Subject Code: PHEE-101

Subject Name: RENEWABLE ENERGY SYSTEM

Programme: Phd (ElectricalEngg.)	**L: 3 T: 0 P: 0**
Semester:1	**Teaching Hours: 44**
Theory/Practical: Theory	**Credits:3**
Internal marks:40	**Percentage of Numerical/Design/ Programming Problems: 60%**
External Marks:60	**Duration of End Semester exam (ESE): 3 hr**
Total marks:100	**Elective Status: Elective**

Prerequisites: Non-Conventional Energy Sources (at UG level)

Additional Material allowed in ESE: Scientific Calculator (Non-programmable)

On Completion of the course, the student will have the ability to:

CO#	Course Outcomes (CO)
1	Understand distributed and central generating station
2	Understand aboutrenewable sources of energy
3	Apply the concepts of power electronic for grid interfacing of distributed generators
4	Understand power quality issues of distributed generation
5	Attain the knowledge of protection and economics of distributed generation

Unit 1Introduction: Distributed vs. Central Station Generation, Turbo-generator, Nuclear generator and Micro-turbines.

Unit 2Renewable Sources of Energy: Introduction to Solar Energy, Wind Energy, Combined Heat and Power, Hydro Energy, Tidal Energy, Wave Energy, Geothermal Energy, Biomass and Fuel Cells.

Unit 3 Interfacing Distributed Generators with Grid: Applications of Power Electronic devices for Grid Interfacing of Distributed Generators.

Unit 4 Power Quality Issues: Impact of Distributed Generation on the Power System, Power Quality Disturbances.

Unit 5 Protection and Economics: Transmission System Operation, Protection of Distributed Generators, Economics of Distributed Generation.

Text/Reference:

1. R. Ranjan,D.P. Kothari, and K.C. Singal, "Renewable Energy Sources and Emerging Technologies", Prentice Hall of India,2011.
2. M. H. Bollen and F. Hassan, "Integration of Distributed Generation in the Power System", Wiley –IEEE Press, 2011.
3. L.L. Lai and T.F. Chan, "Distributed Generation: Induction and Permanent Magnet Generators", Wiley-IEEE Press, 2007.
4. R. A. Messenger and J. Ventre, "Photovoltaic System Engineering", 2010.
5. J. F. Manwell, J.G.McGowan and A.L Rogers, "Wind energy explained: Theory, Design and Application", John Wiley and Sons, 2010.

E-Book and Online learning material:

1. Technical University of Denmark, https://www.coursera.org/learn/wind-energy
2. P.Haridos, IIT Madras, https://swayam.gov.in/courses/4894-july-2018-non-conventionalenergy-resources
3. A. Smets, Sustainable Energy: Design a Renewable Future, TU Delft & EDX
4. A. Smets, Solar Energy, TU Delft & EDX
5. A. Stegner, P.P. Drobinski, Wind resources for renewable energies, École Polytechnique & Courser

Subject Code: PHEL-107 Subject Name: Decision Making Methods

Programme: PhD (ME)	L: 4 T: 0 P: 0
Semester: 1st	Teaching Hours: 48
Theory/Practical: Theory	Credits: 4
Internal Marks: 40	Percentage of Numerical/Design/Programming Problems: 60%
External Marks: 60	Duration of End Semester Exam(ESE): 03 Hrs
Total Marks: 100	Course Status: Elective

Prerequisites: Knowledge of Probability and Basic Mathematics

Additional Material Allowed in ESE: [NIL]

On completion of the course, the student will have the ability to:

CO#	Course Outcomes (CO)
1	Understand different types of decision-making tools.
2	Solve a variety of business issues using apropriate decision tools and frameworks.
3	APR fcation Of different case studies in a real environment.
4	Analyze organizational systems to identify opportunities to improve decision-making.
5	Evaluate various approaches in decision-making in taking the better decision.
6	Synthesis of the decision-making based on individual and group decision-making.

