Scheme & Syllabus

For

Pre-Ph.D. Course Work

In

Computer Science and Engineering

Programme Code: 04

Department of Computer Science & Engineering and Information Technology
BPS Mahila Vishwavidyalaya Khanpur Kalan, Sonepat (India)

Website: www.bpswomenuniversity .ac.in

Chairperson
Department of Computer Science & Engineering and Information Technology
B.P.S. Mahila Vishwavidyalaya, Khanpur Kalan, Sonepat (Haryana)

Department of Computer Science & Engineering and Information Technology
B P S Mahila Vishwavidyalaya, Khanpur Kalan (Sonepat)
(State University Established Under the Legislative Act No 31/2006)

Scheme of studies and Examination for pre-Ph.D. course work in Computer Science & Engineering

Pre-Ph.D programme course for the award of Ph.D. degree in Engineering and Technology (Computer Science & Engineering) at Department of Computer Science & Engineering and Information Technology, B P S Mahila Vishwavidyalaya, Kalan is as follows.

S. No	Code	Course Title	Hrs/Week			Total Credit	Marks		Total Marks
			L	T	P		Internal Marks	External Marks	
Theory									
1.	PPL-701	Research Methodology	3	2	-	5	20	80	100
2.	PEL - 701/702/703	Departmental Subject (Any one out of given choices)	3	2	-	5	20	80	100
*3	CPE-RPE-022	Research and Publication Ethics	3	-	-	2	10	40	50
3	PPP- 721	Independent Study	-	2	6	5	20	80	100
4	PPP- 722	Scientific Communication	-	2	6	5	20	80	100
5	PPP- 723	Software Packages Lab		2	2	3	50	-	50
Total			**9**	**10**	**14**	**25**	**140**	**360**	**500**

* With effect from academic session 2020-21 subject to the approval from the academic council of the University

Note:

- All Engineering departments will share the teaching as well as examination.
- Students have to choose any one of departmental subject in concern and suitability with guide. PEL -701/702/703 are Departmental Subjects of Computer Science & Engineering and Information Technology.
- Students will be allowed to use scientific calculator only but sharing of the same will not be permitted in the exam.
- The theory paper will be of 100 marks having 20 internal and 80 external marks. Nine questions will be set in all by the examiners taking two questions from each unit and one question containing short answer type questions from entire syllabus. Students will be required to attempt five questions, selecting one question from each unit. Question No.1 is compulsory which is from entire syllabus. The duration of theory as well as practical exam will be of 3 hrs. The all question will carry equal marks. The pass marks in the paper will be as per university ordinance.
- Theory examination of Research Methodology subject will be conducted at centre level in FET and all research students will have common question papers.
- Practical examination of Independent Study, Scientific Communication, Software Package lab will be conducted at the departmental level.
- The grand total of the semester credits and marks are 25 and 500, respectively.

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- Minimum passing marks for any subject (paper) shell be 40% in the external examination and 40% in the aggregate of internal and external examinations of the subject.

Programme Outcomes:

1. Provide students with knowledge, general competence, and analytical skills in Research Methodology and Research & Publication Ethics.
2. Build their foundation for research in Computer Science.
3. Plan and conduct original research that addresses questions of significance in a particular subject area in Computer Science.
4. Analyze and be able to articulate the scientific advances and limitations of results described in the research literature.
5. Demonstrate the ability to effectively communicate research proposals and results.
6. Demonstrate in-depth knowledge of a particular subject area and broad knowledge of other areas in Computer Science.
7. Demonstrate an understanding of and ability to follow ethical standards in research, teaching, and professional service

Programme Specific Outcomes:

1. Produce a well-developed research proposal and understand the various tasks required to carry out the research.
2. Select an appropriate methodology with which to conduct the research and defend the methodology of their selection.
3. Find the resources needed to perform the research process.
4. Documentation of its findings in the individual research area.
5. Understand the most advanced research in the candidate's specialization area of Computer Science respectively.
6. Understand of academic theory and the preparation of high-quality research pertinent to the field of study
7. Appropriately employ methods and existing research results in the development of new knowledge, theories and presentation of research in the individual research area

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Research Methodology

Paper Code: PPL-701 **Total Credits: 5**

L	T	C	
3	**2**	**5**	**External Marks: 80**
			Internal Marks: 20

Duration of Exam: 3 Hrs.

