



INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

Dundigal, Hyderabad -500 043

ELECTRONICS AND COMMUNICATION ENGINEERING

COURSE DESCRIPTOR

| | | | | | |
|------------------|--|------------------|----------------|-------------------|----------------|
| Course Title | RESEARCH METHODOLOGIES | | | | |
| Course Code | AHS552 | | | | |
| Programme | B.Tech | | | | |
| Semester | VII | | | | |
| Course Type | Elective | | | | |
| Regulation | R16 | | | | |
| Course Structure | Theory | | | Practical | |
| | Lectures | Tutorials | Credits | Laboratory | Credits |
| | 3 | - | 3 | - | - |
| Course Faculty | Dr. S. Vinoth , Associate Professor | | | | |

I. COURSE OVERVIEW:

Fundamental of Research Methodology and Data Collection is an excellent book that has a collection of basic concepts and terminologies in research method. It is filled with good ideas and tips on how to write very good articles that are fit for publication in reputable journals. The author has tried to identify problems encountered by young researchers and also proffered solutions to those problems. Detailed write-up on sampling techniques and sample size determination were well written and demonstrated in an excellent manner. It is also recommended to staff and students of all tertiary institutions especially those that want to learn how to become their best in research.

II. COURSE PRE-REQUISITES:

| Level | Course Code | Semester | Prerequisites | Credits |
|-------|-------------|----------|----------------------------|---------|
| UG | - | - | Probability and Statistics | 4 |

III. MARKS DISTRIBUTION:

| Subject | SEE Examination | CIA Examination | Total Marks |
|------------------------|-----------------|-----------------|-------------|
| Research Methodologies | 70 Marks | 30 Marks | 100 |

IV. DELIVERY / INSTRUCTIONAL METHODOLOGIES:

| | | | | | | | |
|---|------------------------|---|----------|---|--------|---|-------|
| ✓ | LCD / PPT | ✓ | Seminars | ✓ | Videos | ✓ | MOOCs |
| ✓ | Open Ended Experiments | | | | | | |

V. EVALUATION METHODOLOGY:

The course will be evaluated for a total of 100 marks, with 30 marks for Continuous Internal Assessment (CIA) and 70 marks for Semester End Examination (SEE). Out of 30 marks allotted for CIA during the semester, marks are awarded by taking average of two CIA examinations or the marks scored in the make-up examination.

Semester End Examination (SEE): The SEE is conducted for 70 marks of 3 hours duration. The syllabus for the theory courses is divided into FIVE modules and each module carries equal weightage in terms of marks distribution. The question paper pattern is as follows. Two full questions with “either” or “choice” will be drawn from each module. Each question carries 14 marks. There could be a maximum of two sub divisions in a question.

The emphasis on the experiments is broadly based on the following criteria:

| | |
|------|--|
| 50 % | 50 % To test the objectiveness of the concept. |
| 50 % | To test the analytical skill of the concept OR to test the application skill of the concept. |

Continuous Internal Assessment (CIA):

CIA is conducted for a total of 30 marks (Table 1), with 25 marks for Continuous Internal Examination (CIE), 05 marks for Technical Seminar and Term Paper.

Table 1: Assessment pattern for CIA

| Component | Theory | | Total Marks |
|-----------|----------|----------------------------------|-------------|
| | CIE Exam | Technical Seminar and Term Paper | |
| CIA Marks | 25 | 05 | 30 |

Continuous Internal Examination (CIE):

Two CIE exams shall be conducted at the end of the 9th and 17th week of the semester respectively. The CIE exam is conducted for 25 marks of 2 hours duration, consisting of 5 one mark compulsory questions in part-A and 4 questions in part-B. The student has to answer any 4 questions out of five questions, each carries 5 marks. Marks are awarded by taking average of marks scored in two CIE exams.

Technical Seminar and Term Paper:

Two seminar presentations and the term paper with overview of topic are conducted during II semester. The evaluation of technical seminar and term paper is for maximum of 5 marks. Marks are awarded by taking average of marks scored in two Seminar Evaluations.

