AISSMS
INSTITUTE OF INFORMATION TECHNOLOGY
(IOIT)

ADDING VALUE TO ENGINEERING

An Autonomous Institute Affiliated to Savitribai Phule Pune University
Approved by AICTE, New Delhi and Recognised by Govt. of Maharashtra
Accredited by NAAC with "A+" Grade | NBA - 5 UG Programmes

ACADEMIC COURSE STRUCTURE

Honors in Research
Structure and Syllabus

PROGRAM IN
INSTRUMENTATION ENGINEERING

B.TECH 4 YEAR UG COURSE

(2025 Pattern)

AISSMS INSTITUTE OF INFORMATION TECHNOLOGY
Kennedy Road, Near RTO,
Pune – 411 001, Maharashtra State,
India
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BOS-INSTRUMENTATION ENGINEERING
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PUNE-1.

Institute Vision & Mission

Vision:

To be recognized amongst top 10 private engineering colleges in Maharashtra by the year 2026 by rendering value added education through academic excellence, research, entrepreneurial attitude, and global exposure.

Mission :

- To enable placement of 150 plus students in the 7 lacs plus category & ensure 100% placement of all final year students.
- To connect with 10 plus international universities, professional bodies, and organizations to provide global exposure students
- To create conducive environment for career growth, prosperity, and happiness of 100% staff.
- To be amongst top 5 private colleges in Pune in terms of admission cut off

Quality Policy

We commit ourselves to provide quality education & enhance our students quality through continuous improvement in our teaching and learning processes.

Department Vision & Mission

Vision:

To be recognized as one of the best instrumentation engineering programs by developing globally competent engineers, researchers and entrepreneurs to solve real life problems through skill-based education.

Mission:

M1:To promote learning for skill-based education and emerging technologies to make students globally competent.

M2:To create conducive environment for research, innovations and entrepreneurship.

Program Educational Objectives:

Graduates will

1. solve real life problems by applying the knowledge of instrumentation technology.
2. pursue higher education or be researcher or be entrepreneur.
3. contribute as a socially responsible citizen for the development of nation.
4. for the development of nation.

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Program Outcomes(POs)

1. Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems. [Engineering knowledge]
2. Identify, formulate, research literature, and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences. [Problem analysis]
3. Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations. [Design/development of solutions]
4. Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions. [Conduct investigations of complex problems]
5. Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations. [Modern tool usage]
6. Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice. [The engineer and society]
7. Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development. [Environment and sustainability]
8. Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice. [Ethics]
9. Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings. [Individual and team work]
10. Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions. [Communication]
11. Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments. [Project management and finance]
12. Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change. [Life-long learning]

Program Specific Outcomes (PSOs)

1. Graduates will be able to apply their knowledge of measurement and control to solve the problems related to environment, safety, health and agriculture sectors.

2. Graduates will be able to demonstrate their skills on Programmable logic controller, LabView, Distributed control system and Internet of thing.

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B. Tech. (Honors with Research)												
New Course Code	Courses Name	Sem.	Hours per week			Credit	Examination Scheme					Total
			L	T	P		ISE	ESE	TW	PR	OR	
IOHDR7R1	Research Methodology	VII	3	-	-	3	40#	60*	-	-	-	100
IOHDR7R2	Mathematical Modeling	VII	3	-	-	3	40#	60*	-	-	-	100
IOHDR7R3	Dissertation Phase I	VII	-	-	4	2	-	-	25@@		25@@	50
IOHDR8R4	Research Publication and Ethics	VIII	2	-	-	2	20#	30*	-	-	-	50
IOHDR8R5	Paper Publication	VIII	-	-	4	2	-	-	50	-	-	50
IOHDR8R6	Dissertation Phase II	VIII	-	-	12	6	-	-	100@@	-	100@@	200
Total			**08**	**-**	**20**	**18**	**100**	**150**	**175**	**-**	**125**	**550**

* **End Semester Examination (ESE)** based on subjective questions.

@@ **Passing in both the head is mandatory**

\# **In Semester Evaluation** based on Presentation/Group Discussion/Laboratory Work/Course Project/Home Assignment/Comprehensive Viva Voce/Blog Writing/Case Study/Survey/Multiple-Choice Question (MCQ) examination.