Course objectives:

1. To know the basic data collection methods with emphasis on secondary and survey research.
2. To understand the format of primary data collection instruments.
3. To understand field work problems and techniques.
4. To be able to construct basic samples for use in marketing studies and learn how and when to use different sampling techniques.
5. To understand and use basic data analysis techniques

Unit 1

Objectives of research, Types and significance of research, research and scientific methods, research approaches. Importance of knowing how research is done – Research Process – Criteria of good Research.

Necessity of defining the problem, technique involved in defining the Problem.

Research Design: Need for research design, features of a good design, important concepts relating to research design, different research design.

Significance of report writing, different steps in writing report, layout of the research report, precautions for writing research reports.

Unit 2

Sample Design: Objective and principal of experimental design. Experimental design terminology. Completely randomized design. Complex random sampling design. Blocking design: Latin square design, two and three level of factorial design

Measurement and scaling Techniques: measurement in research, measurement scales and source of errors, tests of second measurement, technique of developing measurement tools, important scaling and scale construction techniques.

Data collection: collection of primary and secondary data through various techniques, selection of appropriate method for data collection, case study method, guideline for developing questionnaire, successful interviewing. Survey V/S experiment.

Unit 3

Processing and analysis of Data, Statistics in Research, measures of central tendency, dispersion, Standard deviation, skewness and kurtosis.

Sampling Fundamentals: Definition, Need, Important sampling distribution, central limit theorem, sampling theories, concept of standard error, estimation, estimation population mean, proportion, sample size and its determination.

Tests of hypothesis and significance: basic concepts, important parametric tests. Hypothesis testing of means, differences between means, comparing two related

samples, testing of proportion, difference between proportions, comparing variance to hypothesised population variance, equality of variances of two normal populations. Hypothesis testing of correlation coefficients, limitations of test of hypothesis.

Unit 4

Tests of significance for large and small samples. Problems based on X^2-test for goodness of fit, t test, F-test and analysis of variance (one way and two way classifications). Regression and Correlation: Karl Pearson's coefficient of correlation, Rank correlation coefficient, Regression Lines, Regression equations. Control charts, namely, X,R,C and p charts. Analysis of variance and covariance.

Course Outcomes:

By the end of the course the students will be able to:

1. Learn the concept of research, research process, types of research, research models and basics formats of report writing.
2. Learn the use of statistical analytic techniques for data analysis and testing of hypothesis.
3. Identify the differences between measurement and scaling and how sample is selected and determined using various approaches.
4. To understand sources of data collection and how data is collected from different sources.
5. To understand the concept of interpretation and role of computer in mathematical and statistical analysis with applications of relevant research methodologies used in computer science.

Books Recommended:

1. Operations Research Methods and Practices, CK Mustafi
2. Operations Research, Kantiswarup, PK Gupta, Manmohan
3. Business Statistics, Gupta and Gupta
4. Theory and problems of probability and Statistics, MP Spiegel
5. Research Methodology (Methods and Techniques), C.R. Khotari, New Age Publisher.
6. Fundamentals of modern statistical methods, Rand R. Wilcox

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RESEARCH & PUBLICATION ETHICS

Paper Code: CPE-RPE-022 **Total Credits: 2**

L	T	C	
3	0	0	**External Marks: 40**
			Internal Marks: 10

Duration of Exam: 3 Hrs.

Course Objectives:

- To study the philosophy of ethics
- To study the scientific conduct of research
- To study the publication ethics
- To know about various journal citation databases
- To know the importance of quality publications

UNIT – I

PHILOSOPHY AND ETHICS (3 Hrs)

1. Introduction to philosophy: definition, nature and scope, concept, branches

2. Ethics: definition, moral philosophy, nature of moral judgments and reactions

SCIENTIFIC CONDUCT (5 Hrs)

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 - II

PUBLICATION ETHICS (7 Hrs)

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 behavior 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 8.

