

**Scheme & Syllabus**  
**For**  
**Master of Technology**  
**In**  
**Computer Science and Engineering (Network Security)**



**Programme Code: 024**

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

*Website: [www.bpswomenuniversity.ac.in](http://www.bpswomenuniversity.ac.in)*

**Department of Computer Science & Engineering  
and  
Information Technology  
Course Curriculum & Scheme of Examinations of  
Master of Technology  
Computer Science and Engineering (Network Security)  
(w.e.f Session 2018-2019)**

**First Semester**

S. No	Code	Course Title	Hrs/Week			Total Credit	Marks		
			L	T	P		Internal Marks	External Marks	Total Marks
<b>Theory</b>									
1	MT-CSL-101	Program Core I- Mathematical foundations of Computer Science	3	0	0	3	20	80	100
2	MT-CSL-102	Program Core II-Advanced Data Structures	3	0	0	3	20	80	100
3		Program Elective I	3	0	0	3	20	80	100
4		Program Elective II	3	0	0	3	20	80	100
5	MT-RM-101	Research Methodology and IPR	2	0	0	2	10	40	50
6		Audit Course-I	2	0	0	0	20	80	100
<b>Lab</b>									
7	MT-CSP-103	Laboratory 1 (Advanced Data Structures)	0	0	4	2	10	40	50
8	MT-NSP-104	Laboratory 2 (Based on Electives)	0	0	4	2	10	40	50
<b>Total</b>			<b>16</b>	<b>00</b>	<b>08</b>	<b>18</b>	<b>110</b>	<b>440</b>	<b>550</b>

**Program Elective I**

1. MT-CSL-211 Digital Forensics
2. MT-NSL-101 Ethical Hacking
3. MT-NSL-102 Intrusion Detection

**Program Elective II**

1. MT-NSL-103 Malware Analysis & Reverse Engineering
2. MT-CSL-207 Secure Software Design and Enterprise Computing
3. MT-CSL-105 Machine Learning

**Note:** Minimum passing marks for any subject (paper) shall be 40% in the external examination and 40% in the aggregate of internal and external examinations of the subject.

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**Second Semester**

S. No	Code	Course Title	Hrs/Week			Total Credit	Marks		
			L	T	P		Internal Marks	External Marks	Total Marks
<b>Theory</b>									
1	MT-CSL-201	Program Core III - Advance Algorithms	3	0	0	3	20	80	100
2	MT-CSL-202	Program Core IV - Soft Computing	3	0	0	3	20	80	100
3		Program Elective III	3	0	0	3	20	80	100
4		Program Elective IV	3	0	0	3	20	80	100
5		Audit Course-II	2	0	0	0	20	80	100
6	MT-NSL-201	Mini Project with Seminar	2	0	0	2	50	-	50
<b>Lab</b>									
7	MT-CSP-204	Laboratory 3 (Based on cores)	0	0	4	2	10	40	50
8	MT-NSP-208	Laboratory 4 (Based on Electives)	0	0	4	2	10	40	50
<b>Total</b>			<b>16</b>	<b>00</b>	<b>08</b>	<b>18</b>	<b>150</b>	<b>400</b>	<b>550</b>

\*Students be encouraged to go to Industrial Training/Internship for at least 2-3 months during semester break.

**Program Elective III**

1. MT-NSL-202 Data Encryption & Compression
2. MT-NSL-203 Steganography & Digital Watermarking
3. MT-NSL-204 Information Theory & Coding

## Program Elective IV

1. MT-NSL-205 Security Assessment and Risk Analysis
2. MT-NSL-206 Secure Coding
3. MT-NSL-207 Biometrics

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**Third Semester**

S. No	Code	Course Title	Hrs/Week			Total Credit	Marks		
			L	T	P		Internal Marks	External Marks	Total Marks
<b>Theory</b>									
1		Program Elective 5	3	0	0	3	20	80	100
2		Open Elective	3	0	0	3	20	80	100
<b>Labs</b>									
3	MT-NSP-304	Dissertation-I /Industrial Project	0	0	16	8	50	200	250
4	MT-NSP-305	Industrial Training	0	0	0	2		50	50
<b>Total</b>			<b>06</b>	<b>00</b>	<b>16</b>	<b>16</b>	<b>90</b>	<b>410</b>	<b>500</b>

\*Students going for Industrial Project/Thesis will complete these courses through MOOCs.

**Program Elective 5**

1. MT-NSL-301 Data Warehousing & Mining
2. MT-NSL-302 Web Search & Information Retrieval
3. MT-NSL-303 Database Security and Access Control

**Open Elective**

1. MT-OE-301 Business Analytics
2. MT- OE-302 Industrial Safety
3. MT- OE-303 Operations Research
4. MT- OE-304 Cost Management of Engineering Projects
5. MT- OE-305 Composite Materials
6. MT-OE-306 Waste to Energy

**Note:** Minimum passing marks for any subject (paper) shall be 40% in the external examination and 40% in the aggregate of internal and external examinations of the subject.

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**Fourth Semester**

S. No.	Paper Code	Paper	L	T	P	Credits	Marks		
							Internal Marks	External Marks	Total Marks
1.	MT-NSP-401	Dissertation II	0	0	32	16	100	400	500
		<b>Total</b>	<b>0</b>	<b>0</b>	<b>32</b>	<b>16</b>	<b>100</b>	<b>400</b>	<b>500</b>

**Note:** Minimum passing marks for any subject (paper) shall be 40% in the external examination and 40% in the aggregate of internal and external examinations of the subject.

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**Audit Course –I**

1. MT-AU - 101 English for Research Paper Writing
2. MT-AU - 102 Sanskrit for Technical Knowledge
3. MT-AU - 103 Value Education
4. MT-AU - 104 Constitution of India

**Audit Course –II**

1. MT-AU - 201 Disaster Management
2. MT-AU - 202 Pedagogy Studies
3. MT-AU - 203 Stress Management by Yoga
4. MT-AU - 204 Personality Development through Life Enlightenment Skills.

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<b>Sr. No.</b>	<b>Semester</b>	<b>Total Credits</b>	<b>Total Marks</b>
1	First	18	550
2	Second	18	550
3	Third	16	500
4	Fourth	16	500
<b>Total Credit/Marks</b>		<b>68</b>	<b>2100</b>

**Program Outcomes:**

The main outcomes of the M.Tech Computer Science & Engineering (Network Security) program are given here. At the end of the program a student is expected to have:

1. An understanding of the theoretical foundations and the limits of computing and Network security.
2. Independently carry out research /investigation and development work to solve practical problems.
3. Write and present a substantial technical report/document.
4. An ability to adapt existing models, techniques, security algorithms, security tools and techniques etc. for efficiently solving problems.
5. An ability to design, develop and evaluate new computer based systems for novel applications which meet the desired needs of industry and society.
6. Understanding and ability to use advanced computing techniques and security tools.
7. An ability to undertake original research at the cutting edge of network security & its related areas.
8. An understanding of professional and ethical responsibility.