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B. Tech. (Honors with Research) Research Methodology			
Course Code	IOHDR7R1	**Credit**	03
Contact Hours	03 Hrs/weeks((L)	**Type of Course**	Lecture
Examination Scheme	ISE:40Marks ESE: 60 Marks	**Total Marks**	100

Course assessment methods/tools:

Sr. No.	Course assessment methods/tools	External/ Internal	Marks
1.	In Semester Evaluation	Internal	**40#**
2.	End Semester Evaluation	Internal	**60***

Course Objectives	
1	To recognize research fundamentals: define, identify problems, explore types, basic concepts, design, ethics, and navigation.
2	To apply literature review skills, synthesize information, identify gaps and integrate into research seamlessly.
3	To develop proficiency in research design, sampling, validity, reliability, and statistics.
4	To understand research proposals, articulate objectives, plan feasibly, budget, manage time, and present convincingly.

Course Outcomes : Students will be able to	
1	Demonstrate proficiency by defining problems, understanding scope, and navigating ethics.
2	Demonstrate expertise in literature review by conducting systematic reviews, synthesizing, and integrating seamlessly.
3	Design research proposals with varied designs, sample size, validity, reliability, pilot studies, and stats plans.
4	Demonstrate proficiency in crafting research proposals: clear objectives, feasible plans, time management and convincing defense.

Topics covered:

Unit 1: Introduction to Research Methodology **(6 hours)**

Definition and Significance of Research, Sources of research problem, Criteria Characteristics of a good research problem (Defining Criteria for a Research Problem, Characteristics that Make a Research Problem Significant, Formulating Clear and Feasible Research Questions). Scope, Objectives and Types of Research (e.g., Basic, Applied, Exploratory, Experimental). Basic Concepts: Variables, hypothesis, and Research Questions. Components of Research Design. Overview of the Research Process. Ethical Considerations in Research.

Chapter 2: Literature Review and Conceptual Framework **(6 hours)**

Purpose and Significance of Literature Review, Conducting a Systematic Literature Review,

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Synthesizing and Analyzing Literature, Developing a Conceptual Framework, Identifying Research Gaps, Incorporating Literature into Research Design.

Chapter 3: Research Design and Sampling (6 hours)

Understanding Research Design, Types of Research Designs: Descriptive, Exploratory and Experimental, Determining Sample Size. Sampling Techniques: Probability and Non-Probability Sampling, Validity and Reliability in Research. Pilot Studies and Pre-testing.

Chapter 4: Data Collection Methods and Instruments (6 hours)

Introduction to Data Collection Methods: Primary and Secondary Data Collection. Types of Data Collection Methods: Surveys, Interviews, Observations, Experiments, Document Analysis. Selecting Appropriate Data Collection Methods based on Research Objectives and Design. Developing Data Collection Instruments: Questionnaires, Interview Guides, Observation Protocols. Piloting and Validating Data Collection Instruments. Ethical Considerations in Data Collection. Data Management and Organization. Documentation and Record-Keeping of Data Collection Processes.

Chapter 5: Data Analysis and Interpretation (6 hours)

Descriptive Statistics: Mean, Median, Mode. Inferential Statistics: Hypothesis Testing, t-tests, chi test, ANOVA. Qualitative Data Analysis: Coding, Themes, Patterns. Software Tools for Data Analysis (e.g., SPSS, R). Regression: Linear, Nonlinear. Presenting Data: Tables, Graphs and Visualizations. Interpreting Research Findings and Drawing Conclusions.

Chapter 6: Research Proposal and Project Management (6 hours)

Components of a Research Proposal, Writing Clear and Concise Research Objectives, Developing a Feasible Research Plan, Budgeting and Resource Allocation, Time Management and Project Scheduling, Presenting and Defending a Research Proposal.

Text Books:

1. Kumar, Ranjit. "Research methodology: A step-by-step guide for beginners." Research methodology (2018): 1-528.
2. Spiegel, Murray R., John J. Schiller, and Alu Srinivasan. "Probability and Statistics: based on Schaum's outline of Probability and Statistics by Murray R. Spiegel, John Schiller, and R. Alu Srinivasan." *(No Title)*.
3. Probability and Statistics for Engineering and the Sciences, Jay Devore, Eighth Edition

Reference Books:

1. "Discrete structures", Liu, Tata McGraw -Hill.
2. "Discrete Mathematical structures", Y N Singh, Wiley- India.
3. "Introduction to Probability and Statistics for Engineers and Scientists", Sheldon M. Ross, Academic Press.

