Program

Master of Philosophy

Computer Science

(Revised with effect from 2016-2017 AY onwards)

Faculty of Sciences

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Programme Outcomes

PO1: Develop scholars into mature researchers, able to make original scientific contributions that have both practical significance and a rigorous, elegant theoretical grounding that underpins the various areas of Computer Science and IT.

PO2: To impart sound knowledge in Computer Science and interdisciplinary areas with Science, Technology and Management related to Information Systems and their applications in relevant fields with the latest technologies. Build a pool of technically and scientifically qualified manpower to build a strong scientific community

PO3: Motivate and orient youngsters to do research with proper baseline.

PO4: Develop professionals and teachers with strong analytical and synthesizing capability with innovative and creative thinking that can instill to student community to develop a strong Scientific community

Programme Specific Outcomes

PSO1. Identify, analyze, and synthesize scholarly literature relating to the field of computer science

PSO2. Write about and orally communicate technical material about computer science and computer systems

PSO3. Understand how technological advances impact society and the social, legal, ethical and cultural ramifications of computer technology and their usage.

Evaluation Scheme and Grading System

1.3 All M.Phil. students must complete 12 credits of course work which includes 4 credits on Research Methodology; 8 credits in the domain of research; a one-credit course on Amrita Values Programme, followed by a Thesis and Viva-voce, carrying 17 credits.

The courses (excluding Thesis and Viva-voce) shall be graded as follows;

Letter Grade	**Grade Points**	**Ratings**
O	10.00	Outstanding
A+	09.50	Excellent
A	09.00	Very Good
B+	08.00	Good
B	07.00	Above Average
C	06.00	Average
P	05.00	Pass
F	00.00	Fail
FA		Failed due to Lack of Attendance
I		Incomplete (awarded only for Lab. courses / Internship, etc)
W		Withheld

2.3.5 Thesis Submission and Evaluation

After the thesis synopsis is approved, the M.Phil. scholar can submit thesis within two weeks from the date of Synopsis submission.

The thesis adviser shall nominate four experts to evaluate the thesis. The Head of the institution can choose anyone from the given list. The Thesis Advisor and Co-Advisor are also invited to provide a formal evaluation of the thesis. All examiners will be given three weeks to provide their evaluation. Each examiner can give one of three recommendations: (i) Accept, (ii) Accept with Modifications, or (iii) Reject. If neither of the external examiners recommends a Reject, the candidate is permitted to proceed to the Viva Voce. If both external examiners recommend a Reject, the thesis is rejected and the candidate is required to leave the M.Phil. Programme. If only one of the examiners recommends a Reject, the thesis is sent to a third external examiner whose evaluation decides whether or not the

candidate is permitted to proceed with the Viva Voce. Prior to the Viva Voce, the candidate must submit a revised Thesis taking into account the comments and suggestions made by all examiners.

2.3.6 Viva Voce

The M.Phil. Thesis Committee consists of the M.Phil. Committee and atleast one of the external experts who evaluated the thesis. The Convener of the M.Phil. Committee serves as the Convener of this Committee. If none of the external examiners can be present, the Head of the Institution can nominate a substitute examiner.

The Convener forwards the consolidated recommendation to the PGP Chair who forwards the same to the PGP Dean. The PGP Dean forwards the final recommendation to the Vice-Chancellor for his approval. After the Vice- Chancellor's approval, the PGP Dean issues the Provisional Certificate.