9. Apply mathematical foundations, algorithms and computer science principles in modeling and designing computer systems.
10. Apply computer science tools and techniques to solve different classes of engineering problems following ethical practices.
11. An understanding of the impact of IT related solutions in an economic, social and environment context.

### **Program Specific Outcomes:**

- 1: Students should be able to develop and implement the solution of real life computing problems using contemporary technologies.
2. Students should have the capability to comprehend the technological advancements in the usage of modern tools to analyze and design subsystems/processes for a variety of applications.
3. Students should be able to clearly understand the concepts and applications in the field of Computer Science & Engineering and Network Security.
- 4: Students should be able to apply ethical principles and commit to professional and social responsibilities.
- 5: Students should be able to apply Network Security techniques and security tools to provide solutions for engineering problems with ethical practices.

## SEMESTER I

MT-CSL-101

### Mathematical Foundation of Computer Science

L T P  
3 0 -

Total Credits: 3  
External Marks: 80  
Internal Marks: 20

Duration of Exam: 3 Hrs.

**Pre-requisites:** Discrete Mathematics

#### Course Objectives:

1. To understand the mathematical fundamentals that is prerequisites for a variety of courses like Data mining, Network protocols, analysis of Web traffic, Computer security, Software engineering, Computer architecture, operating systems, distributed systems, Bioinformatics, Machine learning.
2. To develop the understanding of the mathematical and logical basis to many modern techniques in information technology like machine learning, programming language design and concurrency.
3. To study various sampling and classification Problems.

#### UNIT- I

##### Module-1:

Probability mass, density, and cumulative distribution functions, parametric families of distributions, Expected value, variance, conditional expectation, Applications of the univariate and multivariate Central Limit Theorem, Probabilistic inequalities, Markov chains

#### UNIT- II

##### Module-2:

Random samples, sampling distributions of estimators, Methods of Moments and Maximum Likelihood.

##### Module-3:

Statistical inference, Introduction to multivariate statistical models: regression and classification problems, principal components analysis, The problem of over fitting model assessment.

### UNIT- III

#### Module-4:

**Graph Theory:** Isomorphism, Planar graphs, graph colouring, Hamilton circuits and Euler cycles. Permutations and Combinations with and without repetition, specialized techniques to solve combinatorial enumeration problems

### UNIT- IV

#### Module-5:

**Computer science and engineering applications:** Data mining, Network protocols, analysis of Web traffic, Computer security, Software engineering, Computer architecture, operating systems, distributed systems, Bioinformatics, Machine learning.

#### Module-6:

Recent Trends in various distribution functions in mathematical field of computer science for varying fields like bioinformatics, soft computing and computer vision

#### Course Outcomes:

After completion of course, students would be able to:

- a. To understand the basic notions of discrete and continuous probability.
- b. To understand the methods of statistical inference, and the role that sampling distributions play in those method.
- c. To be able to perform correct and meaningful statistical analyses of simple to moderate complexity.

#### References

1. John Vince, Foundation Mathematics for Computer Science, Springer.
2. K. Trivedi. Probability and Statistics with Reliability, Queuing, and Computer Science Applications. Wiley.

3. M. Mitzenmacher and E. Upfal. Probability and Computing: Randomized Algorithms and Probabilistic Analysis.
4. Alan Tucker, Applied Combinatorics, Wiley

**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.

L T P  
3 0 -

Total Credits: 3  
External Marks: 80  
Internal Marks: 20

Duration of Exam: 3 Hrs.

**Pre-requisites:** UG level course in Data Structures

**Course Objectives:**

1. The student should be able to choose appropriate data structures, understand the ADT/libraries, and use it to design algorithms for a specific problem.
2. Students should be able to understand the necessary mathematical abstraction to solve problems.
3. To familiarize students with advanced paradigms and data structure used to solve algorithmic problems.
4. Student should be able to come up with analysis of efficiency and proofs of correctness.

**UNIT- I**

**Module-1: Dictionaries and Hashing**

**Dictionaries:** Definition, Dictionary Abstract Data Type, Implementation of Dictionaries.

**Hashing:** Review of Hashing, Hash Function, Collision Resolution Techniques in Hashing, Separate Chaining, Open Addressing, Linear Probing, Quadratic Probing, Double Hashing, Rehashing, Extendible Hashing.

**UNIT- II**

**Module-2: Skip Lists**

Need for Randomizing Data Structures and Algorithms, Search and Update Operations on Skip Lists, Probabilistic Analysis of Skip Lists, Deterministic Skip Lists

**Module-3: Trees**

**Trees:** Binary Search Trees, AVL Trees, Red Black Trees, 2-3 Trees, B-Trees, Splay Trees

## UNIT- III

### Module-4: Text Processing

String Operations, Brute-Force Pattern Matching, The Boyer- Moore Algorithm, The Knuth-Morris-Pratt Algorithm, Standard Tries, Compressed Tries, Suffix Tries, The Huffman Coding Algorithm, The Longest Common Subsequence Problem (LCS), Applying Dynamic Programming to the LCS Problem.

## UNIT- IV

### Module-5: Computational Geometry

One Dimensional Range Searching, Two Dimensional Range Searching, Constructing a Priority Search Tree, Searching a Priority Search Tree, Priority Range Trees, Quadrees, k-D Trees.

### Module-6:

Recent Trends in Hashing, Trees, and various computational geometry methods for efficiently solving the new evolving problem

### Course Outcomes:

- a. Understand the implementation of symbol table using hashing techniques.
- b. Develop and analyze algorithms for red-black trees, B-trees and Splay trees.
- c. Develop algorithms for text processing applications.
- d. Identify suitable data structures and develop algorithms for computational geometry problems.

### References

1. Mark Allen Weiss, Data Structures and Algorithm Analysis in C++, 2nd Edition, Pearson, 2004
2. M T Goodrich Roberto Tamassia, Algorithm Design, John Willey, 2002

**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.

L T P  
3 0 -

**Total Credits: 3**  
**External Marks: 80**  
**Internal Marks: 20**

Duration of Exam: 3 Hrs.