EBooks:

1. Discrete Mathematics (openmathbooks.org)
2. mth202.pdf (iitk.ac.in)

MOOC Course: Introduction to Probability and Statistics: Introduction to Probability and Statistics - Course (nptel.ac.in)

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B. Tech. (Honors with Research) Mathematical Modeling			
Course Code	IOHDR7R2	**Credit**	03
Contact Hours	03 Hrs/weeks((L)	**Type of Course**	Lecture
Examination Scheme	ISE:40Marks ESE: 60 Marks	**Total Marks**	100

Course assessment methods/tools:

Sr. No.	Course assessment methods/tools	External / Internal	Marks
1.	In Semester Evaluation	Internal	40#
2.	End Semester Evaluation	Internal	60*

Course Objectives	
1	Students will understand the basic components of the modeling process.
2	Students will be able to construct models from physical laws and assumptions.
3	Students will be able to create deterministic, empirical, stochastic and rule-based models.
4	Students will be able to apply discrete, differential equations and functions to study mechanisms that occur in physics, chemistry, biology, medicine and finance.

Course Outcomes : Students will be able to	
1	Formulate a mathematical modeling and its Simulation
2	Described physical systems by means of differential equations
3	Apply Fourier series and transform techniques for discrete and continuous signal.
4	Apply linear regression models in data analysis and interpretation.
5	Apply the concept of differential equations numerically for various real world problems.
6	Sketch a graphical representation of a two-dimensional linear programming model given in general, standard or canonical form.

Topics covered:

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Unit 1: Introduction to Mathematical Modeling Process **6hrs**

Concepts, Objectives, Methods and Tools, Mathematics of Modeling, Definition of Mathematical Models, Types of Models, Steps in Mathematical Modeling

Unit 2: Modeling With Differential Equations: **6hrs**

Bacteria growth Model, Mixing Problem Models, Temperature Models, Economics and Finance Models, RLC Circuit Models, The Malthusian model, Combat War Model .

Unit 3: Modeling With Fourier series and Transform:
6 hrs

Model Hourly Energy Use in Commercial Buildings, Crank Shaft model, Model with Continuous Signal, Modeling with Economics and Finance through difference equation using Z transform or Laplace transform, Modeling with population dynamics and genetics through difference equation using Z transform.

Unit 4: Linear regression Models: **6 hrs**

Modeling with exponential functions, Fitting linear models to data, evaluating model error; the sum of squared errors, interpreting the correlation coefficient.

Unit 5: Simulation Techniques: **6 hrs**

Euler's method and Modified Euler's method, The SIR Model for Spread of Disease Runge - Kutta method, Model of the spread of HIV-AIDS, Numerical methods to find Eigen values (Power method), Multiple Species Population Modeling.

Unit 6: Optimization Techniques: **6 hrs**

Introduction to Optimization Models, Definitions of Optimization Models, Models and Modeling in Operations Research, Linear Programming, Harvesting of Animal Populations Model, Forest Management Model, Theory of Firm Model.

References:

1. Mathematical Modeling and Simulation: Introduction for Scientists and Engineers, Kai Veltn, Wiley 2009.
2. Introduction to Simulink® with Engineering Applications, Steven T. Karris, Orchard Publications, 2006.
3. A Concrete Approach to Mathematical Modeling, M. M. Gibbons, Wiley-Interscience, 2007.
4. J. N. Kapur, A Mathematical Modeling, Wiley Eastern ltd.
5. J. N. Kapur, Mathematical Models in Biology and Medicine, East-West Press Private limited.

Online Course:

1 "Mathematical Modeling: Analysis and Applications" – on Swayam NPTEL-
2 "Introduction to mathematical modeling "on courser.
"Introduction to linear Programming " on edX.

