press.

PCCRT09 Power Plant Engineering

Teaching Scheme	Examination Scheme
Theory: 3 Hrs../Week	Theory: ESE 70 Marks, CIE 30 Marks
Tutorial: NA	Term Work: NA
Practical: NA	Practical: NA

Unit No.	Details	No. of Lectures
1	Introduction: Choice of power generation; load & load duration curves; load factor; diversity factor; load deviation curve; load management; number and size of generating units, combustion of fuels.	09 Hrs.
2	Coal Fired Power Plant: Steam power plant, Rankin cycle, Carnot cycle, mean temperature of heat addition, effect of variation of steam condition on thermal efficiency of steam power plant, reheating of steam, regeneration, regenerative feed water heating, feed water heaters, canonization of Rankin cycle, optimum degree of regeneration, optimum degree of regeneration, supercritical pressure cycle, steam power plant appraisal, deaerator, typical layout of steam power plant, efficiencies in a steam power plant, cogeneration of power and process heat	10 Hrs.
3	Diesel Engine Power Plant: Basics of a diesel engine and its parts' combustion in a CI engine, pressure- volume curves, applications of diesel engines in power field, advantages and disadvantages of diesel engine power plant, types of diesel plants, general layout, , performance characteristics, supercharging, layout of a diesel engine power plant.	07 Hrs.
4	Hydroelectric Power Plant: Advantages and disadvantages of water power, optimization of hydro-thermal mix, selection of site for a hydroelectric plant, hydrological cycle, hydrographs, storages and pondage, essential elements of a hydroelectric power plants, classification of hydroelectric power plants, hydraulic turbines, turbine size, Pelton wheel, degree of reaction, Francis turbines, propeller and Kaplan turbines, Deriaz turbine, bulb turbine, specific speed, comparison of turbines, cavitations, governing of hydraulic turbines, governing of reaction turbines, surge tanks, performance of turbines	8 Hrs.

Reference books: -
1. Chang, S. H. (2012). Nuclear power plants. BoD – Books on Demand.
2. Gupta, M. K. (2012). POWER PLANT ENGINEERING. PHI Learning Pvt. Ltd.
3. Jog, M. G. (1989). Hydro-Electric and pumped storage plants. Wiley.
4. Murray, R., & Holbert, K. E. (2019). Nuclear energy: An Introduction to the Concepts, Systems, and Applications of Nuclear Processes. Butterworth-Heinemann.
5. Nagpal, G. R. (1980). Power plant Engineering.
6. Petridis, G. K., & Nicolau, D. (2012). Nuclear power plants.
7. Raja, A. K., & Srivastava, A. P. (2006). Power plant Engineering. New Age International.
8. Rust, J. H. (1979). Nuclear Power Plant Engineering.
9. Sharma, P. C. (1985). A text book of Power plant engineering.
10. Skrotzki, B. G. A., & Vopat, W. A. (1960). Power station engineering and Economy. McGraw-Hill Companies.
11. Power Plant Familiarization, Manual of Central Training Resources Unit of NTPC India,

PCCRT10 Statistical Analysis and Information Technology for Rural Development

Teaching Scheme	Examination Scheme
Theory: 3 Hrs../Week	Theory: ESE 70 Marks, CIE 30 Marks
Tutorial:NA	Term Work: 25 Marks
Practical: 2 Hrs../Week	Practical: NA

Unit No.	Details	No. of Lectures
1	Overview, Installing Python, Learning Jupiter note book, mathematical and logical operator, conditional statement...if... Else, For loop while loop Data structure in python: List, tuple, array, set, dictionary.	10Hrs.
2	Introduction to Data Science and Machine Learning, Python for Data Science, Reading a CSV File in Python, Understanding data frames and basic operations, indexing, Installing and understanding various basic libraries viz Numpy, Pandas, matplotlib and sea born ,sklearn Reading file ,writing Files ,merging files, sort, index	10 Hrs.
3	Descriptive statistics and Visualization Data Frequency, Mean, median, Range, Quartile max, min, correlation, percentile Exploring the data, Summarizing the Data, Handling missing value, visualizing the data and interpret summaries for univariate and multi variate data Scatter plot, Stem and Leaf plot, Line plot, Bar and pie plot, Histogram, Box plot, Heat map	12Hrs.
4	Hypothesis Testing, Directional and non-directional hypothesis testing, Understanding Errors while Hypothesis Testing, Understanding T tests, Conducting One sample T tests, T-Critical Value, Paired T tests, Sample T tests, Chi Squared Tests, Correlation,	8 Hrs.