**Pre-Requisites** Cybercrime and Information Warfare, Computer Networks

### Course Objectives

1. Provides an in-depth study of the rapidly changing and fascinating field of computer forensics.
2. Combines both the technical expertise and the knowledge required to investigate, detect and prevent digital crimes.
3. Knowledge on digital forensics legislations, digital crime, forensics processes and procedures, data acquisition and validation, e-discovery tools
4. E-evidence collection and preservation, investigating operating systems and file systems, network forensics, art of steganography and mobile device forensics

## UNIT-I

### Module-1:

**Digital Forensics Science:** Forensics science, computer forensics, and digital forensics.

**Computer Crime:** Criminalistics as it relates to the investigative process, analysis of cyber-criminalistics area, holistic approach to cyber-forensics

## UNIT-II

### Module-2:

**Cyber Crime Scene Analysis:** Discuss the various court orders etc., methods to search and seizure electronic evidence, retrieved and un-retrieved communications, Discuss the importance of understanding what court documents would be required for a criminal investigation.

### Module-3:

**Evidence Management & Presentation:** Create and manage shared folders using operating system, importance of the forensic mindset, define the workload of law enforcement, Explain what the normal case would look like, Define who should be notified of a crime, parts of gathering evidence, Define and apply probable cause.

### UNIT-III

#### Module-4:

**Computer Forensics:** Prepare a case, Begin an investigation, Understand computer forensics workstations and software, Conduct an investigation, Complete a case, Critique a case,

**Network Forensics:** open-source security tools for network forensic analysis, requirements for preservation of network data.

### UNIT-IV

#### Module-5:

**Mobile Forensics:** mobile forensics techniques, mobile forensics tools.

**Legal Aspects of Digital Forensics:** IT Act 2000, amendment of IT Act 2008.

#### Module-6:

Recent trends in mobile forensic technique and methods to search and seizure electronic evidence

#### Course Outcomes

**After completion of course, students would be able to:**

- Understand relevant legislation and codes of ethics
- Computer forensics and digital detective and various processes, policies and procedures
- E-discovery, guidelines and standards, E-evidence, tools and environment.
- Email and web forensics and network forensics

#### References:

- John Sammons, The Basics of Digital Forensics, Elsevier
- John Vacca, Computer Forensics: Computer Crime Scene Investigation, Laxmi Publications

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**L T P**  
**3 0 -**

**Total Credits: 3**  
**External Marks: 80**  
**Internal Marks: 20**

Duration of Exam: 3 Hrs.

**Pre-requisites:** Computer Programming, Web Programming, Computer Networks

**Course Objectives:**

1. Introduces the concepts of Ethical Hacking and gives the students the opportunity to learn about different tools and techniques in Ethical hacking and security and practically apply some of the tools.

**UNIT-I**

**Module-1:**

Introduction to Ethical Disclosure: Ethics of Ethical Hacking, Ethical Hacking and the legal system, Proper and Ethical Disclosure

**Module-2:**

Penetration Testing and Tools: Using Metasploit, Using BackTrack LiveCD, Linux Distribution

**UNIT-II**

**Module-3:**

Vulnerability Analysis: Passive Analysis, Advanced Static Analysis with IDA Pro, Advanced Reverse Engineering

**UNIT-III**

**Module-4:**

Client-side browser exploits, Exploiting Windows Access Control Model for Local Elevation Privilege, Intelligent Fuzzing with Sulley, From Vulnerability to Exploit

## UNIT-IV

### Module-5:

Malware Analysis: Collecting Malware and Initial Analysis, Hacking Malware

### Module-6:

Case study of vulnerability of cloud platforms and mobile platforms & devices

### Course Outcomes

#### After completion of course, students would be able to:

- a. Understand the core concepts related to malware, hardware and software vulnerabilities and their causes
- b. Understand ethics behind hacking and vulnerability disclosure
- c. Appreciate the Cyber Laws and impact of hacking
- d. Exploit the vulnerabilities related to computer system and networks using state of the art tools and technologies

### References:

1. Shon Harris, Allen Harper, Chris Eagle and Jonathan Ness, Gray Hat Hacking: The Ethical Hackers' Handbook, TMH Edition
2. Jon Erickson, Hacking: The Art of Exploitation, SPD

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**L T P**  
**3 0 -**

**Total Credits: 3**  
**External Marks: 80**  
**Internal Marks: 20**

Duration of Exam: 3 Hrs.

**Pre-requisites:** Computer Networks, Computer Programming

### **Course Objectives:**

1. Compare alternative tools and approaches for Intrusion Detection through quantitative analysis to determine the best tool or approach to reduce risk from intrusion
2. Identify and describe the parts of all intrusion detection systems and characterize new and emerging IDS technologies according to the basic capabilities all intrusion detection systems share.

### **UNIT-I**

#### **Module-1:**

The state of threats against computers, and networked systems-Overview of computer security solutions and why they fail-Vulnerability assessment, firewalls, VPN's - Overview of Intrusion Detection and Intrusion Prevention-Network and Host-based IDS

### **UNIT-II**

#### **Module-2:**

Classes of attacks - Network layer: scans, denial of service, penetration-Application layer: software exploits, code injection-Human layer: identity theft, root access-Classes of attackers-Kids/hackers/sophisticated groups-Automated: Drones, Worms, Viruses

### **UNIT-III**

#### **Module-3:**

A General IDS model and taxonomy, Signature-based Solutions, Snort, Snortrules, Evaluation of IDS, Cost sensitive IDS

#### **Module-4:**

Anomaly Detection Systems and Algorithms-Network Behavior Based Anomaly Detectors (rate based)-Host-based Anomaly Detectors-Software Vulnerabilities-State transition, Immunology, Payload Anomaly Detection

#### **UNIT-IV**

#### **Module-5:**

Attack trees and Correlation of alerts-Autopsy of Worms and Botnets-Malware detection-Obfuscation, polymorphism-Document vectors

#### **Module-6:**

Email/IM security issues-Viruses/Spam-From signatures to thumbprints to zero-day detection-Insider Threat issues-Taxonomy-Masquerade and Impersonation-Traitors, Decoys and Deception-Future: Collaborative Security

#### **Course Outcomes**

##### **After completion of course, students would be able to:**

- a. Apply knowledge of the fundamentals and history of Intrusion Detection in order to avoid common pitfalls in the creation and evaluation of new Intrusion Detection Systems. Evaluate the security of an enterprise and appropriately apply Intrusion Detection tools and techniques in order to improve their security posture

#### **References:**

1. The Art of Computer Virus Research and Defense, Peter Szor, Symantec Press ISBN 0-321-30545-3
2. Crimeware, Understanding New Attacks and Defenses, Markus Jakobsson and Zulfikar Ramzan, Symantec Press, ISBN: 978-0-321-50195-0 2008

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**L T P****3 0 -****Total Credits: 3****External Marks: 80****Internal Marks: 20**

Duration of Exam: 3 Hrs.

**Pre-Requisites** Computer Programming, Compiler Design**Course Objective**

- a. The objective of this course is to provide an insight to fundamentals of malware analysis which includes analysis of JIT compilers for malware detection in legitimate code. DNS filtering and reverse engineering is included.