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Course assessment methods/tools:

B. Tech. (Honors with Research) Dissertation Phase I			
Course Code	IOHDR7R3	**Credit**	02
Contact Hours	04 Hrs/weeks((P)	**Type of Course**	Practical
Examination Scheme	TW:25Marks OR:25 Marks	**Total Marks**	50

Sr. No.	Course assessment methods/tools	External/ Internal	Marks
1.	Term Work	Internal	25
2.	Oral	Internal	25

Course Objectives	
1	To apply mathematical, scientific, and engineering fundamentals to identify and understand complex engineering problems within a chosen specialization.
2	To conduct a comprehensive literature review to identify existing research, analyze current trends, and formulate substantiated conclusions regarding the identified problem.
3	To design a methodology for addressing complex engineering problems, considering public health, safety, and environmental factors, as well as cultural and societal considerations.
4	To utilize research-based knowledge and methods, including experimental design, data analysis, and synthesis, to develop valid conclusions and potential solutions.
5	To select and apply appropriate modern engineering and IT tools, including prediction and modeling techniques, while acknowledging their limitations in addressing complex engineering activities
6	To evaluate societal, health, safety, legal, and cultural issues relevant to the chosen engineering problem, and demonstrate an understanding of the professional responsibilities associated with its resolution.

Course Outcomes : Students will be able to	
1.	Analyze complex engineering problems within their specialization using mathematical, scientific, and engineering fundamentals, and propose feasible solutions.
2.	Conduct a thorough literature review, identifying relevant research and trends in their field, and synthesize this information to draw substantiated conclusions related to an engineering problem.
3.	Develop a comprehensive methodology for addressing complex engineering problems, integrating considerations for public health, safety, environmental impact, and societal and cultural factors.
4.	Apply research-based knowledge and methods, including experimental design, data analysis, and synthesis, to formulate valid conclusions and propose potential solutions to engineering problems.
5.	Select and proficiently use appropriate modern engineering and IT tools, including prediction and modeling techniques, to analyze and address complex engineering activities, while recognizing and addressing the limitations of these tools.

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6.	Evaluate the societal, health, safety, legal, and cultural implications of engineering solutions, demonstrating an understanding of the professional responsibilities associated with resolving engineering problems within their specialization.

Dissertation-I will have mid semester presentation and end semester presentation. Mid semester presentation will include identification of the problem based on the literature review on the topic referring to latest literature available. End semester presentation should be done along with the report on identification of topic for the work and the methodology adopted involving scientific research, collection and analysis of data, determining solutions and must bring out individuals contribution. Continuous assessment will be monitored by the departmental committee.

Guidelines for Faculty:

- Provide clear instructions to students regarding the expectations and requirements for Dissertation-I.
- Offer guidance and support to students throughout the process, especially in conducting literature reviews, developing methodologies, and presenting their work.
- Regularly monitor students' progress and provide constructive feedback to help them improve.
- Ensure fairness and consistency in assessing students' mid-semester and end-semester presentations.
- Collaborate with the departmental committee to ensure continuous assessment is conducted effectively.
- Encourage ethical conduct and adherence to academic standards in research and presentation.

Guidelines for Students:

- Begin working on Dissertation-I early to allow sufficient time for conducting literature reviews, developing methodologies, and collecting data.
- Seek guidance from faculty members whenever necessary, especially in identifying research problems, selecting methodologies, and interpreting findings.
- Conduct thorough literature reviews, making sure to reference the latest available literature on the chosen topic.
- Prepare clear and concise presentations for both the mid-semester and end-semester presentations, focusing on identifying the research problem, methodology adopted, data collection and analysis, proposed solutions, and individual contributions.
- Ensure ethical conduct in all aspects of research, including data collection, analysis, and presentation.
- Actively participate in discussions and feedback sessions to improve the quality of work and presentation.
- Meet all deadlines and requirements set by the faculty and departmental committee for Dissertation-I.

Continuous Assessment Method:

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- **Mid-Semester Presentation (Weeks 1-7):**
  - Students conduct literature reviews and identify research problems.
  - Presentations are assessed by faculty members for clarity, relevance, and depth of analysis.
- **Research Methodology Development (Weeks 8-12):**
  - Students develop methodologies for their research, incorporating scientific principles.
  - Faculty members provide guidance and feedback on methodology development.
- **Data Collection and Analysis (Weeks 13-15):**
  - Students collect and analyze data according to their methodologies.
  - Faculty members monitor progress and provide feedback on data collection and analysis.
- **End-Semester Presentation and Report Submission (Week 16):**
  - Students present their end-semester presentations along with reports detailing their work.
  - The departmental committee assesses the quality and completeness of presentations and reports.
  - Continuous assessment is monitored throughout the semester by faculty and the departmental committee to ensure fairness and consistency.