Term Work: -Any 10 Assignments/Case Studies/Seminars/Quiz/Group Discussions etc. based on above syllabus.

Reference Books:

1. Carroll, S. R., & Carroll, D. J. (2002). Statistics made simple for school leaders: Data-Driven Decision Making. R&L Education.
2. Dunn, O. J., & Clark, V. A. (2009). Basic statistics: A Primer for the Biomedical Sciences. John Wiley & Sons.
3. Flichy, P. (1995). Dynamics of modern communication: The Shaping and Impact of New Communication Technologies. SAGE Publications Limited.
4. Gupta, B. N. (2020). Statistics by Dr. B. N. Gupta (English): SBPD Publications. SBPD Publications.
5. L, A. B. (1988). Basic statistics. New Age International Limited Publishers.
6. Lind, D. A. (2002). Statistical techniques in Business & Economics.
7. McKinney, W. (2017). Python for data analysis: Data Wrangling with Pandas, NumPy, and IPython. "O'Reilly Media, Inc."
8. Ott, R., & Longnecker, M. (2015). An introduction to statistical methods and data

Elective-II
PCCRT10 Thermodynamics, Fluid and Electrical Engineering applied to Rural development

Teaching Scheme	Examination Scheme
Theory: 3 Hrs../Week	Theory: ESE 70 Marks, CIE 30 Marks
Tutorial: NA	Term Work: NA
Practical: NA	Practical: NA

Unit No.	Details	No. of Lectures
1	Zeroth law, first law & Second law of thermodynamics, Rankine cycle, Carnot cycle, mean temperature of heat addition, effect of variation of steam condition on thermal efficiency of steam power plant, reheating of steam, regeneration, regenerative feed water heating, feed water heaters	12 Hrs.
2	Introduction, Factors affecting Selection of Site, Schematic Diagrams and relative merits of steam, Gas, Diesel, Hydro Power Plants. Present status of power generation in India. Role of private and government organization, State Level Scenario, Load Shedding. Carbon credits	10 Hrs.
3	Fluid and turbo machinery , Pump, Compressor, Turbine applications for rural development	10 Hrs.
4	Choice of power generation; Load & Load duration curves; Load factor; Diversity factor; Load deviation curve; Load management; Number and size of generating unit; Cost of electrical energy ;Tariff-Power factor improvement.	8 Hrs.

Reference Books:

1. Bakshi, U. A., & Bakshi, M. V. (2020). Electrical technology. Technical Publications.
2. Dossat. (1984). Principles of Refrigeration 2ND Edition SI Version SEA.
3. Hveding, V. (1992). Hydropower development in Norway.
4. Kehlhofer, R. (1999). Combined-cycle gas & steam turbine power plants. Pennwell Books.
5. Nag, P. K. (2014). Power plant Engineering.
6. Rajput, E. R. K. (2006). Utilisation of electrical power. Firewall Media.
7. Stoecker, W. F. (1972). Refrigeration and air conditioning.
8. Uppal, S. L. (1984). Electrical power: Generation, Transmission, Distribution, Switchgear and Protection, Utilization of Electrical Energy and Electric Traction: in M.K.S. Units.

Teaching Scheme	Examination Scheme
Theory: 3 Hrs../Week	Theory :ESE 70 Marks, CIE 30 Marks
Tutorial:NA	Term Work: NA
Practical: NA	Practical: NA

Unit No.	Details	No. of Lectures
1	Post-harvest Technology Role of agro processing in rural development-Scope and importance, Post-harvest Technology – Concept- Importance with reference to agricultural products – Present scenario with reference to World, India, Maha1rashtraand Marathwada– Scope - extent of Post-harvest losses–causes of Post-harvest losses –salient features of Post-harvest management.	10 Hrs.
2	Post-harvest Handling Steps in Post-harvest handling–Harvesting stages–maturity indices of fruits and vegetables, Sorting and Grading-Precooling, Pretreatments , Importance of packing–Types of Packages used for packing of commercial products- Methods of storage– transportation.	08 Hrs.
3	Post-harvest technology of major crops Post-harvest technology and product diversification aspect of important crops like Sugarcane- Jaggery production, utilization of molasses, Cereals –Rice; Fruits–Mango, banana, sapota, guava, Lemon; Spices–Ginger, Pepper, Turmeric; Plantation crops - Coconut, Commercial Flowers, etc.	10 Hrs.
4	Processing Technologies Concept – steps and Principles - methods of preservation - important commercial methods like - Canning, preparation of Jam, Jelly, Pickles, Squash, Marmalade, etc. Entrepreneurship Development in Agri - based processing industries Scope of self – employability – Present scenario - licensing and FSSAI registration aspects - list of machineries used in processing industry - marketing strategies	12 Hrs.