**UNIT-I****Module-1:**

Fundamentals of Malware Analysis (MA), Reverse Engineering Malware (REM) Methodology, Brief Overview of Malware analysis lab setup and configuration, Introduction to key MA tools and techniques, Behavioral Analysis vs. Code Analysis, Resources for Reverse-Engineering Malware (REM) Understanding Malware Threats, Malware indicators, Malware Classification, Examining ClamAV Signatures, Creating Custom ClamAV Databases, Using YARA to Detect Malware Capabilities, Creating a Controlled and Isolated Laboratory, Introduction to MA Sandboxes, Ubuntu, Zeltser's REMnux, SANS SIFT, Sandbox Setup and Configuration New Course Form, Routing TCP/IP Connections, Capturing and Analyzing Network Traffic, Internet simulation using INetSim, Using Deep Freeze to Preserve Physical Systems, Using FOG for Cloning and Imaging Disks, Using MySQL Database to Automate FOG Tasks, Introduction to Python, Introduction to x86 Intel assembly language, Scanners: Virus Total, Jotti, and NoVirus Thanks, Analyzers: Threat Expert, CWSandbox, Anubis, Joebox, Dynamic Analysis Tools: Process Monitor, Regshot, HandleDiff, Analysis Automation Tools: Virtual Box, VM Ware, Python, Other Analysis Tools

**UNIT-II****Module-2:****Malware Forensics**

Using TSK for Network and Host Discoveries, Using Microsoft Offline API to Registry Discoveries, Identifying Packers using PEiD, Registry Forensics with Reg Ripper Plu-

gins:, Bypassing Poison Ivy's Locked Files, BypassingConficker's File System ACL Restrictions, Detecting Rogue PKI Certificates.

### UNIT-III

#### Module-3:

##### Malware and Kernel Debugging

Opening and Attaching to Processes, Configuration of JIT Debugger forShellcode Analysis, Controlling Program Execution, Setting and CatchingBreakpoints, Debugging with Python Scripts and Py Commands, DLL ExportEnumeration, Execution, and Debugging, Debugging a VMware WorkstationGuest (on Windows), Debugging a Parallels Guest (on Mac OS X). Introductionto WinDbg Commands and Controls, Detecting Rootkits with WinDbgScripts,Kernel Debugging with IDA Pro.

### UNIT-IV

#### Module-4:

##### Memory Forensics and Volatility

Memory Dumping with MoonSols Windows Memory Toolkit, Accessing VMMemory Files Overview of Volatility, Investigating Processes in MemoryDumps, Code Injection and Extraction, Detecting and Capturing SuspiciousLoaded DLLs, Finding Artifacts in Process Memory, Identifying Injected Code with Malfind and YARA

#### Module-5:

##### Researching and Mapping Source Domains/IPs

Using WHOIS to Research Domains, DNS Hostname Resolution, QueryingPassive DNS, Checking DNS Records, Reverse IP Search New Course Form,Creating Static Maps, Creating Interactive Maps.

#### Module-6:

Case study of Finding Artifacts in Process Memory, Identifying InjectedCode with Malfind and YARA

#### Course Outcomes

##### On completion of the course the student should be able to

- b. To understand the concept of malware and reverse engineering.
- c. Implement tools and techniques of malware analysis

**References:**

1. Michael Sikorski, Andrew Honig “Practical Malware Analysis: The Hands-On Guide to Dissecting Malicious Software” publisher William Pollock

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## MT-CSL-207 Secure Software Design and Enterprise Computing(Elective II)

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**Total Credits: 3**  
**External Marks: 80**  
**Internal Marks: 20**

Duration of Exam: 3 Hrs.

**Pre-Requisites** Computer Programming, Software Engineering

### Course Objective

1. To fix software flaws and bugs in various software.
2. To make students aware of various issues like weak random number generation, information leakage, poor usability, and weak or no encryption on data traffic
3. Techniques for successfully implementing and supporting network services on an enterprise scale and heterogeneous systems environment.
4. Methodologies and tools to design and develop secure software containing minimum vulnerabilities and flaws.

### UNIT-I

#### Module-1:

##### Secure Software Design

Identify software vulnerabilities and perform software security analysis, Master security programming practices, Master fundamental software security design concepts, Perform security testing and quality assurance.

### UNIT-II

#### Module-2:

##### Enterprise Application Development

Describe the nature and scope of enterprise software applications, Design distributed N-tier software application, Research technologies available for the presentation, business and data tiers of an enterprise software application, Design and build a database using an enterprise database system, Develop components at the different tiers in an enterprise system, Design and develop a multi-tier solution to a problem using technologies used in enterprise system, Present software solution.



## UNIT-III

### Module-3:

#### Enterprise Systems Administration

Design, implement and maintain a directory-based server infrastructure in a heterogeneous systems environment, Monitor server resource utilization for system reliability and availability, Install and administer network services (DNS/DHCP/Terminal Services/Clustering/Web/Email).

## UNIT-IV

### Module-4:

Obtain the ability to manage and troubleshoot a network running multiple services, understand the requirements of an enterprise network and how to go about managing them.

### Module-5:

Handle insecure exceptions and command/SQL injection, Defend web and mobile applications against attackers, software containing minimum vulnerabilities and flaws.

### Module-6:

Case study of DNS server, DHCP configuration and SQL injection attack

### Course Outcomes

#### After completion of course, students would be able to:

- a. Differentiate between various software vulnerabilities.
- b. Software process vulnerabilities for an organization.
- c. Monitor resources consumption in a software.
- d. Interrelate security and software development process.

### References:

1. Theodor Richardson, Charles N Thies, Secure Software Design, Jones & Bartlett
2. Kenneth R. van Wyk, Mark G. Graff, Dan S. Peters, Diana L. Burley, Enterprise Software Security, Addison Wesley.

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**L T P**  
**3 0 -**

**Total Credits: 3**  
**External Marks: 80**  
**Internal Marks: 20**

Duration of Exam: 3 Hrs.

**Pre-requisites:**

**Course Objectives:**

1. To learn the concept of how to learn patterns and concepts from data without being explicitly programmed in various IOT nodes.
2. To design and analyze various machine learning algorithms and techniques with a modern outlook focusing on recent advances.
3. Explore supervised and unsupervised learning paradigms of machine learning.
4. To explore Deep learning technique and various feature extraction strategies.