Curriculum Structure

M.Phil. in Computer Science (2 Semesters - 1 year)

Curriculum and Credit Distribution

	Code	Title	Credit
Semester I	15CSA701	Research Methodology	4
	15CSA702	Advanced Computing Techniques	4
	15AVP501	Amrita Values Programme	1
			9
Semester II		Elective	4
	15CSA796	Dissertation (based on the chosen elective)	12
	15CSA797	Viva-voce	5
			21
		TOTAL CREDITS	**30**

List of Electives

15CSA731	Cloud Computing Techniques	3 0 2	4
15CSA732	Data Analytics	3 0 2	4
15CSA733	Mobile and Wireless Technologies	3 0 2	4
15CSA734	Science Communication Techniques	3 0 2	4
15CSA735	Soft Computing Techniques	3 0 2	4
15CSA736	System and Network Security	3 0 2	4
15CSA737	Visual Communication	3 0 2	4

Course Objectives, Course Outcomes, Syllabus

SEMESTER I

Research Methodology **3-1-0-4**

Course Description: *The research methodology module is intended to assist students in planning and carrying out research projects. The students are exposed to the principles, procedures and techniques of implementing a research project. The course starts with an introduction to research and carries through the various methodologies involved. It continues with finding out the literature using computer technology and ends with knowing the tools used for data analysis in various systematical way, and writing the report, paper using LateX s/w.*

Course Outcomes

CO1	Define research and describe the research process and research methods
CO2	Understand and apply basic research methods including research design, data analysis, and interpretation.
CO3	Student will be able to perform literature review effectively
CO4	Learn various tools and methods to perform quantitative data analysis
CO5	Students will be able to use LaTeX and Berner to write research publications

Unit 1

Introduction - meaning of research - objectives of research -motivation in research - types of research - research approaches - significance of research -research methods versus methodology - research and scientific method - importance of knowing how research is done - research processes - criteria of good research - defining research problem - selecting the problem - necessity of defining the problem - techniques involved in defining a problem – research design - meaning of research design - need for research design - features of good design - different research designs - basic principles of experimental design.

Unit 2

Resources for research - research skills – time management - role of supervisor and scholar - interaction with subject experts. Thesis Writing: The preliminary pages and the introduction - the literature review - methodology - the data analysis - the conclusions - the references (IEEE format).

Unit 3

Review of Literature: Significance of review of literature – source for literature: books -journals – proceedings - thesis and dissertations - unpublished items. On-line Searching: Database – SciFinder – Scopus - Science Direct - Searching research articles - Citation Index - Impact Factor - H-index etc.

Unit 4

Tools in Research: Introduction of analytical tools – Introduction to data analysis – least squares fitting of linear data and non-linear data - exponential type data - logarithmic type data - power function data and polynomials of different orders - plotting and fitting of linear, Non-linear, Gaussian, Polynomial, and

Sigmoidal type data - fitting of exponential growth, exponential decay type data – plotting polar graphs - plotting histograms - Y error bars - XY error bars - data masking. Quantitative Techniques: General steps required for quantitative analysis -reliability of the data - classification of errors – accuracy – precision – statistical treatment of random errors - the standard deviation of complete results – error proportion in arithmetic calculations - uncertainty and its use in representing significant digits of results - confidence limits - estimation of detection limit.

Unit 5

LaTeX and Beamer: Writing scientific report - structure and components of research report - revision and refining' - writing project proposal - paper writing for international journals, submitting to editors - conference presentation – preparation of effective slides, pictures, graphs - citation styles.

Text Books

[1] C. R. Kothari*, Research Methodology Methods and Techniques,* 2nd. ed. New Delhi: New Age International Publishers, 2009.
[2] R. Panneerselvam, *Research Methodology*, New Delhi: PHI, 2005.
[3] P. Oliver, *Writing Your Thesis,*New Delhi:Vistaar Publications, 2004.
[4] F. Mittelbach and M. Goossens,*The LATEX Companion*, 2nd. ed. Addison Wesley, 2004.

Reference Books

[1] J. W. Creswell, *Research Design: Qualitative, Quantitative, and Mixed Methods Approaches,* 3nd. ed. Sage Publications, 2008.
[2] Kumar, *Research Methodology: A Step by Step Guide for Beginners*, 2nd. ed. Indian: PE, 2005.
[3] B. C. Nakra and K. K. Chaudhry, *Instrumentation, Measurement and Analysis,*2nd. ed. New Delhi: TMH publishing Co. Ltd., 2005.
[4] I. Gregory, *Ethics in Research*, Continuum, 2005.
[5] Ranjit Kumat, *Research Methodology – A step by step guide for beginners* , Second edition, Pearson

Evaluation Pattern: 1.3

ADVANCED COMPUTING TECHNIQUES 3 – 1 – 0 – 4

Course Description

This paper gives insights into the fundamental and emerging technologies in Computer Science.