UNIT - III

DATABASES AND RESEARCH METRICS (7 Hrs)

(A) Databases (4 Hrs)

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

(B) Research Metrics (3 Hrs)

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

UNIT - IV

Practice

OPEN ACCESS PUBLISHING (4 Hrs)

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 Suggested, etc.

PUBLICATION MISCONDUCT (4 Hrs)

(A) Group Discussions

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 (2 hrs.) :Use of plagiarism software like Tumitin, Urkund and other open source software tools

Course Outcomes:

By completion of course the student is able to

1. Ethics in conduct of scientific research
2. Know the scientific misconducts
3. How to avoid plagiarism and what are the penalties of plagiarism
4. Know the quality of research publications
5. Write research and review articles.

References:

1. Bird, A. (2006). Philosophy of Science, Routledge
2. P. Chaddah (2018) Ethics in Competitive Research: Do not get scooped; do not get plagiarised.
3. Indian National Science Academy (INSA), Ethics in Science Education, Research and Governance (2019).
4. Beall, J (2012), Predatory publishers are corrupting open access. Nature, 489(7415),179.
5. National Academy of Sciences, National Academy of Engineering and Institute of Medicine (2009). On being a Scientist: A guide to Responsible Conduct in Research, Third Edition, national Academic press.

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Departmental subjects in Computer Science & Engineering

1. PEL-701 Security of Information System
2. PEL-702 Advanced Computer Architecture
3. PEL-703 Simulation and Modeling

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Security of Information System

Paper Code: PEL-701 **Total Credits: 5**

L	T	C	
3	2	5	**External Marks: 80**
			Internal Marks: 20

Duration of Exam: 3 Hrs.

Course Objective:

- To understand basics of Cryptography and Network Security.
- To be able to secure a message over insecure channel by various means.
- To learn about how to maintain the Confidentiality, Integrity and Availability of a data.
- To understand various protocols for network security to protect against the threats in the networks.

Unit-1

Basic Encryption and Decryption

Terminology and Background: **E**ncryption, Decryption and Cryptosystems, Plain Text and Cipher Text, Encryption Algorithms, Cryptanalysis.
Introduction to Ciphers**:** Monoalphabetic Substitutions such as the Caesar Cipher, Cryptanalysis of Monoalphabetic Ciphers, Polyalphabetic Ciphers such as Vigenere Tableaux, Cryptanalysis of Polyalphabetic Ciphers, Perfect Substitution Cipher such as the Vernam Cipher, Stream and Block Ciphers, Characteristics of 'Good' Ciphers**:** Shannon Characteristics, Confusion and Diffusion, Unicity Distance.

Secure Encryption Systems
Public Key (Asymmetric key) Encryption Systems: Concept and Characteristics of Public key Encryption System, Introduction to Merkle-Hellman Knapsacks, Rivest-Shamir-Adelman (RSA) Encryption in Detail, Introduction to Digital Signature Algorithms, The Digital Signature Standard (DSA).
Hash Algorithms: Hash Concept, Description of Hash Algorithms, Message Digest Algorithms such as MD4 and MD5, Secure Hash Algorithms such as SHA1 and SHA2.
Secure Secret Key (Symmetric) Systems: The Data Encryption Standard (DES), Analyzing and Strengthening of DES, Key Escrow and Clipper, Introduction to Advance Encryption Standard (AES)

Unit–2

Applied Cryptography, Protocols and Practice
Key Management Protocols: Solving Key Distribution Problem, Diffie-Hellman Algorithm, Key Exchange with Public Key Cryptography.
Public Key Infrastructure (PKI): Concept of Digital Certificate, Certificate Authorities and it's roles, X509 Structure of Digital Certificate, Types of Public Key Infrastructures.
Legal Issues: Copyrights, Patents, Trade Secrets, Computer Crime, Cryptography and the Law.

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Unit–3

Operating System, Database and Program Security

Operating Systems Security: Security Policies, Models of Security, Security Features of Ordinary Operating System, Security Features of Trusted Operating System.