**UNIT-I**

**Module-1: Supervised Learning (Regression/Classification)**

- Basic methods: Distance-based methods, Nearest-Neighbours, Decision Trees, Naive Bayes
- Linear models: Linear Regression, Logistic Regression, Generalized Linear Models
- Support Vector Machines, Nonlinearity and Kernel Methods
- Beyond Binary Classification: Multi-class/Structured Outputs, Ranking

**UNIT-II**

**Module-2: Unsupervised Learning**

- Clustering: K-means/Kernel K-means
- Dimensionality Reduction: PCA and kernel PCA
- Matrix Factorization and Matrix Completion
- Generative Models (mixture models and latent factor models)

## UNIT-III

### Module-3:

Evaluating Machine Learning algorithms and Model Selection, Introduction to Statistical Learning Theory, Ensemble Methods (Boosting, Bagging, Random Forests)

### Module-4:

Sparse Modeling and Estimation, Modeling Sequence/Time-Series Data, Deep Learning and Feature Representation Learning

## UNIT-IV

### Module-5:

Scalable Machine Learning (Online and Distributed Learning)  
A selection from some other advanced topics, e.g., Semi-supervised Learning, Active Learning, Reinforcement Learning, Inference in Graphical Models, Introduction to Bayesian Learning and Inference

### Module-6:

Recent trends in various learning techniques of machine learning and classification methods for IOT applications, various models for IOT applications

### Course Outcomes:

- Extract features that can be used for a particular machine learning approach in various IOT applications.
- To compare and contrast pros and cons of various machine learning techniques and to get an insight of when to apply a particular machine learning approach.
- To mathematically analyse various machine learning approaches and paradigms.

### References

- Kevin Murphy, Machine Learning: A Probabilistic Perspective, MIT Press, 2012
- Trevor Hastie, Robert Tibshirani, Jerome Friedman, The Elements of Statistical Learning, Springer 2009 (freely available online)
- Christopher Bishop, Pattern Recognition and Machine Learning, Springer, 2007.

**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.

**MT-RM-101**

## **Research Methodology and IPR (Elective II)**

**L T P**  
**3 0 -**

**Total Credits: 3**  
**External Marks: 40**  
**Internal Marks: 10**

Duration of Exam: 3 Hrs.

### **Pre-requisites:**

### **Course Objectives:**

1. Understand research problem formulation.
2. Analyze research related information
3. Follow research ethics
4. Understand that today's world is controlled by Computer, Information Technology, but tomorrow world will be ruled by ideas, concept, and creativity.
5. Understanding that when IPR would take such important place in growth of individuals & nation, it is needless to emphasis the need of information about Intellectual Property  
Right to be promoted among students in general & engineering in particular
6. Understand that IPR protection provides an incentive to inventors for further research work and investment in R & D, which leads to creation of new and better products, and in turn brings about, economic growth and social benefits.

## **UNIT-I**

### **Module-1:**

Meaning of research problem, Sources of research problem, Criteria Characteristics of a good research problem, Errors in selecting a research problem, Scope and objectives of research problem, Approaches of investigation of solutions for research problem, data collection, analysis, interpretation, Necessary instrumentations

### **Module-2:**

Effective literature studies approaches, analysis Plagiarism, Research ethics

## **UNIT-II**

### **Module-3:**

Effective technical writing, how to write report, Paper Developing a Research Proposal, Format of research proposal, a presentation and assessment by a review committee

### **Module-4:**

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

Nature of Intellectual Property: Patents, Designs, Trade and Copyright. Process of Patenting and Development: technological research, innovation, patenting, development. International Scenario: International cooperation on Intellectual Property. Procedure for grants of patents, Patenting under PCT

### UNIT-III

#### Module-5:

Patent Rights: Scope of Patent Rights, Licensing and transfer of technology, Patent information and databases, Geographical Indications

### UNIT-IV

#### Module-6:

New Developments in IPR: Administration of Patent System. New developments in IPR; IPR of Biological Systems, Computer Software etc, Traditional knowledge Case Studies, IPR and IITs

#### Course Outcomes:

- a. To identify sources of research problem and approaches of investigation for solutions for research problem.
- b. To learn various research ethics.
- c. To learn the concepts of patents, procedure for granting patents and administration of patent system.

#### References

1. Stuart Melville and Wayne Goddard, “Research methodology: an introduction for science & engineering students”
2. Wayne Goddard and Stuart Melville, “Research Methodology: An Introduction”
3. Ranjit Kumar, 2nd Edition , “Research Methodology: A Step by Step Guide for beginners”
4. Halbert, “Resisting Intellectual Property”, Taylor & Francis Ltd ,2007.
5. Mayall , “Industrial Design”, McGraw Hill, 1992.
6. Niebel , “Product Design”, McGraw Hill, 1974.
7. Asimov, “Introduction to Design”, Prentice Hall, 1962.
8. Robert P. Merges, Peter S. Menell, Mark A. Lemley, “ Intellectual Property in NewTechnological Age”, 2016
9. T. Ramappa, “Intellectual Property Rights Under WTO”, S. Chand, 2008

**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.

**MT-CSP-103**

**Laboratory 1 (Advanced Data Structures)**

**L T P**

**-- 4**

**Total Credits: 2**

**External Marks: 40**

**Internal Marks: 10**

Duration of Exam: Hrs.

At least 10 to 15 exercises related to the subject should be given by the teacher concerned.

**MT-NSP-104**

**Laboratory 2 (Based on Electives)**

**L T P**

**-- 4**

**Total Credits: 2**

**External Marks: 40**

**Internal Marks: 10**

Duration of Exam: Hrs.

At least 20 exercises related to the electives subject (i.e.10 exercises from each subject) should be given by the teacher concerned.

## SEMESTER II

MT-CSL-201

### Advance Algorithms

L T P  
3 0 -

**Total Credits: 3**  
**External Marks: 80**  
**Internal Marks: 20**

Duration of Exam: 3 Hrs.

**Pre-requisites:** UG level course in Algorithm Design and Analysis

#### Course Objectives:

1. Introduce students to the advanced methods of designing and analyzing algorithms.
2. The student should be able to choose appropriate algorithms and use it for a specific problem.
3. To familiarize students with basic paradigms and data structures used to solve advanced algorithmic problems.
4. Students should be able to understand different classes of problems concerning their computation difficulties.
5. To introduce the students to recent developments in the area of algorithmic design.

### UNIT - I

#### Module-1:

**Sorting:** Review of various sorting algorithms, topological sorting

**Graph:** Definitions and Elementary Algorithms: Shortest path by BFS, shortest path in edge-weighted case (Dijkstra's), depth-first search and computation of strongly connected components, emphasis on correctness proof of the algorithm and time/space analysis, example of amortized analysis.



## UNIT - II

### Module-2:

**Matroids:** Introduction to greedy paradigm, algorithm to compute a maximum weight maximal independent set, Application to MST.

**Graph Matching:** Algorithm to compute maximum matching. Characterization of maximum matching by augmenting paths, Edmond's Blossom algorithm to compute augmenting path

### Module-3:

**Flow-Networks:** Maxflow-mincut theorem, Ford-Fulkerson Method to compute maximum flow, Edmond-Karp maximum-flow algorithm.

