Third Semester

Research Methodology (HU-211)
Humanities and Social Science (HU); 3 Credits (3-0-0)

Objective:

- To learn the art of Literature Review and to focus on a research problem using scientific methods.
- To inculcate analytical thinking and data interpretation capability.
- To enable to apply the fundamental laws of performance analysis to establish the relationships between workload parameters and system performance for a given system.

S. No.	Topic	No. of Lectures
Unit 1	Formulating Research Problem and Conceptualizing a Research Design: Meaning of research problem, Sources of research problem, Criteria/Characteristics of a good research problem, Scope and objectives of research problem. Reviewing the literature, formulating a research problem, Identifying variables, Constructing hypotheses, Errors in selecting a research problem. Research design: Objectives, Strategies, Guidelines for design of experiments. Selecting a study design.	**8**
Unit 2	Research Modeling: Types of Models, Model building and stages, Data consideration and testing Heuristic and Simulation modeling. Mathematical Modeling and Simulation: Important of modeling and simulation, Continuous and discrete models and simulation, Model validation, verification and credibility. Modeling Principles: Fundamental laws, Monte Carlo simulation, stochastic state transition systems.	**6**
Unit 3	Research Tools: Tools needed for Editing, Presentation, Data Analysis and visualization, Simulation and Modeling. Analysis, Design and Simulation tools related to specialization. Searching: Using advanced search technique for searching research materials in online repositories/consortium, like inflibnet, Indest, Scopus, etc.	**6**
Unit 4	Developing a Research Proposal: Format of research proposal, Individual research proposal. Institutional proposal, Proposal of a student – a presentation and assessment by a review committee consisting of Guide and external expert only.	**6**
Unit 5	Report writing and Publishing Research Findings: Pre writing considerations, Formats of report writing, Formats of publications in	**6**

	Research journals. Writing a research report/thesis. Plagiarism: Introduction of Plagiarism, Dimension of Plagiarism, Detect Plagiarism, Strategies to Minimize Plagiarism.	
		32

Recommended Textbooks

1. "Research Methodology-Methods and Techniques", 2/e, by C.K. Kothari (2004), New Age International, New Delhi.
2. "Research Methodology: A Step by Step Guide for Beginners", 2/e, by Ranjit Kumar (2005), Pearson India
3. "Elements of Research Writing", by Dr. S.K. Yadav (2015), UDH Publishers & Distributors, Pvt. Ltd. New Delhi
4. "Applied Statistics & Probability for Engineers", 3/e, by Douglas C. Montgomery and George C. Runger (2007), Wiley India.
5. "Theory of modeling and simulation integration discrete event and continuous complex dynamic systems", by Bernard P. Zeigher, Herbert Praehofer, Tag Gon Kim (2000), Academic Press.

References

1. "A Beginner's Guide to MATLAB", http://www.math.iitb.ac.in/~pde08/matlab1.pdf.
2. "LaTex Tutorial", by Jeff Clark (2002), http://ece.uprm.edu/~caceros/latex/introduction.pdf

Web Application & Server Security (MCS-211)
Department Elective (DE-IV); 4 Credits (3-1-0)

Objective:

The primary objective of this course is to *study* and *practice* fundamental techniques in developing secure web based applications, including vulnerability of web based applications and how to protect those applications from attacks. In addition, advanced topics related to Web, such as E-commerce security, Web 2.0, collaborative Web-based applications, etc., will also studied. Students are encouraged to complete a publishable research paper in one of the related topics.

S. No.	Topic	No. of Lectures
Unit 1	**Introduction & Fundamentals:** web application ,web server, security and web application, security and web server, firewalling a web server.	**5**
Unit 2	**Web application commons attacks** Introduction OWASP, Commons attacks, threats and OWASP principles,	**12**

	introduction to secure design, typical attack models (MITM, MITB) and other attacks (DOS, ARP cache poisoning, DNS cache poisoning etc.)	
Unit 3	**Security Audit Framework** web server security configuration checklist, web application testing checklist.	**8**
Unit 4	**Security Audit Tools** attacks to privacy (spyware and backdoors, browser, email etc.), tracking techniques (HTTP-cookies, third party cookies, browser fingerprinting, CSP), advanced browser configuration, anonymity and onion routing (Tor).	**10**
Unit 5	**Internet E-Mail** architecture and infrastructure, functions, agents and standards, MIME and PGP, phishing, spamming & spoofing, DKIM, SPF, introduction to email forensics, configuration (cookies, contents, scripting, etc.) attack to browsers and users tracking/profiling (third party cookies, super-cookies, cookie theft etc.) browser security (add-ons, same-origin policy etc.) and secure browsing	**10**
		45

Text Books:-

1. Oppliger, Rolf. *Security Technologies for the World Wide Web, Second Edition.* Artech House Publishers. 2003. (ISBN: 1580533485).