Database Security: Security Requirements of Databases, Reliability and Integrity, Protection of Sensitive Data, Inference Problem: Direct and Indirect Attacks

Program Security: Kinds of Malicious Code, How Viruses Attach and Gain Control, Homes for Viruses, Virus Signatures, Preventing Virus Infection, Trapdoors, Convert Channels, Control Against Program Threats, Java mobile codes.

Unit-4

Network Security

Network Security Issues such as Impersonation, Message Confidentiality, Message Integrity, Code Integrity, Denial of Service, Secure Communication Mechanisms such as IPSec, PKI based Authentication and Kerberos Authentication, Biometrics Authentication Mechanisms, Access Control Mechanisms, Firewalls

Web Security: Solving Privacy Problems, Solving Authentication Problems, Secure Socket Layer (SSL) Protocol, Secure Electronic Transaction (SET) Protocol, Safe Guarding Web Servers.

Secure Electronic Mail*:* Privacy Enhanced Email (PEM), Pretty Good Privacy (PGP), Public Key Cryptography Standards-PKCS#7, Secure/Multipurpose Internet Mail Extensions (S/MIME)

Course Outcomes:

Completion of this course will enable the students to:

- Describe network security services and mechanisms.
- Symmetrical and Asymmetrical cryptography.
- Data integrity, Authentication, Digital Signatures.
- Various network security applications, IPSec, Firewall, IDS, Web security, Email security, and Malicious software etc.

Text Books:

1. Charles P Pfleeger," Security in Computing"
2. Bruce Schnneier , " Applied Cryptography Protocols"
3. Lincoln d stein, "World wide web security FAQ"
4. RSA Laboratories, "Cryptographic Message Synatx Standards"

Reference Books:

1. William Stallings, "Network Security Principles", Pearson
2. William Stallings, "Cryptography Essentials", Pearson

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Advanced Computer Architecture

Paper Code: PEL-702 **Total Credits: 5**

L	T	C	
3	2	5	**External Marks: 80**
			Internal Marks: 20

Duration of Exam: 3 Hrs.

Course objectives

1. The course is designed to train the graduates in Architecture of digital computers
2. Architecture of various digital units of a computer.
3. Usage of digital computers in industry and research.

UNIT – I

Parallel computer models: The state of computing, Multiprocessors and multicomputers, Multivector and SIMD computers, Architectural development tracks
Program and network properties :Conditions of parallelism, Data and resource dependences,Hardware and software parallelism,Program partitioning and scheduling, Grain size and latency, Program flow mechanisms,Control flow versus data flow,Data flow architecture,Demand driven mechanisms,Comparisons of flow mechanisms

UNIT - II

System Interconnect Architectures: Network properties and routing, Static interconnection networks, Dynamic interconnection Networks, Multiprocessor system interconnects, Hierarchical bus systems, Crossbar switch and multiport memory,Multistage and combining network.
Processors and Memory Hierarchy : Advanced processor technology, Instruction-set Architectures,CISC Scalar Processors, RISC Scalar Processors, Superscalar Processors,VLIW Architectures, Vector and Symbolic processors
Memory Technology: Hierarchical memory technology, Inclusion, Coherence and Locality, Memory capacity planning, Virtual Memory Technology

UNIT - III

Backplane Bus System: Backplane bus specification, Addressing and timing protocols, Arbitration transaction and interrupt, Cache addressing models, Direct mapping and associative caches.
Pipelining :Linear pipeline processor, Nonlinear pipeline processor, Instruction pipeline design, Mechanisms for instruction pipelining, Dynamic instruction scheduling, Branch handling techniques, Arithmetic Pipeline Design, Computer arithmetic principles, Static arithmetic pipeline, Multifunctional arithmetic pipelines

UNIT - IV

Vector Processing Principles: Vector instruction types, Vector-access memory schemes.

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Synchronous Parallel Processing: SIMD Architecture and Programming Principles, SIMD Parallel Algorithms, SIMD Computers and Performance Enhancement

Course Outcomes:

1. Ability to understand architecture of digital computers.
2. Ability to apply digital computers in solving complex problems in industry research.
3. Ability to take up advanced course in Computer Architecture.