**Matrix Computations:** Strassen's algorithm and introduction to divide and conquer paradigm, inverse of a triangular matrix, relation between the time complexities of basic matrix operations, LUP-decomposition

## UNIT - III

### Module-4:

**Shortest Path in Graphs:** Floyd-Warshall algorithm and introduction to dynamic programming paradigm, more examples of dynamic programming

**Modulo Representation of integers/polynomials:** Chinese Remainder Theorem, Conversion between base-representation and modulo-representation, Extension to polynomials, Application: Interpolation problem.

**Discrete Fourier Transform (DFT):** In complex field, DFT in modulo ring. Fast Fourier Transform algorithm, Schonhage-Strassen Integer Multiplication algorithm

## UNIT - IV

### Module-5:

**Linear Programming:** Geometry of the feasibility region and Simplex algorithm

**NP-completeness:** Examples, proof of NP-hardness and NP-completeness.

**One or more of the following topics based on time and interest**

Approximation algorithms, Randomized Algorithms, Interior Point Method, Advanced Number Theoretic Algorithm

### Module-6:

Recent Trends in problem solving paradigms using recent searching and sorting techniques by applying recently proposed data structures.

**Course Outcomes:**

- a. Analyze the complexity/performance of different algorithms.
- b. Determine the appropriate data structure for solving a particular set of problems.
- c. Categorize the different problems in various classes according to their complexity.
- d. Students should have an insight of recent activities in the field of the advanced data structure

**References**

1. "Introduction to Algorithms" by Cormen, Leiserson, Rivest, Stein.
2. "The Design and Analysis of Computer Algorithms" by Aho, Hopcroft, Ullman.
3. "Algorithm Design" by Kleinberg and Tardos.

**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.

**L T P**  
**3 0 -**

**Total Credits: 3**  
**External Marks: 80**  
**Internal Marks: 20**

Duration of Exam: 3 Hrs.

**Pre-requisites:** Basic knowledge of mathematics

**Course Objectives:**

1. To introduce soft computing concepts and techniques and foster their abilities in designing appropriate technique for a given scenario
2. To implement soft computing based solutions for real-world problems
3. To give students knowledge of non-traditional technologies and fundamentals of artificial
4. neural networks, fuzzy sets, fuzzy logic, genetic algorithms
5. To provide studentan hand-on experience on MATLAB to implement various strategies

**UNIT - I**

**Module-1: Introduction to Soft Computing and Neural Networks**

Evolution of Computing: Soft Computing Constituents, From Conventional AI to Computational Intelligence: Machine Learning Basics

**Module-2: Fuzzy Logic**

Fuzzy Sets, Operations on Fuzzy Sets, Fuzzy Relations, Membership Functions: Fuzzy Rules and Fuzzy Reasoning, Fuzzy Inference Systems, Fuzzy Expert Systems, Fuzzy Decision Making

**UNIT - II**

**Module-3: Neural Networks**

Machine Learning Using Neural Network, Adaptive Networks, Feed forward Networks, Supervised Learning Neural Networks, Radial Basis Function Networks: Reinforcement Learning, Unsupervised Learning Neural Networks, Adaptive Resonance architectures, Advances in Neural networks

## UNIT - III

### Module-4: Genetic Algorithms

Introduction to Genetic Algorithms (GA), Applications of GA in Machine Learning: Machine Learning Approach to Knowledge Acquisition

## UNIT - IV

### Module-5: Matlab/Python Lib

Introduction to Matlab/Python, Arrays and array operations, Functions and Files, Study of neural network toolbox and fuzzy logic toolbox, Simple implementation of Artificial Neural Network and Fuzzy Logic

### Module-6:

Recent Trends in deep learning, various classifiers, neural networks and genetic algorithm, Implementation of recently proposed soft computing techniques

### Course Outcomes:

- a. Identify and describe soft computing techniques and their roles in building intelligent machines
- b. Apply fuzzy logic and reasoning to handle uncertainty and solve various engineering problems.
- c. Apply genetic algorithms to combinatorial optimization problems.
- d. Evaluate and compare solutions by various soft computing approaches for a given problem.

### References

2. Jyh:Shing Roger Jang, Chuen:Tsai Sun, EijiMizutani, Neuro:Fuzzy and Soft Computing, Prentice:Hall of India, 2003.
2. George J. Klir and Bo Yuan, Fuzzy Sets and Fuzzy Logic:Theory and Applications, Prentice Hall, 1995.
3. MATLAB Toolkit Manual

**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.

**L T P**  
**3 0 -****Total Credits: 3**  
**External Marks: 80**  
**Internal Marks: 20**

Duration of Exam: 3 Hrs.

**Pre-Requisites:** Image Processing, Linear Algebra, Cryptography**Course Objective**

1. This course will cover the concept of security, types of attack experienced, encryption and authentication for deal with attacks, what is data compression, need and techniques of data compression

**UNIT - I****Module-1:****Introduction to Security:** Need for security, Security approaches, Principles of security, Types of attacks.**Encryption Techniques:** Plaintext, Cipher text, Substitution & Transposition techniques, Encryption & Decryption, Types of attacks, Key range & Size.**UNIT - II****Module-2:****Symmetric & Asymmetric Key Cryptography:** Algorithm types & Modes, DES, IDEA, Differential & Linear Cryptanalysis, RSA, Symmetric & Asymmetric key together, Digital signature, Knapsack algorithm.**User Authentication Mechanism:** Authentication basics, Passwords, Authentication tokens, Certificate based & Biometric authentication, Firewall.**UNIT - III****Module-3:****Case Studies Of Cryptography:** Denial of service attacks, IP spoofing attacks, Secure inter branch payment transactions, Conventional Encryption and Message Confidentiality, Conventional Encryption Principles, Conventional Encryption Algorithms, Location of Encryption Devices, Key Distribution.

**Public Key Cryptography and Message Authentication:** Approaches to Message Authentication, SHA-1, MD5, Public-Key Cryptography Principles, RSA, Digital Signatures, Key Management.

**Module-4:**

**Introduction:** Need for data compression, Fundamental concept of data compression & coding, Communication model, Compression ratio, Requirements of data compression, Classification.

**Methods of Data Compression:** Data compression-- Loss less & Lossy

## UNIT - IV

**Module-5:**

Entropy encoding-- Repetitive character encoding, Run length encoding, Zero/Blank encoding; Statistical encoding-- Huffman, Arithmetic & Lempel-Ziv coding; Source encoding-- Vector quantization (Simple vector quantization & with error term); Differential encoding—Predictive coding, Differential pulse code modulation, Delta modulation, Adaptive differential pulse code modulation; Transform based coding : Discrete cosine transform & JPEG standards; Fractal compression

**Module-6:**

Recent trends in encryption and data compression techniques.