Course Outcomes

CO1	Learn the concepts of advanced operating system
CO2	Understand the concepts, use and management of modern database systems
CO3	Give knowledge about various security threats and prevention methods
CO4	Provides understanding on machine learning techniques
CO5	Gives insight to emerging technologies, new research areas and open problems

Unit 1

Advanced Operating Systems: Virtual memory management, Synchronization and communication, Distributed Operating System.

Unit 2

Advanced Database Systems: Overview of emerging database applications and challenges- Mobile Data Management, Geographic Information System, Biological and Genomic Databases, Spatial Databases, Multimedia Databases, Distributed Databases.

Unit 3

Security problems in Computing – attacks and vulnerabilities, Uses of Encryption – Key exchange, Hash Functions, Digital Signatures, Digital Certificate, program security, User Authentication – Kerberos, File Protection Mechanisms, Security in Networks – Firewalls, Intrusion Detection Systems, Secure E-mail.

Unit 4

Machine Learning: Learning theory, Supervised Learning- Classification, Unsupervised Learning- Clustering, Learning Techniques – Soft Computing Techniques

Unit 5

Emerging Technologies* **:** Cloud computing, Software Defined Networks, Big Data, Knowledge management and business intelligence, Mobile computing, Green computing, Storage technologies, Sematic Web Technologies.

***** Subjected to change based on recent trends.

Text Books:

1. Charles P. Pfleeger, & Shani Lawrence Pfeeger, *Security in Computing*, Fourth Edition, Pearson
2. Pradeep K. Sinha , Distributed Operating Systems PHI, 2004
3. Abraham fiberschatz & Hendry F. Korths “Data base systems concepts” Mc Graw Hill International fifth edition, 2006
4. A. Silberschatz ,P. B. Galvin,G. Gagne,*Operating System ConceptsEssentials*, 8th ed.John Wiley & Sons, Inc. 2010.
5. Ramez Elmasri and Shamkant B. Navathe, Database Systems – Models, Languages, Design and Application Programming, 6th Edition, Pearson
6. Neural Computing: An Introduction by R. Beale and T. Jackson, Adam Hilger, 1990.
7. Adaptive Pattern Recognition and Neural Networks by Pao. Y.H., Addision Wesley, 1989.
8. Soft Computing and Intelligent Systems Design: Theory, Tools and Applications by Prof Fakhreddine O. Karray and Prof Clarence W De Silva Pearson Publications, Aug 2004

Recommended Reading

[1] Silberschatz, Korth and Sudarshan,*Database System Concepts*, 6thed.McGraw-Hill.
[2] E. Bertino, L. Martino,*Object- Oriented Database Systems: Concepts and Architectures*, Addison-Wesley Publication, 2012.
[3]. A. S. Tanenbaum, *Distributed Operating system*, 3rd ed. Prentice hall 2008.

Evaluation Pattern: 1.3

SEMESTER II

15CSA796 Dissertation (based on the chosen elective) 12

Course Objectives

The module aims to develop an understanding of the processes and skills required to undertake a supervised research project at masters level of study, and to write this up as your dissertation. The dissertation is the assessment for this module.

The module objectives are

- develop research skills commensurate with the accomplishment of a masters degree
- develop skills in independent inquiry
- produce a coherent and logically argued piece of writing that demonstrates competence in research and the ability to operate independently
- address issues of research design, methodology, ethics and theoretical arguments, and apply these to your own research

Course Outcomes

CO1	Identify/define problems and Generate questions and/or hypotheses
CO2	Review and summarize the literature and apply appropriate research methods
CO3	Collect data systematically and conduct research responsibly and ethically
CO4	Evaluate, interpret, and analyze a body of empirical data and evidence and discuss findings in the broader context of the field
CO5	Develop and sustain an evidence-based argument and produce publishable results

Evaluation Pattern: 2.3.5

15CSA797 Viva-voce 5

Course Objectives

This course is aimed at evaluating the knowledge level of students in various courses.