Reference Books: -
1. Aberle, E. D., Forrest, J. C., Gerrard, D. E., & Mills, E. W. (2020). Principles of meat Science.
2. Borgstrom, G. (1961). Fish as food.
3. Hall, G. M. (1992). Fish processing technology. Wiley-VCH.
4. Lawrie, R. A. (1981). Developments in meat science.
5. Levie, A. (1963). The Meat Handbook.
6. Moorjani, M. N. (1998). Fish processing in India.
7. Sharma, B. D. (2011). Outlines of meat science and technology.
8. Sharma, S. (2005). Modern abattoir practices and animal byproducts technology.
9. Singh, R. A. (2018). Poultry production.

Elective-II
PCCRT10Greenhouse Technology

Teaching Scheme	Examination Scheme
Theory: 3 Hrs../Week	Theory:ESE 70 Marks, CIE 30 Marks
Tutorial:	Term Work:
Practical:NA	Practical: NA

Unit No.	Details	No. of Lectures
1	Green house technology- Introduction , Components and design of green houses, Advantages, Applications in agriculture Fundamentals of Green House Technology	10 Hrs.
2	Structure and Construction of a Green House. Designing and layout of green house, laying the greenhouse	10 Hrs.
3	Installation of greenhouse structure, erection of greenhouse structure Covering the greenhouse with nets and sheets Checking the first time leakages through the gutter Maintenance of greenhouse	08 Hrs.
4	Greenhouse Technology- Instruction in greenhouse structures and greenhouse environment regulations. Plant growth, development and propagation, production and maintenance of bedding and container produced plants.	12 Hrs.

Reference Books: -
1. Tiwari, G. N. (2003). Greenhouse technology for controlled environment. Alpha Science Int'l Ltd.
2. Patil N. N. (2016). Greenhouse Technology - Management, Operations and Maintenance
3. Castilla, N. (2013). Greenhouse Technology and Management. CABI.
4. Greenhouse Technology and Managemen14 December 2012by Nicolas Castilla and Esteban Baeza

PCCRT09 Numerical Methods and Optimization

Teaching Scheme	Examination Scheme
Theory: 3 Hrs../Week	Theory:ESE 70 Marks, CIE 30 Marks
Tutorial:	Term Work:
Practical:NA	Practical: NA

Unit No.	Details	No. of Lectures
1	Linear Algebraic Equation: 1. Gauss Elimination Method- Naïve Gauss Elimination, Pitfalls of Elimination, Techniques of improving solutions, Gauss- Jordan method 2. Matrix Invention- LU decomposition, Gauss Sedial, Jacobi Iteration method	08 Hrs.
2	A. Curve Fitting: i. Least Square Regression – Linear regression, Polynomial Regression ii. Interpolation – Newton's divided difference, interpolating polynomial, Languages interpolating polynomial B. Statistics: Mean and standard deviation, Addition and multiplication laws probabilities, Binomial, Poisson and normal distribution.	10 Hrs.
3	Numerical Differentiation and Integration a. Newtonscote's Integration of equation: Trapezoidal rule, Simpson's rules, Integration unequal segments. b. Integration of Equation: Romberg's Integration and Gauss Quadrature. c. Numerical differentiation, Differentiation formulae, Richardson extrapolation, Derivation of unequally spaced data, Forward difference, Central difference, Backward difference, Backward difference	10 Hrs.
4	Ordinary Differential Equation: a. Taylor''s series method, Picard's Method, Runge-Kutta method, Eulers Method, Improved polygon method, System of equation b. Boundary value and Eigen value problem, Shooting Method, Finite Difference Method, Eigen value problem based on polynomial method, Power method. Partial Differential Equation: a. Finite Difference – Elliptical equation, Laplac''s equation, Linemen's Method, Secondary variables, Boundary condition. b. Finite Difference- Parabolic Equation , Explicit Method- Bender- Schmidt method, Implicit method- Crank Nicolson Method	12 Hrs.