System Programming (MCS-214)

Discipline Core (DC); 3 Credits (0-0-6)

Objectives: After successful completion of the course, student will be able to:

1. understand importance of optimization of industrial process management
2. apply basic concepts of mathematics to formulate an optimization problem
3. analyse and appreciate variety of performance measures for various optimization problems

Unit	Contents	No. of Lectures
	PYTHON	
Unit 1	Installation working with python, Understanding python variables, Python basic operations, Understanding python blocks	**8**
Unit 2	Python Data Types and Flow Control, Declaring and using numeric data, Defining list and loop, Use of while loop, pass, continue and break, Learn Python function and understanding packages.	**10**
Unit 3	Python File operation: Working log files in python, Manipulating pointers, Programming using file operations, Constructors and destructors, Programming using oops support, Classes, abstraction, encapsulation, inheritance in python. String operations, operations on list, tuples, and dictionaries.	**12**
	MATLAB	
Unit 4	MATLAB as a sophisticated calculator, Arrays, Matrices and related operations: addition, subtraction, multiplication and element by element operations, Visualization: XY- plotting functions, Subplots and Overlay plots. Variables, loops, selection, Functions, scripts.	**6**
Unit 5	Package handling: adding packages and use of inbuilt functions and file I/O: reading and writing files. Loading and processing Image files. Solving equations and curve fitting. Probability and Statistics: Interpolation ,Statistics, Histogram and probability, The Normal Distribution, Random number Generation, Interpolation.	**6**
		42

References/Text Books:

1. Introduction to Python: by Guido Van Rossum

2. Getting started with MATLAB, Rudra Pratap, Oxford university Press.

3. MATLAB: A Practical Introduction to Programming and Problem Solving, 3rd edition, Stormy Attaway, Elsevier.

4. G. H. Golub and C. F. Van Loan, Matrix Computations, 3 rd Ed., Johns Hopkins University

Natural Language Processing
Departmental Electives (DE); 4 Credits (3-1-0)

S. No.	Topic	No. of Lectures
Unit 1	**Introduction:** NLP applications; Ambiguities: sense, pronoun reference & structural/attachment; basic issues in speech and language processing; Role of syntax, semantics, context, world-knowledge & pragmatics, Corpus-unilingual, bilingual; Zipf's law, corpus text analysis- sentence & word boundary; tokenization; named-entities; Rule-based approach, vs. Statistical approach to analysis;, Fundamental aspects of English grammar; Contrastive examples from Hindi.	8
Unit 2	**Linguistic resources:** machine readable dictionary, lexical data base, semantic tree, ontology, Wordnet, Treebank, verb sub-categorization; evaluation measures: Precision & Recall. **Morphological Analysis and synthesis:** Types of Morphology, Appr oaches to Morphological Analysis, Morphological Processing, Morphological synthesis, examples from Hindi.	8
Unit 3	**Syntactic Analysis: U**se of transition network for basic language analysis, recursive transition network, augmented transition network, shallow parsing **Context Free Grammars** for English Language Syntax, basic parsing techniques - top down parsing, bottom up parsing, comparison of top down and bottom up parsing, Augmenting CFG with features, Introduction to Probabilistic CFG. Collocations, Multi-word expressions.	8
Unit 4	Language modeling, Markov models, Hidden Markov Models, Parts of speech tagging: rule based and stochastic part of speech tagging. **Semantic Analysis:** Representation of knowledge for language analysis Syntax driven s emantic analysis, lexical semantic approach Word Sense Disambiguation, Pronoun reference	8

	disambiguation, text similarity	
Unit 5	**Applications:** Text categorization, Text Summarization, Sentiment Analysis, Information Retrieval, Question Answering, Dialogues and Conversational Agents, Natural Language Generation, Machine **Translation-** RBMT. EBMT, SMT, hybridization. Publication/Subscription Middleware, Service Discovery and Disconnected Operations.	**8**
		40

Text Books:-

1. Daniel Jurafsky & James H.Martin, " Speech and Language Processing", Pearson Education (Singapore) Pte. Ltd., 2002.
2. James Allen, "Natural Language Understanding", Pearson Education, 2003

Reference Books:-

C.D. Manning and H. SWchulz, "Foundations of Statistical Natural Language Processing", MIT Press