VI. HOW PROGRAM OUTCOMES ARE ASSESSED:

| Program Outcomes (POs) | | Strength | Proficiency assessed by |
|------------------------|--|----------|-------------------------|
| PO 1 | Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems | 3 | Seminar and Term paper |
| PO 2 | Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences | 3 | Guest Lecture |
| PO 4 | Conduct investigations of complex problems: 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.. | 3 | Seminar and Term paper |
| PO 5 | Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations. | 3 | Seminar and Term paper |
| PO 6 | The engineer and society: 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. | 3 | Seminar and Term paper |

3 = High; 2 = Medium; 1 = Low

VII. COURSE OBJECTIVES:

| The course should enable the students to: | |
|---|---|
| I | Identify an appropriate research problem in their interesting domain. |
| II | Organize and conduct research project. |
| III | Understand the Preparation of a research project thesis report. |
| IV | Understand the law of patent and copyrights. |
| V | Understand the Adequate knowledge on IPR. |

VIII. COURSE OUTCOMES (COs):

| COs | Course Outcomes | CLOs | Course Learning Outcomes |
|-----|--|------|--|
| CO1 | Understand the research process and formulate the research problem | CLO1 | Understand the different approaches of research |
| | | CLO2 | Understand the features of good design, types of research design |
| CO2 | Illustrate various measurement, scaling and estimate hypotheses values in research | CLO3 | Understand the forecasting techniques and scale construction techniques |
| | | CLO4 | Understand the time series analysis, interpolation and extrapolation; |
| CO3 | Explore on various data collection methods and professional attitude, goals and ethics | CLO5 | Understand the collection of secondary data, cases and schedules. |
| | | CLO6 | Professional attitude and goals, concept of excellence, ethics in science and engineering. |

| | | | |
|-----|---|-------|--|
| | | CLO7 | Understand the participation in public debates on scientific issues. |
| | | CLO8 | Understand the famous frauds in science, and case studies. |
| CO4 | Prepare a well-structured research paper and scientific presentations | CLO9 | Understand the techniques of interpretation, and making scientific presentation. |
| | | CLO10 | Understand the patent laws, patent and searching process. |
| CO5 | Explore on various IPR components and process of filing | CLO11 | Understand the importance of intellectual property rights. |
| | | CLO12 | Understand the rights to perform the, copy right ownership issues. |

IX. COURSE LEARNING OUTCOMES(CLOs):

| CLO Code | CLO's | At the end of the course, the student will have the ability to | PO's Mapped | Strength of Mapping |
|-----------|--------|---|---------------|---------------------|
| AHS552.01 | CLO 1 | Understand The Different Approaches of Research | PO1,PO2 | 3 |
| AHS552.02 | CLO 2 | Understand the features of good design, types of research design, | PO1 PO2 | 3 |
| AHS552.03 | CLO 3 | Understand the forecasting techniques and scale construction techniques | PO2, PO4 | 3 |
| AHS552.04 | CLO 4 | understand the time series analysis, interpolation and extrapolation; | PO1,PO 2 &PO4 | 3 |
| AHS552.05 | CLO 5 | understand the collection of secondary data, cases and schedules. | PO2,PO5 | 2 |
| AHS552.06 | CLO 6 | Professional attitude and goals, concept of excellence, ethics in science and engineering | PO1,PO5 | 3 |
| AHS552.07 | CLO 7 | understand the participation in public debates on scientific issues | PO 1,PO3 | 3 |
| AHS552.08 | CLO 8 | understand the famous frauds in science, and case studies. | PO1,PO4 & PO6 | 3 |
| AHS552.09 | CLO 9 | understand the techniques of interpretation, and making scientific presentation | PO4,PO5 &PO6 | 3 |
| AHS552.10 | CLO 10 | understand the patent laws, patent and searching process, | PO4,PO5, &PO6 | 2 |
| AHS552.11 | CLO 11 | understand the importance of intellectual property rights; | PO 5,PO6 | 3 |
| AHS552.12 | CLO 12 | understand the rights to perform the, copy right ownership issues | PO 5,PO6 | 3 |