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B. Tech. (Honors with Research) Research Publication and Ethics			
Course Code	**IOHDR8R4**	**Credit**	**02**
Contact Hours	**02 Hrs/weeks((L)**	**Type of Course**	**Lecture**
Examination Scheme	**ISE:20 Marks ESE:30 Marks**	**Total Marks**	**50**

Course assessment methods/tools:

Sr. No.	Course assessment methods/tools	External/ Internal	Marks
1.	In Semester Evaluation	Internal	20#
2.	End Semester Evaluation	Internal	30*

Course Objectives	
1	To comprehend the importance of research publications, types (journals, conferences, books), impact factors, citations, and ethical considerations in publishing.
2	To achieve proficiency in research paper writing: Structure, abstracts, introductions, conclusions, clarity, conciseness, language, style, peer review, responding to comments, rejections, revisions, and positive review practices.
3	To demonstrate research software, mastering plagiarism detection, reference management, and understanding ethical software usage and implications in data analysis.
4	To understand publication ethics, including its definition, importance, best practices (COPE, WAME), conflict of interest, misconduct, violation, authorship, identification, and predatory publishers.

Course Outcomes : Students will be able to	
1	Comprehend the importance of research publications, including types (journals, conferences, books), impact factors, citations, and ethical considerations in publishing.
2	Demonstrate proficiency in research paper writing: structure, abstracts, introductions, conclusions, clarity, conciseness, language, style, peer review, response to comments, rejections, revisions, and positive review practices.
3	Develop proficiency in employing software tools for research publication, encompassing plagiarism detection, reference management, citation formatting, and data analysis, with a focus on prioritizing ethical considerations in software utilization.
4	Demonstrate publication ethics, covering its definition, importance, best practices (COPE, WAME), conflict of interest, misconduct, violation, authorship, identification, and predatory publishers by checking the plagiarism of the article.

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Topics covered:

Unit 1: Introduction to Research Publication (8 hours)

Importance of Research Publications, Types of Research Publications: Journals, Conferences, Books Understanding Impact Factor and Citations, Ethical Considerations in Publishing.

Unit 2: Manuscript Writing, Structure and Review Process (8 hours)

Structure of a Research Paper, Writing Abstracts, Introductions, and Conclusions, Clarity and Conciseness in Writing, Language and Style in Manuscript Writing. Peer Review Process, Responding to Reviewer Comments, Dealing with Rejections and Revisions, Best Practices for a Positive Review Process.

Unit 3: Research Tools Overview & Ethics (8 hours)

Introduction to Software Tools for Research Publication: Overview of software tools in research publication, Importance of ethical considerations in software usage. Plagiarism Detection and Prevention: Introduction to plagiarism detection software (e.g., Turnitin, PlagScan), Strategies for preventing plagiarism in research writing. Reference Management and Citation Formatting: Introduction to reference management software (e.g., Zotero, Mendeley, EndNote). Data Analysis Software and Ethical Implication: Overview of data analysis software (e.g., R, SPSS, MATLAB).

Unit 4: Philosophy, Ethics, and Publication Integrity (8 hours)

Introduction to Philosophy: Definition, nature, and branches. Ethics: Moral philosophy, moral judgments, reactions. Scientific conduct: Ethics in research, honesty, misconduct (falsification, fabrication, plagiarism, redundant publications, misrepresentation). Publication Ethics: Definition, importance, best practices (COPE, WAME), conflict of interest, misconduct types, authorship, identification, complaints, predatory publishers, consequences.

References:

1. "How to Write and Publish a Scientific Paper" by Robert A. Day and Barbara Gastel
2. "The Craft of Research" by Wayne C. Booth, Gregory G. Colomb, and Joseph M. Williams
3. "Doing Ethics in Science: An Introduction" Theodore Goldfarb
4. "Publication Ethics: A Practical Guide" Elizabeth Wager, Sabine Kleinert, and David G.