Course Outcomes

CO1	Have a systematic understanding of their field of knowledge, which includes a critical awareness of current problems and/or new insights at the forefront of that field
CO2	Continue to advance their knowledge and understanding, and to develop new skills to a high level
CO3	Improve the verbal defence skills of the scholar
CO4	Determines standards and merits of the thesis
CO5	Proves the originality, credibility and authenticity of the research thesis

Evaluation Pattern: 2.3.6

ELECTIVES

SCIENCE COMMUNICATION TECHNIQUES 3-0-2-4

Course Objective

This course is for those who want to train as professional science communicators. Academic components provide a broad overview of the professional science communication landscape. The course includes print journalism, new media work, broadcast television or radio production and presentation.

Course Outcomes

CO1	Understand the history of science communication
CO2	Give the students the need and importance of science communication, and various sources of scientific communications
CO3	Able to design an develop effective science communication using moden tools
CO4	Learn various science tecasting technologies
CO5	Students will be able to modern medias, social media and blogs for science broadcasting

Unit 1

Science Communication- an introduction- Professional scientific communication - History of science and technology communication theory, laws and ethics

Unit 2

Need for science communication - Importance and use of science communication, Sources of scientific information – books, scientific reports, scientific journals, magazines, feature syndicates, leaflets, tabloids, wall magazines, speeches, seminars, press releases, databases, encyclopedias on science, etc - Comparative study of science sections and supplements carried in Indian / foreign newspapers and science magazines.

U**nit 3**

Science Reporting and Writing- web designing- Computer Graphics, Formats in Science Communication- Multimedia- Concepts and Applications-Advertising-Public Relations

Unit 4

Science Telecasting - Health Communication- Development Communication-Environmental Communication- Animation Concepts and design.

Unit 5

Science Broadcasting- New Media and Science Communication- Internet- Blogs- Alternative Media and Science Communication

Text

- Anthony Wilson, “Handbook of Science Communication”, IOP
- Kahlor, LeeAnn, Communicating Science, Routledge Publishers

References

- Dubas O and Martel L, "Media Impact. A Research Study on Science Communication
- Vilanilam J.V., "Science Communication and Development", Sage Publications, 1993
- Jane Gregory and Steve Miller, Science in Public: Communication, Culture, and Credibility, Plenum, New York, 1998.
- James G, Paradis and Muriel L. Zimmerman, The MIT Guide to Science and
- Engineering Communication. MIT Press, UK, 2002.

Evaluation Pattern: 1.3

DATA ANALYTICS 3-0-2-4

Prerequisites

This course requires that you are familiar with high-school level linear algebra, and calculus. Knowledge of probability theory, statistics, and programming is desirable.

Course Objectives

The main goal of this course is to help students learn, understand, and practice big data analytics and machine learning approaches, which include the study of modern computing big data technologies and scaling up machine learning techniques focusing on industry applications. Mainly the course objectives are: conceptualization and summarization of big data and machine learning, trivial data versus big data, big data computing technologies, machine learning techniques, and scaling up machine learning approaches.

Course Outcomes

CO1	Understanding various types of data and preprocessing techniques
CO2	basic understanding of descriptive and inferential statistics
CO3	Comprehend the concepts of supervised and unsupervised learning techniques
CO4	Learn the fundamental concepts of various supervised learning methodologies
CO5	Understanding the concepts of Unsupervised Learning and Challenges for Big Data Analytics

Unit 1

Introduction to data analytics (DA), data preparation, data cleaning. Data types and measures of similarity, Data Preprocessing and numerosity reduction, Data Governance

Unit 2

Descriptive Statistics, Probability Distributions, Inferential Statistics through hypothesis tests, Permutation & Randomization Test, Regression, ANOVA (Analysis of Variance)

Unit 3 Machine Learning: Introduction and Concepts, Differentiating algorithmic and model based frameworks, Frequent pattern mining Regression : Ordinary Least Squares, Ridge Regression, Lasso Regression, K Nearest Neighbours Regression & Classification

Unit 4

Supervised Learning with Regression and Classification techniques -1: Bias-Variance Dichotomy, Model Validation Approaches, Logistic Regression, Linear Discriminant Analysis, Quadratic Discriminant Analysis, Regression and Classification Trees, Support Vector Machines.