TEXT BOOKS:

1. Kai Hwang, "Advanced computer architecture"; TMH, 2000.

REFERENCES BOOKS:

1. J.P.Hayes, "computer Architecture and organization", MGH, 1998.
2. M.J Flynn, "Computer Architecture, Pipelined and Parallel Processor Design", Narosa Publishing, 1998.
3. D.A.Patterson, J.L.Hennessy, "Computer Architecture: A quantitative approach", Morgan Kauffmann, 2002.
4. Hwang and Briggs, "Computer Architecture and Parallel Processing"; MGH, 2000.

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Simulation and Modeling

Paper Code: PEL-703 **Total Credits: 5**

L	T	C	
3	2	5	**External Marks: 80**
			Internal Marks: 20

Duration of Exam: 3 Hrs.

Course Objective:

- Define the basics of simulation modeling and replicating the practical situations in organizations
- Generate random numbers and random variates using different techniques.
- Develop simulation model using heuristic methods.
- Analysis of Simulation models using input analyzer, and output analyzer
- Explain Verification and Validation of simulation model.

Unit-1

System models and role of simulation. Entities, Attributes, States and Activities. Types of systems - Deterministic, Stochastic, Continuous and Discrete systems. Steps in simulation studies.

Simulation environment, Modelling consideration, Performance evaluation techniques, Error sources in simulation, design of simulation experiment – length of run, replication, elimination of initial bias, variance reduction techniques.

Unit-2

Statistical tools and techniques- generation of pseudorandom numbers, random variate generation for uniform, Poisson and normal distributions, sampling and estimation, maximum likelihood estimation, confidence intervals and hypothesis testing, stochastic processes and Markov models.

Unit-3

Discrete event simulation languages. Simulation of inventory and queuing systems - single and multiserver queues, network of queues. Modelling and performance evaluation of computers and computer communication networks. Workload characterization. Continuous system simulation languages, growth and decay models, system dynamics diagrams.

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Unit-4

Biological and Sociological system simulation. Verification and validation of simulation models - input/output validation, sensitivity analysis, performance measures and their estimation. Case studies.

Course Outcomes:
After the successful completion of the course, the students will be able to:
1. Describe the role of important elements of discrete event simulation and modeling paradigm.
2. Conceptualize real world situations related to systems development decisions, originating from source requirements and goals.
3. Develop skills to apply simulation software to construct and execute goal-driven system models.
4. Interpret the model and apply the results to resolve critical issues in a real world environment.

Books Recommended:
1. Simulation of Communication Systems by M.C. Jeruchim & Others, Plenum Press.
2. Modern Digital and Communication Systems by Lathi B.P.
3.
4. Discreet Event System Simulation – by Banks, Carsen, Nelson, Persian Edu. Asia.
5. Related IEEE/IEE publications

Text Books:

1. Bernard P. Zeigler, Theory of Modelling and Simulation, Krieger Publishing Co., Inc., Melbourne, FL, 1984
2. Narsingh Deo, System Simulation with Digital Computer, Prentice Hall PTR, Upper Saddle River, NJ, 1983
3. Graham M. Birtwistle, DEMOS: a system for discrete event modelling on Simula, Springer-Verlag New York, Inc., New York, NY, 1987
4. System Simulation – by DS Hira

Note: Nine questions will be set in all by the examiners taking two questions from each unit and one question containing short answer type questions from entire syllabus. Students will be required to attempt five questions, selecting one question from each unit. Question No.1 is compulsory which is from entire syllabus.

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Independent Study

Paper Code: PPP-721			**Total Credits: 5**
L	**T**	**P**	**External Marks: 80**
-	**2**	**6**	**Internal Marks: 20**

Course Objectives

The independent study course is a curriculum option for all students in all degree programs and divisions. Choosing an Independent Study allows students to work with their advisors or division faculty to determine an individualized plan for the knowledge and skills to be sought in a specific or individualized public health topic or focus (in addition to the knowledge and skills to be obtained in the required public health core courses, practicum and culminating experience). In essence, the student and the student's advisory committee are building specialized courses that will constitute a focus area for masters and doctoral students to complete their degree program.