Reference Books:
1. Burden, R. L. (2011). Numerical analysis.
2. Chapra, S. C. (2018). Applied Numerical Methods with MATLAB® for Engineers and Scientists.
3. Cheney, E., & Kincaid, D. (2012). Numerical Mathematics and Computing. Cengage Learning.
4. Fausett. (2009). Applied Numerical Analysis using MATLAB. Pearson Education India.

PCCRT12 SEMINAR –II

Teaching Scheme	Examination Scheme
Theory: NA	Theory: NA
Tutorial: NA	Term Work: 25 Marks
Practical:2 Hrs../Week	Practical: NA

Seminar II shall be based on tentative topic of dissertation such as review paper on some specific well defined area/ specialized stream of Rural Technology. Each student has to prepare a write up of about 25-30 pages of "A4" size sheets and submit it in IEEE format in duplicate as the term work. The student has to deliver a seminar talk in front of the faculty of the department and his classmates. The faculty, based on the quality of work, carried out, preparation and understanding of the candidates. Some marks should be reserved for the attendance of a student in the seminars of other students.

Semester-III
PCCRT13 Industrial Training

Teaching Scheme	Examination Scheme
Theory: NA	Theory: NA
Tutorial: NA	Term Work: 50 Marks
Practical: NA	Practical:

The student has to prepare the report of training undergone in the industry during vacation after semester II. It shall include the brief details of assignment completed by the candidate and general observation and analysis. The identified areas for undertaking the dissertation work shall form part of report. The term work marks should be based on report and departmental oral exams. The training should be of minimum two weeks from reputed industries and certificate of the same should be a part of the report.

PCCRT14 Comprehensive Viva

Teaching Scheme	Examination Scheme
Theory:	Theory:
Tutorial:	Term Work: 25 Marks
Practical:	Practical: 25 Marks

The students have to prepare on all subjects which they have studied in I st and IInd semesters the viva will be conducted by the External/Internal Examiner jointly and their appointments will be made by university. The in-depth knowledge, preparation and subjects understanding will be assessed by the Examiners.

PCCRT15 Dissertation Phase – I

Teaching Scheme	Examination Scheme
Theory: NA	Theory:- NA
Tutorial: NA	Term Work: 50 Marks
Practical: 5 Hrs../ Week	Practical: 50 Marks

The term work submitted by the student shall include.
1) Work diary maintained by the student and counter signed by his guide.
2) The content of work diary shall reflect the efforts taken by candidates for (a) Searching the suitable project work. (b)Visits to different factories or organizations. (c) The brief report of feasibility studies carried to come to final conclusion. (d) Rough sketches. (e) Design calculations etc. carried by the student.
3) The student has to make a presentation in front of panel of experts in addition to guide as decided by department head.
A Synopsis of Dissertation should be prepared, presented and submitted to university authority in a stipulated time period.

Semester-IV
PCCRT16Dissertation Phase – II

Teaching Scheme	Examination Scheme
Theory:	Theory:
Tutorial:	Term Work: 100 Marks
Practical: 5 Hrs../ Week	Practical:

The dissertation submitted by the student on topic already approved by university authorities on basis of initial synopsis submitted by the candidate, shallbe according to following guidelines. Format of dissertation report: The dissertation work report shall be typed on A4 size bond paper. The total No. of minimum pages shall not less than 60. Figures, graphs, annexure etc be as per the requirement. The report should be written in the standard format.
1. Title sheet
2. Certificate
3. Acknowledgement
4. List of figures, Photographs/Graphs/Tables
5. Abbreviations.
6. Abstract
7. Contents.
8. Text with usual scheme of chapters.
9. Discussion of the results and conclusions Bibliography (the source of illustrative matter be acknowledged clearly at appropriate place IEEE/ASME/Elsevier Format)

A Dissertation Report should be prepared, presented and submitted to university authority in a stipulated time period.

PCCRT17Dissertation Phase – III

Teaching Scheme	Examination Scheme
Theory:	Theory:
Tutorial:	Term Work: 100 Marks
Practical: 5 Hrs../ Week	Practical:100 Marks

The student has to make a presentation in front of panel of experts in addition to guide as decided by University authority as a Final Viva of Master of Technology.