### Course Outcomes

**After completion of course, students would be:**

- a. At the end of this course the student will have the knowledge of plaintext, cipher text, RSA and other cryptographic algorithm, Key Distribution, Communication Model, Various models for data compression

### References:

1. Cryptography and Network Security by B. Forouzan, McGraw-Hill.
2. The Data Compression Book by Nelson, BPB.
3. Cryptography & Network Security by Atul Kahate, TMH.

**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.

**L T P**  
**3 0 -**

**Total Credits: 3**  
**External Marks: 80**  
**Internal Marks: 20**

Duration of Exam: 3 Hrs.

**Pre-Requisites** Image and Video Processing, Linear Algebra

### **Course Objective**

- a. The objective of course is to provide a insight to steganography techniques. Watermarking techniques along with attacks on data hiding and integrity of data is included in this course.

## **UNIT - I**

### **Module-1:**

**Steganography:** Overview, History, Methods for hiding (text, images, audio,video, speech etc.), Issues: Security, Capacity and Imperceptibility,Steganalysis: Active and Malicious Attackers, Active and passive steganalysis,

### **Module-2:**

Frameworks for secret communication (pure Steganography, secret key, publickey steganography), Steganography algorithms (adaptive and non-adaptive),

## **UNIT - II**

### **Module-3:**

Steganography techniques: Substitution systems, Spatial Domain, Transformdomain techniques, Spread spectrum, Statistical steganography, CoverGeneration and cover selection, Tools: EzStego, FFEncode, Hide 4 PGP, Hideand Seek, S Tools etc.)

### **Module-4:**

Detection, Distortion, Techniques: LSB Embedding, LSB Steganalysisusingprimary sets, Texture based

## **UNIT - III**

### **Module-5:**

**Digital Watermarking:** Introduction, Difference between Watermarking andSteganography, History, Classification (Characteristics and Applications),Types and

techniques (Spatial-domain, Frequency-domain, and Vectorquantization based watermarking), Attacks and Tools (Attacks by Filtering,Remodulation, Distortion, Geometric Compression, Linear Compression etc.),Watermark security & authentication.

## UNIT - IV

### Module-6:

Recent trends in Steganography and digital watermarking techniques. Case study of LSB Embedding, LSB Steganalysis using primary sets

### Course Outcomes

**After completion of course, students would be:**

3. Learn the concept of information hiding.
4. Survey of current techniques of steganography and learn how to detect and extract hidden information.
5. Learn watermarking techniques and through examples understand the concept.

### References:

1. Peter Wayner, “Disappearing Cryptography–Information Hiding: Steganography & Watermarking”, Morgan Kaufmann Publishers, New York, 2002.
2. Ingemar J. Cox, Matthew L. Miller, Jeffrey A. Bloom, Jessica Fridrich, TonKalker, “DigitalWatermarking and Steganography”, Margan Kaufmann Publishers, New York, 2008.
3. Information Hiding: Steganography and Watermarking-Attacks and Countermeasures by Neil F.Johnson, ZoranDuric, SushilJajodia
4. Information Hiding Techniques for Steganography and Digital Watermarking by StefanKatzenbeisser, Fabien A. P. Petitcolas

**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.



**L T P**  
**3 0 -**

**Total Credits: 3**  
**External Marks: 80**  
**Internal Marks: 20**

Duration of Exam: 3 Hrs.

**Pre-Requisites** Probability Theory, Computer Networks

### **Course Objective**

1. The objective of this course is to provide an insight to information coding techniques, error correction mechanism. Various compression techniques for text, video and image are covered for thorough knowledge of efficient information conveying systems.

### **UNIT - I**

#### **Module-1:**

Information and entropy information measures, Shannon's concept of Information. Channel coding, channel mutual information capacity (BW),

#### **Module-2:**

Theorem for discrete memory less channel, information capacity theorem, Error detecting and error correcting codes,

### **UNIT - II**

#### **Module-3:**

Types of codes: block codes, Hamming and Lee metrics, description of linear block codes, parity check Codes, cyclic code, Masking techniques,

### **UNIT - III**

#### **Module-4:**

Compression: loss less and lossy, Huffman codes, LZW algorithm, Binary Image compression schemes, run length encoding, CCITT group 3 1-D Compression, CCITT group 3 2D compression, CCITT group 4 2D Compression.

## UNIT - IV

### Module-5:

Convolutional codes, sequential decoding. Video image Compression: CITT H261 Video coding algorithm, audio (speech) Compression. Cryptography and cipher.

### Module-6:

Case study of CCITT group 3 1-DCompression, CCITT group 3 2Dcompression.

### Course Outcomes

#### After completion of course, students would be:

- a. The aim of this course is to introduce the principles and applications of information theory.
- b. The course will study how information is measured in terms of probability and entropy.
- c. The students learn coding schemes, including error correcting codes, The Fourier perspective; and extensions to wavelets, complexity, compression, and efficient coding of audio-visual information.

### References:

1. Fundamentals in information theory and coding, Monica Borda, Springer.
2. Communication Systems: Analog and digital, Singh and Sapre, TataMcGraw Hill.
3. Multimedia Communications Fred Halsall.
4. Information Theory, Coding and Cryptography R Bose.
5. Multimedia system Design Prabhat K Andleigh and KiranThakrar.

**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.

**L T P**  
**3 0 -**

**Total Credits: 3**  
**External Marks: 80**  
**Internal Marks: 20**

Duration of Exam: 3 Hrs.

**Pre-Requisites** Computer and Network Security

### Course Objectives

1. Describe the concepts of risk management
2. Define and differentiate various Contingency Planning components
3. Integrate the IRP, DRP, and BCP plans into a coherent strategy to support sustained organizational operations.
4. Define and be able to discuss incident response options, and design an Incident Response Plan for sustained organizational operations.

## UNIT - I

### Module-1:

**Security Basics:** Information Security (INFOSEC) Overview: critical information characteristics – availability information states – processing security countermeasures\_education, training and awareness, critical information characteristics – confidentiality critical information characteristics – integrity, information states – storage, information states – transmission, security countermeasures\_policy, procedures and practices, threats, vulnerabilities.