Supervised Learning with Regression and Classification techniques -2: Ensemble Methods: Random Forest, Neural Networks, Deep learning

Unit 5

Unsupervised Learning and Challenges for Big Data Analytics : Clustering, Associative Rule Mining, Challenges for big data analytics.

Prescriptive analytics: Creating data for analytics through designed experiments, Creating data for analytics through Active learning, Creating data for analytics through Reinforcement learning. (R, Weka or any tool)

References

- Hastie, Trevor, et al. The elements of statistical learning. Vol. 2. No. 1. New York: springer, 2009.
- Montgomery, Douglas C., and George C. Runger. Applied statistics and probability for engineers. John Wiley & Sons, 2010

Evaluation Pattern: 1.3

VISUAL COMMUNICATION **3-0-2-4**

Course Objectives

This course acquaints understudies with correspondence in an imaginative and creative viewpoint through visual symbolism and media. Students will learn the concepts, theories, aesthetics and skills of visual communication, covering visual persuasion, graphic design and so on.

Course Outcomes

CO1	Learn the importance of effective communication and the factors affecting communication
CO2	Understand the process of communication in various levels
CO3	Learn the fundamental design elements, its need, role, process and methodologies
CO4	Learn to apply principles of visual and sensory perceptions
CO5	Able to use various tools used for graphic design through various process to effectively deliver an idea

Unit 1

Necessity and importance of Human and Visual Communication, Communication as expression, skill and process, Understanding Communication: SMRC-Model

Unit 2

Communication as a process- Message, Meaning, Connotation, Denotation Culture/Codes etc ., Levels of communication: Technical, Semantic, and Pragmatic. The semiotic landscape: language and visual communication, narrative representation

Unit 3

Fundamentals of Design: Definition. Approaches to Design, Centrality of Design, Elements of Design: Line, Shape, Space, Color, Texture. Form Etc. Principles of Design: Symmetry. Rhythm, Contrast, Balance Mass/Scale etc. Design and Designers (Need, role, process, methodologies etc.)

Unit 4

Principles of Visual and other Sensory Perceptions - Color psychology and theory (some aspects) Definition, Optical / Visual Illusions Etc Various stages of design process- problem identification, search for solution refinement, analysis, decision making, and implementation.

Unit 5

Basics of Graphic Design - Definition, Elements of GD, Design process-research, a source of concept, the process of developing ideas-verbal, visual, combination & thematic, visual thinking, associative techniques, materials, tools (precision instruments etc.) design execution, and presentation.

References

1. Lester, E (2000) Visual Communications: Images with Messages. Thomson Learning
2. Schildgen, T (1998). Pocket Guide to color with digital applications. Thomson Learning
3. Picture this: Media Representation of Visual Arts and artists. University of Luton Press
4. Palmer, Frederic: Visual Elements of Art and Design,1989, Longman
5. Porter, Tom and Goodman, Sue: Manual of Graphic Technique 2: For Architects, Graphic Designers, and Artists,1982, Astragal Books. London
6. Palmer. F: Visual Awareness (Batsford, 1972)

Evaluation Pattern: 1.3

SOFT COMPUTING TECHNIQUES **3-0-2-4**

Course Objectives

Develop the skills to gain a basic understanding of neural network theory and fuzzy logic theory.

