



Department of Electrical Engineering

Islamic University of Science and Technology, Awantipora

No. DoEE/SoET/2021/ 417

File No.: 2120


Dated: 13th December, 2021

Head, Department of Computer Science
Islamic University of Science & Technology

Subject: Approved syllabus of Research Methodology for Ph.D programme of Batch 2020.

Sir,

With reference to your communication made vide no. IUST/DOCS/DRC/syllabus/299, dated: 07/12/2021, regarding the subject cited above, kindly find enclosed herewith the same, for your information and necessary action at your end.


Dr Mubashar Yaqoob Zargar
Research Coordinator, SoE&T, IUST

No. of enclosures: 12 (twelve)





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12/14/20

Islamic University of Science and Technology
Awantipora, Kashmir

Office of the Dean, School of Engineering and Technology (SoET)

Circular regarding mandatory courses for research scholars granted admission in PhD in the various departments of SoET, IUST

It was resolved by consensus in a meeting attended by all Heads of SoET that research scholars granted admission in PhD in the various departments of the SoET, IUST in the year 2020 would have to complete two courses covering the content of Research methodology and Research ethics. These courses can be covered in two semesters.

The course content for the course on Research methodology was framed by consensus, and the course content for the course on Research ethics would be followed according to the UGC directive for the same. Further, it was also resolved that the two courses would be jointly taught by the departments within SoET, and the responsibilities for teaching the content were distributed. However, there would be one coordinating department responsible for registration, time-table, classes, examination, evaluation etc. for each course. The details of the courses and the teaching and coordinating departments are given below:

Course Name	Coordinating department for Spring 2020	Teaching departments for Spring 2020
SET801F: Research and Publication ethics	Computer Science and Engineering (CSE)	CSE, ECE, CE, FT
SET802F: Research Methodology for Engineering and Technology	Computer Science (CS)	CS, FE, ME, FT, Dept. of English language and Literature

A part of both courses (SET801F and SET802F) would be taught by Dean SoET and Dean Research, respectively.

The syllabi for the courses and the content distribution details (for spring 2020) amongst the teaching departments is attached.

Copy to:

1. Honourable Vice Chancellor, IUST for kind information
2. Dean Academic Affairs, IUST for kind information
3. Controller examination, IUST for kind information
4. All Heads/Incharge Heads ECE, FE, CSE, ME, CE, FT, CS for information and further necessary action.
5. Directorate of Information Technology and support services (DITSS), for necessary action as regards registration of the students for the said courses.

6. *Dean Research - IUST.*

Dean SoET
IUST



Enclosed: 11 pages

Syllabi





SET802F: Research Methodology for Engineering and Technology

Credits: 4

Unit-I (12 hours) Science and Scientific research: Knowledge and the epistemology of knowledge, deductive and inductive inference, A brief history of scientific ideas, important thinkers, scientists and scientific advancements. Principles of effective research, aspects of research - self-development and the creative process, the problem-solver and the problem-creator; Finding and solving research problems, Literature survey, developing a research plan, research proposals.

Unit-II (12 hours): Computational thinking and statistical analysis: Measures of central tendency. Data and its nature. data representation. curve plotting using MS-Excel and Origin. Hypothesis testing concept of p-value. Student's t-test and F-test. ANOVA(one way and two way). transformation of data. Tests of significance. non-parametric tests. simple, partial and multiple correlations. Basic principles of Statistical Computation using various softwares: design of experiments and analysis of results using various softwares (MATLAB, ORIGIN, SPSS, Design Expert. etc)

Unit-III (10 hours): Scientific Writing: The research report, Steps in writing a report, Layout of the research report, Writing references and bibliography. Presentations: Importance of effective presentation, Planning a good presentation. Scientific Papers: How to write good papers, models of the paper writing process, identifying ideas and telling the story, The benefits of targeting good journals, Peer review, How to respond to reviewer comments, reviewing a paper.

Unit-IV (10 hours): Technical and Scientific documentation using Latex: What is LATEX?, A short history of TEX, Main attractions of LATEX: Automatic Styling according to Journal requirements, Cross references, Writing Complex Maths. The LATEX document, Typical Input Files, Post-processed look, The Edit/Format/Preview Process, Embedding References in the Document, Bibliography management using BIBTEX, Presentations using Beamer, Introduction to Overleaf, Hands-on sessions on LATEX.

Unit-V (16 hours): Modelling, Simulation and Data analysis using software tools: Introduction, Variable types, arrays and matrices, multidimensional arrays, subarrays, operations, functions, using



functions, with array inputs; Displaying output data: Two Dimensional plotting, multiple plots, subplots; Logarithmic and Polar plots; Control Flow/Branching Statements: Logical data type, Relational operators, if...else, switch...case, Loops- While and For loops, nested loops. User defined functions. Additional Data and Plot Types: Complex Data, Complex numbers with relational operators, Complex functions, String functions, 3D line plots, 3D surface, mesh and contour plots, Introduction to Optimal Design using software tools.