Detailed Contents:

1. **Introduction:** Problem Solving and Decision Making, Types of decisions: Insight, innovation, and creativity in decision making, Decision Making Tools and Models, Individual and Group Decision Making, Quantitative and Qualitative Methods in Practice. **07 Hrs**
2. **Probability:** Experiments and the Sample Space, Assigning Probabilities to Experimental Outcomes, Probability Distributions, Random Variables, Discrete Probability Distributions, Uniform Probability Distribution, Normal Probability Distribution, Decision Making with/without Probabilities. **07 Hrs**
3. **Linear Programming:** Linear Programming Problem: Problem Formulation, Graphical, Simplex, Big M Method, Duality, Duality Theorem, Sensitivity Analysis and Interpretation of Solution. **10 Hrs**
4. **Distribution and Sequencing Methods:** Transportation Problem, Assignment Problem, Sequencing Problem, Processing ri jobs through one machine, two machine and m machines. **07 Hrs**
5. **Multi-Criteria Decision Methods (MCDM):** Concept of MCDM, Difference between MCDM and multi-attribute decision making (MADM), analytical hierarchy process (AHP), Technique for Order of Preference by Similarity to Ideal Solution (TOPSIS), Data Envelopment Analysis (DEA), and Entropy weights method. **10 Hrs**
6. **Big Data:** The future of big data and decision making, Case discussion **07 Hrs**

Reference/Text Books:

1. David R. Anderson, Dennis J. Sweeney, Thomas A. Williams, Jeffrey D. Camm, James J. Cochran, *"Quantitative Methods for Business"*, 13th Edition, South Western Cengage Learning, Mason, OH, 2015.
2. Prem Kumar Gupta, D S Hira, *" Operations Research"*, 6th Edition, S. Chand, New Delhi 2011.
3. R V Rao, *"Decision Makitig in the Manufacturing Environment Using Graph Theoryand Fuzzy Multiple Attribute Decision Making Methods"*, 1st Edition, Springer-3 erlag London,2007.
4. Christian Albright, Wayne L. Winston, *"Business Analytics. Data Analysis and Decision Making"*, 5th Edition, Cengage Learning, 2015.

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I.K. GUJRAL PUNJAB TECHNICAL UNIVERSITY
Estd. Under Punjab Technical University Act, 1996
(Punjab Act No. 1 of 1997)

Ref. No. : IKGPTU/Reg/NF/ 169 *Dated :* 23.06.2021

NOTIFICATION

Sub: Introduction of two credit course "Research and Publication Ethics (RPE).

I.K. Gujral Pujnab Technical University, Jalandhar has introduced a mandatory two credit course on "Research and Publication Ethics (RPE) for all Ph.D students in their pre-registration course work from January 2021 onwards. The course content/ structure as per UGC guidelines (letter No.D.O.No.F.1-1/2018 (Journal/CARE) dated December 2019) has been included in Ph.D. course work. The details are as follows:

Research and Publication Ethics (RPE)
(2 Credits)

1. Course structure

- The course comprises of six modules listed in table below. Each module has 4-5 units.

Modules	Unit title	Teaching hours
Theory		
RPE 01	Philosophy and Ethics	4
RPE 02	Scientific Conduct	4
RPE 03	Publication Ethics	7
Practice		
RPE 04	Open Access Publishing	4
RPE 05	Publication Misconduct	4
RPE 06	Database and Research Metrics	7
	Total	**30**

Syllabus (as suggested by UGC)

THEORY

- **RPE 01: PHILOSOPHY AND ETHICS (3hrs.)**

1. Introduction to Philosophy: definition, nature and scope, concept, branches
2. Ethics: definition, moral Philosophy, nature of moral judgements and reactions

- **RPE 02: SCIENTIFIC CONDUCT (5hrs.)**

1. Ethics with respect to science and research
2. Intellectual honesty and research integrity
3. Scientific misconducts: Falsification, Fabrication and Plagiarism (FFP)
4. Redundant publications: duplicate and overlapping publications, salami slicing.
5. Selective reporting and misrepresentation of data

- **RPE 03: PUBLICATION ETHICS (7hrs.)**

1. Publication Ethics: definition, introduction, and importance
2. Best practices/standards setting initiatives and guidelines: COPE, WAME, etc.
3. Conflicts of interest
4. Publication misconduct: definition, concept, problems that lead to unethical behaviour and vice versa, types.
5. Violation of publication ethics, authorship, and contributorship
6. Identification of publication misconduct, complaints and appeals
7. Predatory publishers and journals

PRACTICE

- **RPE 04: OPEN ACCESS PUBLISHING (4hrs.)**

1. Open access publications and initiatives
2. SHERPA/RoMEO online resource to check publisher copyright & self–archiving policies.
3. Software tool to identify predatory publications developed by SPPU.
4. Journal finder/journal suggestion tool viz. JANE, Elsevier Journal Finder, Springer Journal Suggester, etc.