Course Outcomes

CO1	Basic understanding of AI techniques and soft computing techniques
CO2	Comprehend the concepts of feed forward neural networks
CO3	*Implemetation of Associative memories* by using neural networks

CO4	To have an understanding of the concepts of fuzzy sets, knowledge representation using fuzzy rules, approximate reasoning, fuzzy inference systems
CO5	To learn the basic concepts of Evolutionary Computation

Unit 1

Artificial Intelligence – a Brief Review – Pitfalls of Traditional AI – Need for Computational Intelligence – Importance of Tolerance of Imprecision and Uncertainty - Constituent Techniques – Overview of Artificial Neural Networks - Fuzzy Logic - Evolutionary Computation.

Unit 2

Neural Network: Biological and Artificial Neuron, Neural Networks, Supervised and Unsupervised Learning. Single Layer Perceptron - Multilayer Perceptron – Backpropagation Learning. –

Unit 3

Neural Networks as Associative Memories - Hopfield Networks, Bidirectional Associative Memory. Topologically Organized Neural Networks – Competitive Learning, Kohonen Maps,

Unit 4

Fuzzy Logic: Fuzzy Sets – Properties – Membership Functions - Fuzzy Operations. Fuzzy Logic and Fuzzy Inference System

Unit 5

Evolutionary Computation - Overview of other Bio-inspired Algorithms - Swarm Intelligence Algorithms

Text books/ References:

1. Kumar S, "*Neural Networks - A Classroom Approach*", Tata McGraw Hill, 2004.
2. Ross T J, "*Fuzzy Logic with Engineering Applications*", McGraw Hill, 1997.
3. Eiben A E and Smith J E, "*Introduction to Evolutionary Computing*", Second Edition, Springer, Natural Computing Series, 2007.
4. Engelbrecht, A.P, "*Fundamentals of Computational Swarm Intelligence*", John Wiley & Sons, 2006.
5. Konar. A, "*Computational Intelligence: Principles, Techniques and Applications*", Springer Verlag, 2005.

Evaluation Pattern: 1.3

CLOUD COMPUTING TECHNIQUES **3-0-2-4**

Course Objectives

Students will learn

- To use Cloud Services.
- To implement Virtualization

Course Outcomes

CO1	Define Cloud Computing and memorize the different Cloud service and deployment models

CO2	Describe importance of virtualization along with their technologies
CO3	Use and Examine different cloud computing services
CO4	Learn platform as a service using Eucalyptus
CO5	Understand service level agreement to manage data stored on cloud

Unit 1

Cloud Computing - Introduction, characteristics,Benefits, challenges and risks, Web 2.0

Unit 2

Computing Environments- Platforms. Parallel and Distributed Computing- Virtualization: Characteristics- Taxonomy- Pros and Cons – Virtualization environments, Hypervisors – Xen, Vmware, Hyper –V

Unit 3

Cloud Computing Architecture- Service Models – Deployment Models- Infrastructure as a Service

Unit 4

Resource Virtualization-Server-Storage-Network-Platform as a Service- Cloud Platform and Management- Software as a Service- Case Study on Eucalyptus. Service Management in Cloud Computing

Unit 5

Service Level Agreement-Billing and Accounting- Managing Data. Cloud Security challenges: approaches, Infrastructure, Data and Storage Security.

Text Books / References:

1. Rajkumar Buyya, Christian Vecchiola and S. ThamaraiSelvi, "*Mastering Cloud Computing: Foundations and Applications Programming*" , First Edition, McGrawHill Education, 2013.
2. Rajkumar Buyya, James Broberg and Andrzej M. Goscinski, "*Cloud Computing: Principles and Paradigms*", First Edition, Wiley, 2011.
3. Barrie Sosinsky , "*Cloud Computing Bible*", First Edition , Wiley-India, 2010.
4. Nikos Antonopoulos, Lee Gillam, "*Cloud Computing: Principles, Systems and Applications*",First Edition , Springer, 2012.
5. Ronald L. Krutz, Russell Dean Vines "*Cloud Security: A Comprehensive Guide to Secure Cloud Computing*", First Edition, Wiley-India, 2010.