Course content:

Study of research oriented activities involving problem formulation, literature review, plan of the research work related to the Ph.D. topic. The student is required to present the same in department.

Course Outcomes

After completing the course, you should be able to:

1. Demonstrate a command of entomological knowledge and scientific principles
2. Demonstrate an ability to apply graduate coursework in an area of specific professional or personal interest to you.

Note: Assessment/ evaluation of the candidate will be carried out by internal board of examiner on the basis of literature review, proposal, presentation and viva voce.

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Scientific Communications

Paper Code: PPP-722			**Total Credits: 5**
L	**T**	**P**	**External Marks: 80**
-	**2**	**6**	**Internal Marks: 20**

Duration of Exam: 3 Hrs.

Course Objectives
The primary objective of this course is to provide students with a practical introduction to undertaking scientific research and provide experience with presenting science information in written and oral form. Emphasis will be placed on presentation to a scientifically educated, but non-specialist audience. Students will be introduced to the principles of peer review. Feedback will be provided from both experienced speakers as well as graduate student peers.

Course content:
Application of computer and information technology in scientific research: operating system, use of software package such as MS Office, Power Point, Excel, SPSS, etc. application of data base of literature via internet.

Introduction of English Grammar: Word Choice, Sentence Structure, paragraph structure and comprehension.

Types of Scientific Communications, Basic concept of paper writing, Importance of publishing research papers, writing review articles, citation index/impact factor

Publishing Research paper:
a) Preliminaries, Format, Choosing Journal
b) Title, Running Title
c) Authors: Single and Multi authorship
d) Writing Abstract
e) Introduction section
f) Materials and Methods Section
g) Result Section
h) Figures: Design Principles, Legends, Table components, Graphs: Types, Style, Tables v/s Graph
i) Discussion Section: Format, Grammar Style, Content.
j) Acknowledgements
k) References : Different Styles
l) Selecting Keywords
m) Communication with the Editor, Handling Referees' Comments, Galey Proofs

Preparing and Delivering of Oral and Poster Presentations
Avoiding Plagiarism, introduction to intellectual property rights i.e. patent and copy right, etc. Preparing documents for MoUs, Confidentiality Agreements.

The research student is required to prepare a concept paper/working paper/review paper by reviewing at least 40-60 research papers/reference books/ etc. The student is required to present the same in department/conference/ seminar/ workshop/ journal.

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Course Outcomes

1. Understand the requirement for professional conduct in a graduate program and how to successfully progress in graduate school
2. Understand the need for ethical scientific research and conduct
3. The role of the scientific method in research and how to generate research questions and hypotheses that can lead to publications
4. How to efficiently generate high impact presentations of varying length
5. How to use statistics in research and generate data constructs for manuscripts and posters/presentations
6. Understand the components of scientific abstracts and manuscripts, and how to write efficiently

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Software Packages Lab

Paper Code: PPP-723 **Total Credits: 3**

L	**T**	**P**	**Internal Marks: 50**
-	2	2	

Course Objectives

1. Prescribe the conventional and evolution of software.
2. Resolve the process of managing a software from conventional to modern.
3. Analyze the architecture of a model based software and the process flow.
4. Describe the process automation, process management and its discriminants.
5. Review the economics for the next generation software

Course content:

Study and application of tools and software packages related to the topic and discipline of the study and department.

- Software testing tool, Information security tool, simulation and software packages in Computer Science & Engineering.

Course Outcomes:

1. Able to elicit, analyze and specify software requirements through a productive working relationship with various stakeholders of the project
2. Analyze and translate a specification into a design, and then realize that design practically, using an appropriate software engineering methodology.
3. Know how to develop the code from the design and effectively apply relevant standards and perform testing, and quality management and practice
4. Able to use modern engineering tools necessary for software project management, time management and software reuse.

Note: Evaluation/ assessment of the candidate in terms of practical exam and viva voce by internal board of examiner.

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Ph.D CSE