References:

1. Research Methods for Engineers, David V. Thiel, Cambridge University Press
2. The Discoveries. Great Breakthroughs in 20th-century Science, Alan Lightman
3. On The Shoulders Of Giants, Stephen Hawking
4. God Created the Integers: The Mathematical Breakthroughs That Changed History, Stephen Hawking
5. How to write a great research paper, Simon Peyton Jones, Microsoft Research Cambridge
6. Latex: A Document Preparation System Users, Leslie Lamport, Addison-Wesley
7. MATLAB Programming for Engineers, Stephen J. Chapman
8. <http://michaelnielsen.org/blog/principles-of-effective-research/>
9. <https://www.isical.ac.in/~palash/research-methodology.html>
10. <https://goelsan.wordpress.com/2013/04/10/research-method-for-engineering-research-students-iv-an-incomplete-course-for-phd-scholars/>

Annexure

A list of proposed assignment topics for the research scholars to improve their writing skills and their ability to commence a good literature survey

1. Assignment 1: Download and read a good quality PhD thesis in an area related to your research area. Summarise the work in 500 words.
2. Assignment 2: List the top rated journals and conferences in your chosen areas. List some well known researchers whose work in your chosen area has been well recognized as outstanding and exemplary. Also write a short note about the contribution by any two of them.
3. Assignment 3: Literature review: Shortlist 10 good quality papers in your research area. Write a report containing the list of papers with citation count, extract and tabulate the research



SET802F: Research Methodology for Engineering and Technology

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Unit-II (12 hours): Computational thinking and statistical analysis: Measures of central tendency, Data and its nature, data representation, curve plotting using MS-Excel and Origin, Hypothesis testing concept of p-value, Student's t-test and F-test, ANOVA(one way and two way), transformation of data, Tests of significance, non-parametric tests, simple, partial and multiple correlations, Basic principles of Statistical Computation using various softwares; design of experiments and analysis of results using various softwares (MATLAB, ORIGIN, SPSS, Design Expert, etc)

Unit-III (10 hours): Scientific Writing: The research report, Steps in writing a report, Layout of the research report, Writing references and bibliography, Presentations: Importance of effective presentation, Planning a good presentation, Scientific Papers: How to write good papers, models of the paper writing process, identifying ideas and telling the story, The benefits of targeting good journals, Peer review, How to respond to reviewer comments, reviewing a paper.

Unit-IV (10 hours): Technical and Scientific documentation using Latex: What is LATEX?, A short history of TEX, Main attractions of LATEX: Automatic Styling according to Journal requirements, Cross references, Writing Complex Maths, The LATEX document, Typical Input Files, Post-processed look, The Edit/Format/Preview Process, Embedding References in the Document, Bibliography management using BIBTEX, Presentations using Beamer, Introduction to Overleaf, Hands-on sessions on LATEX.

Unit-V (16 hours): Modelling, Simulation and Data analysis using software tools: Introduction, Variable types, arrays and matrices, multidimensional arrays, subarrays, operations, functions, using

SET801F: Research and Publication ethics

Credits: 2

Unit 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

Unit 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

Unit 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

Unit 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 tools viz. JANE, Elsevier Journal Finder, Springer Journal Suggester, etc.

Unit 05: PUBLICATION MISCONDUCT (4hrs.)

- A. Group Discussions (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

Unit 06: DATABASES AND RESEARCH METRICS (7hrs.)

A. Databases (4hrs.)

Indexing databases

Citation databases: Web of Science, Scopus. etc.

B. Research Metrics (3hrs.)

Impact Factor of journal as per Journal Citation Report, SNIP, SJR, IPP, CiteScore

Metrics: h-index, g index, i10 index, altmetrics

References

1. Bird, A. (2006). Philosophy of Science. Routledge
2. MacIntyre, Alasdair (1967), A short history of ethics
3. P. Chaddah (2018), Ethics in Competitive Research: Don't get Scooped, don't get plagiarised
4. On Being a Scientist: A guide to responsible conduct in research (2009), National Academies Press.
5. Resnik, D.B. (2011), What is ethics in research and why is it important, National institute of environmental health sciences
6. Beall, J. (2012), Predatory publishers are corrupting open access. Nature, 489(7415)
7. Ethics in Science Education, Research and Governance (2019), Indian National Science Academy (INSA).