Online Course:

1. "Scientific Writing and Publishing" on edX
2. "Publishing Your Research" on Coursera

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B. Tech. (Honors with Research) Paper Publication			
Course Code	**IOHDR8R5**	**Credit**	**02**
Contact Hours	**04 Hrs/weeks((P)**	**Type of Course**	**Practical**
Examination Scheme	**TW:100Marks OR: 50 Marks**	**Total Marks**	**150**

Course assessment methods/tools:

Sr. No.	Course assessment methods/tools	External/ Internal	Marks
1.	Term Work	Internal	100
2.	Oral	Internal	50

Course Objectives	
1	To analyze journal integrity through the utilization of software, thereby improving their capacity to distinguish reputable sources for research.
2	To develop proficiency in journal selection by recommending appropriate journals for research papers using various journal finder tools, thus deepening their understanding of scholarly publication avenues.
3	To gain copyright policy awareness by utilizing SHERPA/RoMEO to examine publisher copyright policies, thereby fostering comprehension of intellectual property rights in academic publishing.

Course Outcomes : Students will be able to	
1	Assess journal integrity using SPPU software, enhancing their ability to discern reputable research sources.
2	Develop proficiency in journal selection, recommending suitable journals through various finder tools, deepening their understanding of scholarly publication avenues.
3	Describe copyright policy awareness via SHERPA/RoMEO, fostering comprehension of intellectual property rights in academic publishing.

List of Experiment

1. Demonstrate the use of SPPU software tools through a practical exercise. Ask students to use the tools to analyze a list of journals and identify potential predatory ones.
2. Use different journal finder tools, such as JANE, Elsevier Journal Finder, Springer Journal Suggester, etc. to suggest appropriate journals for research paper. After using the tools, share your experiences and findings.
3. Demonstrate the use of SHERPA/RoMEO to check a specific publisher's copyright policies. Use examples to illustrate the process.

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4. Use different plagiarism detection software tools, explore their functionalities, and gain practical experience in using these tools for detecting plagiarism in textual content.
5. Perform an experiment by distributing a set of sample documents intentionally containing instances of plagiarism and tasking each group with utilizing their assigned plagiarism detection tool to identify and highlight the instances of plagiarism within the documents.
6. Demonstrate how to import citations, organize and categorize references within the reference management tool, and generate a properly formatted bibliography for the provided set of documents.
7. Explore a variety of image integrity and data verification tools, delve into their functionalities, and obtain practical proficiency in using these tools to ensure the integrity and authenticity of images and data in research and scholarly work.
8. Research Databases and Repositories: The task involves understanding various types of research databases, acquiring skills in accessing and utilizing research repositories, exploring the significance of indexing databases, examining citation databases, and effectively employing a database matrix for conducting a robust literature review.
9. Research Metrics and Responsible Use: Embark on an exploration of Research Metrics and Responsible Use through this assignment. Dive into the intricacies of various research metrics such as Impact Factor derived from Citation Reports, SNIP (Source Normalized Impact per Paper), SJR (SCImago Journal Rank), IPP (Impact per Publication), and Cite Score. Additionally, delve into the responsible use of metrics in academic evaluation, including the examination of h-index, i10 index, g index, and the emerging field of altmetrics.
10. Prepare a report using LaTeX, focusing on its introduction, basics, equation writing, citation management, document collaboration, templates, graphics handling, and troubleshooting. Emphasize the distinct features and advantages of LaTeX for researchers in academic writing.
11. Create and manage accounts on key research platforms like Google Scholar, Scopus, Clarivate, Research Gate, etc.
12. Prepare a review paper and publish it in a peer-reviewed journal. This paper must not be submitted for any other activity throughout the entire B. Tech. course.

B. Tech. (Honors with Research) Dissertation Phase II			
Course Code	**IOHDR8R6**	**Credit**	**06**
Contact Hours	**12 Hrs/weeks((P)**	**Type of Course**	**Practical**
Examination Scheme	**TW:100Marks OR:100 Marks**	**Total Marks**	**200**

Course assessment methods/tools:

Sr. No.	Course assessment methods/tools	External/ Internal	Marks
1.	Term Work	Internal	100
2.	Oral	Internal	100

Course Objectives	
1	To apply mathematical, scientific, and engineering fundamentals to identify and understand complex engineering problems within a chosen specialization.
2	To conduct a comprehensive literature review to identify existing research, analyze current trends, and formulate substantiated conclusions regarding the identified problem.
3	To design a methodology for addressing complex engineering problems, considering public health, safety, and environmental factors, as well as cultural and societal considerations.
4	To utilize research-based knowledge and methods, including experimental design, data analysis, and synthesis, to develop valid conclusions and potential solutions.
5	To select and apply appropriate modern engineering and IT tools, including prediction and modeling techniques, while acknowledging their limitations in addressing complex engineering activities
6	To evaluate societal, health, safety, legal, and cultural issues relevant to the chosen engineering problem, and demonstrate an understanding of the professional responsibilities associated with its resolution.