3 = High; 2 = Medium; 1 = Low

X. MAPPING COURSE OUTCOMES LEADING TO THE ACHIEVEMENT OF PROGRAM OUTCOMES

| Course Outcomes (COs) | Program Outcomes | | | | |
|-----------------------|------------------|-----|-----|-----|-----|
| | PO1 | PO2 | PO4 | PO5 | PO6 |
| CO 1 | 3 | 3 | | | |
| CO 2 | 3 | 3 | 3 | | |
| CO 3 | 3 | | 3 | 3 | |
| CO 4 | | | 3 | 3 | 3 |

| | | | | | |
|------|--|--|--|---|---|
| CO 5 | | | | 3 | 3 |
|------|--|--|--|---|---|

XI. ASSESSMENT METHODOLOGIES – DIRECT

| | | | | | |
|-----------|------------------------------|--------------|------------------------------|----------------------------|------|
| CIE Exams | PO 1,PO 2 , PO4, PO5, PO6 | SEE Exams | PO 1,PO 2 , PO4, PO5, PO6 | Seminars and term paper | PO 6 |
| VIVA | - | Student Viva | - | Mini Project | - |

XII. ASSESSMENT METHODOLOGIES – INDIRECT

| | | | |
|---|--|---|---------------------------|
| ✓ | Early Semester Feedback | ✓ | End Semester OBE Feedback |
| ✗ | Assessment of Mini Projects by Experts | | |

XIII. SYLLABUS

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|--|---|--------------------|
| UNIT-I | INTRODUCCION TO RESEARCH AND PHILOSOPHIES | Classes: 07 |
| Introduction to research: The role of research, research process overview; Philosophies and the language of research theory building: Science and its functions, what is theory, the meaning of methodology | | |
| UNIT-II | A RESEARCHER PROBLEMS AND HYPOTHESES | Classes: 10 |
| Thinking like a researcher: Understanding concepts, constructs, variables, and definitions; Problems and hypotheses: Defining the research problem, formulation of the research hypotheses, the importance of problems and hypotheses. | | |
| UNIT-III | RESEARCH DESIGN AND DATA COLLECTION | Classes: 09 |
| Research design: Experimental and no experimental research design, field research, and survey research. Methods of data collection: Secondary data collection methods, qualitative methods of data collection, and survey methods of data collection. | | |
| UNIT-IV | ATTITUDE MEASUREMENT , SCALING AND SAMPLING TECHNIQUES | Classes: 09 |
| Attitude measurement and scaling: Types of measurement scales; Questionnaire designing, reliability and validity; Sampling techniques: The nature of sampling, probability sampling design, non probability sampling design, and determination of sample size. | | |
| UNIT-V | PROCESSING AND ANALYSIS OF DATA,ETHICAL ISSUES | Classes: 10 |
| Processing and analysis of data ; Ethical issues in conducting research; Report generation, report writing, and APA format; Title page, abstract, introduction, methodology, results, discussion, references, and appendices. | | |
| TEXT BOOKS | | |
| <ol style="list-style-type: none"> 1. Bryman, Alan, Bell, Emma, —Business Research Methods, Oxford University Press, 3rd Edition, 2011. 2. Kerlinger, F.N., Lee, H.B.,—Foundations of Behavioral Research, Harcourt Inc., 4thEdition, 2000. 3. Rubin, Allen, Babbie, Earl, —Essential Research Methods for Social Work, Cengage Learning Inc., USA, 2009. | | |
| REFERENCE BOOKS | | |

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|--|
| <ol style="list-style-type: none"> 1. Anantasi A., Urbina S., —Psychological Testingl, Pearson Education, 2004. 2. Chawla, Deepak, Sondhi, Neena, —Research Methodology: Concepts and Casesl, Vikas Publishing House Pvt. Ltd. Delhi, 2011. 3. Pawar B.S., —Theory Building For Hypothesis Specification In Organizational Studiesl, Response Books, New Delhi, 2009. 4. Neuman W.L., —Social Research Methods: Qualitative and Quantitative Approachesl, Pearson Education, 2008. |
| WEB REFERENCES |
| <ol style="list-style-type: none"> 1. https://en.wikipedia.org/wiki/Online_research_methods 2. https://www.prescott.edu/library/resources/research-bibliography.php |
| E-BOOK REFERENCES |
| <ol style="list-style-type: none"> 1. https://www.hcmuaf.edu.vn/.../Research%20Methodology%20-%20Methods%20and%20T... 2. https://www.federaljack.com/ebooks/My%20collection%20of%20medical%20books,%2020... |