Content Distribution details



SET802F: Research Methodology for Engineering and Technology

Course Coordinating Dept.: CS *CS*

Content	Department responsible for teaching the content in Spring 2020
<p>Unit-I (12 hours) Science and Scientific research: Knowledge and the epistemology of knowledge, deductive and inductive inference, A brief history of scientific ideas, important thinkers, scientists and scientific advancements. Principles of effective research, aspects of research - self-development and the creative process, the problem-solver and the problem-creator; Finding and solving research problems, Literature survey, developing a research plan, research proposals.</p>	Dean Research, IUST
<p>Unit-II (12 hours): Computational thinking and statistical analysis: Measures of central tendency, Data and its nature, data representation, curve plotting using MS-Excel and Origin, Hypothesis testing concept of p-value, Student's t-test and F-test, ANOVA(one way and two way), transformation of data, Tests of significance, non-parametric tests, simple, partial and multiple correlations, Basic principles of Statistical Computation using various softwares: design of experiments and analysis of results using various softwares (MATLAB, ORIGIN, SPSS, Design Expert, etc)</p>	ME+FT
<p>Unit-III(10 hours): Scientific Writing: The research report, Steps in writing a report, Layout of the research report, Writing references and bibliography, Presentations: Importance of effective presentation, Planning a good presentation, Scientific Papers: How to write good papers, models of the paper writing process, identifying ideas and telling the story, The benefits of targeting good journals, Peer review, How to respond to reviewer comments, reviewing a paper, Identification of publication misconduct, complaints and appeals Predatory publishers and journals</p>	ME+Dept. Of English Language and Literature
<p>Unit-IV (10 hours): Technical and Scientific documentation using Latex: What is LATEX?, A short history of TEX, Main attractions of LATEX: Automatic Styling according to Journal requirements, Cross</p>	EE



<p>references, Writing Complex Maths: The LATEX document, Typical Input Files, Post-processed look, The Edit/Format/Preview Process, Embedding References in the Document, Bibliography management using BIBTEX, Presentations using Beamer, Introduction to Overleaf, Hands on sessions on LATEX.</p>	
<p>Unit-V (16 hours): Modelling, Simulation and Data analysis using software tools: Introduction, Variable types, arrays and matrices, multidimensional arrays, subarrays, operations, functions, using functions with array inputs, Displaying output data. Two Dimensional Plotting, multiple plots, subplots, Logarithmic and Polar plots. Control Flow/Branching Statements: Logical data type, Relational operators, if - else, switch - case, Loops - While and For loops, nested loops. User defined functions. Additional Data and Plot Types: Complex Data, Complex numbers with relational operators, Complex functions, String functions, 3D line plots, 3D surface, mesh and contour plots, Introduction to Optimal Design using software tools.</p>	<p>CS</p>



SET801F: Research and Publication ethics

Course Coordinating Dept.: CSE

Content	Department responsible for teaching the content in Spring 2020
<ul style="list-style-type: none"> ● PHILOSOPHY AND ETHICS (3hrs.) <ol style="list-style-type: none"> 1 Introduction to philosophy: definition, nature and scope, concept branches 2 Ethics: definition, moral philosophy, nature of moral judgements and reactions 	Dean SoET
<ul style="list-style-type: none"> ● SCIENTIFIC CONDUCT (5hrs.) <ol style="list-style-type: none"> 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 	CSE
<ul style="list-style-type: none"> ● PUBLICATION ETHICS (7hrs.) <ol style="list-style-type: none"> 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 	ECE



<ul style="list-style-type: none"> ● OPEN ACCESS PUBLISHING (4hrs.) <ol style="list-style-type: none"> 1. Opens 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 tools viz. JANE, Elsevier Journal Finder, Springer Journal Suggester, etc. 	<p>CE</p>
<ul style="list-style-type: none"> ● PUBLICATION MISCONDUCT (4hrs.) <ul style="list-style-type: none"> A. Group Discussions (2hrs.) <ol style="list-style-type: none"> 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.) <p>Use of plagiarism software like Turnitin, Urkund and other open source software tools</p> 	<p>A. Group Discussions: Dean-SoET</p> <p>B. Software tools: FT</p>
<ul style="list-style-type: none"> ● DATABASES AND RESEARCH METRICS (7hrs.) <ul style="list-style-type: none"> A. Databases (4hrs.) <ol style="list-style-type: none"> 1. Indexing databases 2. Citation databases: Web of Science, Scopus, etc. B. Research Metrics (3hrs.) <ol style="list-style-type: none"> 1. Impact Factor of journal as per Journal Citation Report, SNIP, SJR, IPP, CiteScore 2. Metrics: h-index, g index, i10 index, altmetrics 	<p>FT</p> 