Course Outcomes : Students will be able to	
1.	Analyze complex engineering problems within their specialization using mathematical, scientific, and engineering fundamentals, and propose feasible solutions.
2.	Conduct a thorough literature review, identifying relevant research and trends in their field, and synthesize this information to draw substantiated conclusions related to an engineering problem.
3.	Develop a comprehensive methodology for addressing complex engineering problems, integrating considerations for public health, safety, environmental impact, and societal and cultural factors.
4.	Apply research-based knowledge and methods, including experimental design, data analysis, and synthesis, to formulate valid conclusions and propose potential solutions to engineering problems.
5.	Select and proficiently use appropriate modern engineering and IT tools, including prediction and modeling techniques, to analyze and address complex engineering activities, while recognizing and addressing the limitations of these tools.

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6.	Evaluate the societal, health, safety, legal, and cultural implications of engineering solutions, demonstrating an understanding of the professional responsibilities associated with resolving engineering problems within their specialization.

Dissertation Phase II
Dissertation – II will be extension of the to work on the topic identified in Dissertation – I. Continuous assessment should be done of the work done by adopting the methodology decided involving numerical analysis/ conduct experiments, collection and analysis of data, etc. There will be pre submission seminar at the end of academic term. After the approval the student has to submit the detail report and external examiner is called for the viva-voce to assess along with guide.

Guidelines for Faculty:

- Provide clear instructions to students regarding the expectations and requirements for Dissertation-II, emphasizing its extension from Dissertation-I.
- Offer guidance and support to students throughout the continuation of their research, especially in implementing methodologies, conducting numerical analysis, experiments, and data collection and analysis.
- Regularly monitor students' progress and provide constructive feedback to help them navigate challenges and make improvements.
- Ensure fairness and consistency in assessing the work done by students throughout Dissertation-II.
- Collaborate with external examiners and the departmental committee to organize pre-submission seminars and viva-voce examinations.
- Encourage ethical conduct and adherence to academic standards throughout the research process and in the preparation of reports and presentations.

Guidelines for Students:

- Build upon the work done in Dissertation-I and select a topic for Dissertation-II that is a logical extension of the previous research.
- Begin working on Dissertation-II early to allow sufficient time for implementing methodologies, conducting experiments, and collecting and analyzing data.
- Seek guidance from faculty members and the research advisor when selecting methodologies and designing experiments.
- Ensure accuracy and rigor in numerical analysis, experiments, and data collection, adhering to the approved methodology.
- Prepare for the pre-submission seminar by organizing and presenting the findings and progress made in Dissertation-II.
- Submit a detailed report on the research conducted, including the methodology, findings, analysis, and conclusions, for assessment by the external examiner and the faculty.
- Participate actively in the viva-voce examination, responding to questions from the external examiner and faculty members regarding the research conducted.

Continuous Assessment Method:

- **Progress Monitoring (Throughout the Academic Term):**
  - Faculty members monitor students' progress in Dissertation-II, providing guidance and feedback as needed.

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- Students regularly update their research advisor on the progress made, including any challenges encountered and solutions implemented.

- **Pre-Submission Seminar (End of Academic Term):**
  - Students organize and present their progress and findings in a pre-submission seminar to faculty members and peers.
  - Feedback provided during the seminar helps students refine their work before final submission.
- **External Examiner Assessment:**
  - After the pre-submission seminar and approval by the faculty, students submit a detailed report for assessment by an external examiner.
  - The external examiner evaluates the report and prepares questions for the viva-voce examination.
- **Viva-Voce Examination:**
  - Students participate in a viva-voce examination conducted by the external examiner and faculty members.
  - Questions focus on the research conducted, methodology, findings, analysis, and conclusions.
  - Assessment during the viva-voce examination contributes to the overall evaluation of Dissertation-II.

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