XIV. COURSE PLAN:

The course plan is meant as a guideline. Probably there may be changes

| Lecture No | Topic Outcomes | Topic/s to be covered | Reference |
|------------|---|--|-------------|
| 1 | Understand the concept of types of research | Definition, types of research | T1:2.1 |
| 2 | Understand the various Research Approaches | Research Approaches | T1:2.3 |
| 3 | understand Research process, validity and reliability in research | Research process, validity and reliability in research | T1:2.3.1 |
| 4 | understand the Features of good design | Features of good design | T1:7.2 |
| 5 | Understanding the Types of research design | Types of research design | T1:7.3 |
| 6 | Understand the Basic principles of experimental design | Basic principles of experimental Design | T1:7.4 |
| 7 | Understand the various types Errors in measurement | Errors in measurement | T1:7.5 |
| 8-9 | Understand the tests of sound measurement | Tests of sound measurement | T1:8.1 |
| 10-11 | Understand the scaling and scale construction techniques | Scaling and scale construction techniques | T1:8.2 |
| 12-13 | Understand the forecasting techniques | Forecasting techniques | T1:8.3 |
| 14 | Understand the concept of time series analysis | Time series analysis | T1:8.4 |
| 15 | Interpolation and extrapolation | Interpolation and extrapolation. | T1:8.5 |
| 16 | Understand the Primary data, questionnaire and interviews | Primary data, questionnaire and interviews | T1:8.6 |
| 17-18 | Understand the collection of secondary data, cases and schedules | Collection of secondary data, cases and schedules | T1:9.1 |
| 19 | Understand the Professional attitude and goals | Professional attitude and goals | T1:9.2, 9.3 |
| 20 | Understanding the scheduling in DOS concept of excellence | Concept of excellence | T2:9.3.4 |
| 21 | Understand real time OS in | Ethics in science and engineering | T1:9.5 |

| | | | |
|----|--|--|-----------|
| | DOS environment | | |
| 22 | Understand the some famous frauds in science | Some famous frauds in science | T2:7.1 |
| 23 | Understand the Case studies | Case studies | T2:7.2 |
| 24 | Understand the Layout of a research paper | Layout of a research paper | T2:7.3 |
| 25 | Techniques of interpretation | Techniques of interpretation | T2:7.4 |
| 26 | Understand techniques of interpretation | Techniques of interpretation | T2:8.3 |
| 27 | Understand the making scientific presentation at conferences | Making scientific presentation at conferences | T2:8.4 |
| 28 | Understand the popular lectures to semi technical audience | Popular lectures to semi technical audience | T3:8.5 |
| 29 | Understand the participating in public debates on Scientific issues | Participating in public debates on Scientific issues. | T3:8.6 |
| 30 | Understand the types of intellectual property | Introduction, types of intellectual Property | T3:10.7 |
| 31 | Understand the international organizations ,agencies and treaties | International organizations ,agencies and treaties | T3:10.8 |
| 32 | Understand the importance of intellectual property rights | Importance of intellectual property rights; | T3:10.9 |
| 33 | Understand the Law of copy rights, rights of reproduction | Law of copy rights: Fundamental of copy right law, originality of material, rights of reproduction | T3:11.7 |
| 34 | Understand the rights to perform the work publicly, copy right ownership issues | Rights to perform the work publicly, copy right ownership issues | T3:11.7.1 |
| 35 | Understand copy right registration, notice of copy right | Copy right registration, notice of copy right | T3:11.7.2 |
| 36 | Understand the international copy right law; Law of patents: Foundation of patent law, patent searching process, | International copy right law; Law of patents: Foundation of patent law, patent searching process, | T3:11.8 |
| 37 | Understand the ownership rights and transfer | Ownership rights and transfer | T3:12.1-2 |

XIV. GAPS IN THE SYLLABUS - TO MEET INDUSTRY / PROFESSION REQUIREMENTS:

| S NO | Description | Proposed actions | Relevance with POs |
|-------------|---------------------------------|-------------------------|---------------------------|
| 1 | Knowledge on research problems. | Seminars/NPTEL | PO2,PO4 |

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