Evaluation Pattern: 1.3

MOBILE AND WIRELESS TECHNOLOGIES 3-0-2-4

Course Objectives: The purpose of this course is to introduce modern digital mobile and wireless

communication systems.

Course Outcomes

CO1	Introduces the students with various 3G and 4G technologies
CO2	Understand 802.11 wireless architecture
CO3	Give knowledge about various multi access control protocols
CO4	Learn to use bluetooth and its working.
CO5	Understand the role of TCP for various wireless applications

Unit 1

GSM –Mobile services ,system architecture ,Radio interface ,protocols, Localization and calling ,Handover, security- 27--31 GPRS ,HSCDC

Unit 2

Wireless LAN:IEEE 802.11,system architecture- IEEE-802.11

Unit 3

protocol architecture, physical layers ,medium access control layers, MAC management 802.11b,802.11 a ,Hiper LAN

Unit 4

Bluetooth ,Adhoc network ,sensor network-Mobile IP, DHCP

Unit 5

Transport and application- TCP over wireless -indirect IP,snooping TCP, Mobile TCP –Fast retransmit/Fast recovery ,Transmission time out ,selective retransmission- Wireless Application Protocol.

Textbook:

1. Mobile Communications by Jochen Schiller,Pearson Education 2nd Edition
2. Wireless communications & Networks by William stallings.
3. Principles of Wireless Networks by Kaveh Pahlavan and Prashanth Krishnamurthy, Prentic Hall 2002
4. James F. Kurose et al.,"Computer Networking", Addison Wesley, 2002.

Evaluation Pattern: 1.3

SYSTEM AND NETWORK SECURITY 3-0-2-4

Course Objectives: System and Network Security a study of the security principles and practices of computer and network systems. The students will be able to understand what the foundational theory is behind computer security, what the common threats are, and how to deal with attackers.

Course Outcomes

CO1	Student will be able to identify various threats and how to protect from those threats using encryption techniques
CO2	Will be able to use authentication techniques according to the requirements and needs of the user
CO3	Learn various flaws in programming and how to prevent those program flaws
CO4	Study protection provided by operating systyem how to use it
CO5	Understand security threats in a network, how to prevent it and privacy and ethical issues

Unit 1

Basic Security Concepts: Threat Models- Common Security Goals. Cryptography and Cryptographic Protocols including Encryption, Private Key and Public-key Cryptography,

Unit 2

Authentication, Message Authentication Codes, Hash Functions, One-way Functions, Secure Channels, Zero Knowledge in Practice, Cryptographic Protocols and their Integration into Distributed Systems and other Applications - Authentication: Overview – Requirements - Functions-Protocols –Applications – Kerberos – X.509 Directory Services.

Unit 3

Program Security: Secure Program -Non-Malicious Program Errors -Malicious Code -Program Controls.

Unit 4

Operating System Security: Memory Protection -Access Control -File Protection Mechanisms -User Authentication

Unit 5

Network Security: Threats in Networks -Security Controls – Firewalls-Intrusion Detection Systems - Computer Crime -Ethical Issues. Case Study: Privacy Rights, Fraud, Accuracy of Information, Denial Of Service.

TEXTBOOK:

1. Charles P. Pfleeger and Shari Lawrence Pfleeger, “Security in Computing”, Fourth Edition, Prentice Hall,2007.
2. Ross J. Anderson and Ross Anderson, “Security Engineering: A Guide to Building Dependable Distributed Systems”, Wiley India Pvt Ltd, 2001.
3. C.K Shyamala, N. Harini and T.R.Padmanabhan, “Cryptography and Security”, First Edition, Wiley India Pvt Ltd, 2011.
4. Matthew Bishop, “Computer Security: Art and Science”, Addison-Wesley, 2003.
5. William Stallings, “Cryptography and Network Security: Principles and Practice”, Fifth Edition, Pearson Education, 2011.
6. Forouzan B A, “Cryptography and Network Security”, Special Indian Edition, Tata McGraw Hill, 2007

Evaluation Pattern: 1.3