- **RPE 05: PUBLICATION MISCONDUCT (4hrs.)**

A. Group Discussion (2hrs.)

1. Subject specific ethical issues, FFP, authorship
2. Conflicts of interest
3. Complaints and appeals: examples and fraud from India and abroad

B. **Software tools (2hrs.)**

Use of plagiarism software like Turnitin, Urkund, and other open-source software tools.

- **RPE 06: DATABASES AND RESEARCH METRICS (7hrs.)**

A. Databases (4hrs.)

1. Indexing databases
2. Citation databases: Web of Science, Scopus, etc.

B. Research Metrics (3hrs.)

1. Impact Factor of journal as per Citation Report, SNIP, SJR, IPP, Cite Score
2. Metrics: h-index, g-index, i10 index, altmetrics

2. Course Work Structure – 17 Credits

All candidates admitted to Ph.D programme shall be required to complete the Ph.D course work, proposed by the Supervisor keeping in view the candidate's areas of research in the University Teaching Department. Pre Ph.D course work will be **17 credits and shall be offered on regular** basis at IKGTU campus.

Structure of course work is as under:

Sr. No.	Nature of Course	Name of Course	Credits	Remarks
1	Core	1. Research Methodology	4	The syllabus of RM should be formulated faculty wise such as Engineering, Sciences, Management/ Humanities and Life Sciences
		2. Subject Related theory paper	4	Discipline specific related to Advancements in theoretical methods for research.
		3. Presentation	3	Discipline specific
2.	Interdisciplinary	4. Elective	4	From list of Subjects from allied fields
3.	Research and Publication Ethics (RPE)	5. Research and Publication Ethics (RPE)	2	As Per UGC
	Total Minimum credits		**17**	

a. The candidate will have to clear Courses within the first two semesters as per the programme of the Department.

b. Direct fellowship awardees or candidates registered for Ph.D. during the middle of the semester will take up course work in the following semester

c. The syllabus for the Pre-Ph.D. course work, not covered in the ongoing PG curriculum, will be drawn by the Board of Studies or RAC subject to the approval by BoS and highest academic body of the University.

d. An Attendance less than the mandatory 75% (including 10% attendance benefit on medical grounds) in the course work shall attract cut in the scholarship /fellowship.

3. Applicability:

It is decided that the 17 credit course work will be applicable to all students which are enrolled from January 2021 onwards.

(Sandeep Kumar Kazal)
Registrar

Endst. No. IKGPTU/Reg/NF/170-174 **Dated:**23**.06.2021**

A copy is forwarded to the following officers for information please.

1. Vice Chancellor Secretariat: For information of Vice Chancellor
2. Dean (R&D)
3. Director (Main Campus): To inform all Deputy Dean (Faculty), HoDs (Teaching) and In-charge, Constituent Campuses
4. Director/Principal, Autonomous College
5. Incharge (ITS): For upload of notice in the Notice Board of University website and Ph.D admissions link also.

(Sandeep Kumar Kazal)
Registrar

PHRM-101: RESEARCH METHODOLOGY

Internal Marks: 50
External Marks: 100
Total Marks: 150

L T P
4 0 0

Overview of Research: Nature and Objectives of research, historical, descriptive and experimental, Study and formulation of research problem, Scope of research and formulation of hypotheses; Feasibility, preparation and presentation of research proposal.

Methods of Data Collection: Primary data and Secondary Data, methods of primary data collection, classification of secondary data.

Sampling Methods: Probability sampling: simple random sampling, systematic sampling, stratified sampling, cluster sampling and multistage sampling. Non probability sampling: convenience sampling, judgment sampling, quota sampling. Sampling distributions.

Processing and Analysis of Data: Statistical measures and their significance. Central tendencies, variation, skewness, Kurtosis, time series analysis, correlation and regression, Testing of Hypotheses, Parametric (t, z and F) Chi Square, ANOVA. Measures of central tendency and dispersion: mean, median, mode, range, mean deviation and standard deviation. Regression and correlation analysis.

Design of Experiments: Basic principles, study of completely randomized and randomized block designs. Edition and tabulation of results, presentation of results using figures, tables and text, quoting of references and preparing bibliography.

Note: Application and use of various software for case studies should essential be covered in the lectures.

Recommended Books

1. C.R Kothari, Research Methodology, Wishwa Prakashan
2. P.G Triphati, Research Methodology, Sultan Chand & Sons, N.Delhi
3. Fisher, Design of Experiments, Hafner
4. Sadhu Singh, Research Methodology in Social Sciences, Himalya Publishers
5. Stauffer etal, Management & Meditation, Wiley & Sons