## UNIT - II

### Module-2:

Threats to and Vulnerabilities of Systems: definition of terms (e.g., threats, vulnerabilities, risk), major categories of threats (e.g., fraud, Hostile Intelligence Service (HOIS), malicious logic, hackers, environmental and technological hazards, disgruntled employees, careless employees, HUMINT, and monitoring), threat impact areas, Countermeasures: assessments (e.g., surveys, inspections), Concepts of Risk Management: consequences (e.g., corrective action, risk assessment), cost/benefit analysis of controls, implementation of cost-effective controls, monitoring the efficiency and effectiveness of controls (e.g., unauthorized or inadvertent disclosure of information), threat and vulnerability assessment

## UNIT - III

### Module-3:

Security Planning: directives and procedures for policy mechanism, Risk Management: acceptance of risk (accreditation), corrective actions information identification, risk analysis and/or vulnerability assessment components, risk analysis results evaluation, roles and responsibilities of all the players in the risk analysis process, Contingency Planning/Disaster Recovery: agency response procedures and continuity of operations, contingency plan components, determination of backup requirements, development of plans for recovery actions after a disruptive event, development of procedures for off-site processing, emergency destruction procedures, guidelines for determining critical and essential workload, team member responsibilities in responding to an emergency situation

## UNIT - IV

### Module-4:

#### Policies and Procedures

Physical Security Measures: alarms, building construction, cabling, communications centre, environmental controls (humidity and air conditioning), filtered power, physical access control systems (key cards, locks and alarms) Personnel Security Practices and Procedures: access authorization/verification (need\_to\_know), contractors, employee clearances, position sensitivity, security training and awareness, systems maintenance personnel, Administrative Security Procedural Controls: attribution, copyright protection and licensing, Auditing and Monitoring: conducting security reviews, effectiveness of security programs, investigation of security breaches, privacy review of accountability controls, review of audit trails and logs

### Module-5:

Operations Security (OPSEC): OPSEC surveys/OPSEC planning INFOSEC: computer security – audit, cryptography\_encryption (e.g., point\_to\_point, network, link), cryptography\_key management (to include electronic key), cryptography\_strength (e.g., complexity, secrecy, characteristics of the key)

### Module-6:

Case study of threat and vulnerability assessment

## Course Outcomes

### After completion of course, students would be:

- a. Capable of recommending contingency strategies including data backup and recovery and alternate site selection for business resumption planning
- b. Skilled to be able to describe the escalation process from incident to disaster in case of security disaster.
- c. Capable of Designing a Disaster Recovery Plan for sustained organizational operations.
- d. Capable of Designing a Business Continuity Plan for sustained organizational operations.

### References:

1. Principles of Incident Response and Disaster Recovery, Whitman &Mattord, Course Technology  
ISBN: 141883663X
2. (Web Link) [http://www.cnss.gov/Assets/pdf/nstissi\\_4011.pdf](http://www.cnss.gov/Assets/pdf/nstissi_4011.pdf)

**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.

**L T P**  
**3 0 -**

**Total Credits: 3**  
**External Marks: 80**  
**Internal Marks: 20**

Duration of Exam: 3 Hrs.

**Pre-Requisites** Computer Programming, Compiler Design, Web programming

### Course Objectives

1. Understand the basics of secure programming.
2. Understand the most frequent programming errors leading to software vulnerabilities.
3. Identify and analyze security problems in software.
4. Understand and protect against security threats and software vulnerabilities.
5. Effectively apply their knowledge to the construction of secure software systems

### UNIT - I

#### Module-1:

Introduction to software security, Managing software security risk, Selecting software development technologies, An open source and closed source, Guiding principles for software security, Auditing software, Buffer overflows, Access control, Race conditions, Input validation, Password authentication

### UNIT - II

#### Module-2:

Anti-tampering, Protecting against denial of service attack, Copy protection schemes, Client-side security, Database security, Applied cryptography, Randomness and determinism

### UNIT - III

#### Module-3:

Buffer Overrun, Format String Problems, Integer Overflow, and Software Security Fundamentals SQL Injection, Command Injection, Failure to Handle Errors, and Security Touchpoints

**Module-4:**

Cross Site Scripting, Magic URLs, Weak Passwords, Failing to Protect Data, Weak random numbers, improper use of cryptography

**UNIT - IV****Module-5:**

Information Leakage, Race Conditions, Poor usability, Failing to protect network traffic, improper use of PKI, trusting network name resolution

**Module-6:**

Case study of Cross Site Scripting, Magic URLs, Weak Passwords Buffer overflows, Access control, Race conditions.

**Course Outcomes****After completion of course, students would be able to:**

- a. Write secure programs and various risks in the software.
- b. Eliminate security problems in the open source software.
- c. Real time software and vulnerabilities associated with them.
- d. Interrelate security and software engineering.

**References:**

1. J. Viega, M. Messier. Secure Programming Cookbook, O'Reilly.
2. M. Howard, D. LeBlanc. Writing Secure Code, Microsoft
3. J. Viega, G. McGraw. Building Secure Software, Addison Wesley

**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.

**L T P**  
**3 0 -**

**Total Credits: 3**  
**External Marks: 80**  
**Internal Marks: 20**

Duration of Exam: 3 Hrs.

**Pre-Requisites** Image Processing

**Course Objective**

1. The objective of this course is to introduce Bio-metric and traditional authentication methods. Application of bio-metric systems in government sector and various facerecognition and finger print recognition methods are included.

**UNIT - I**

**Module-1:**

Introduction and Definitions of bio-metrics, Traditional authenticated methods and technologies

**Module-2:**

Bio-metric technologies: Fingerprint, Face, Iris, Hand Geometry, Gait Recognition, Ear, Voice, Palm print, On-Line Signature Verification, 3D Face Recognition, Dental Identification and DNA.

**UNIT - II**

**Module-3:**

The Law and the use of multi bio-metrics systems

**Module-4:**

Statistical measurement of Bio-metric, Bio-metrics in Government Sector and Commercial Sector

**UNIT - III**

**Module-5:**

Case Studies of bio-metric system, Bio-metric Transaction. Bio-metric System Vulnerabilities.



## UNIT - IV

### Module-6:

Recent trends in Bio-metric technologies and applications in various domains.  
Case study of 3D face recognition and DNA matching.

### Course Outcomes

#### After completion of course, students would be:

- a. Perform R&D on bio-metrics methods and systems.
- b. A good understanding of the various modules constituting a bio-metric system.
- c. Familiarity with different bio-metric traits and to appreciate their relative significance.
- d. A good knowledge of the feature sets used to represent some of the popular bio-metric traits.
- e. Evaluate and design security systems incorporating bio-metrics.
- f. Recognize the challenges and limitations associated with bio-metrics.

### References:

1. Biometrics for network security, Paul Reid, Hand book of Pearson
2. D. Maltoni, D. Maio, A. K. Jain, and S. Prabhakar, Handbook of Fingerprint Recognition, Springer Verlag, 2003.
3. A. K. Jain, R. Bolle, S. Pankanti (Eds.), BIOMETRICS: Personal Identification in Networked Society, Kluwer Academic Publishers, 1999.
4. J. Wayman, A.K. Jain, D. Maltoni, and D. Maio (Eds.), Biometric Systems: Technology, Design and Performance Evaluation, Springer, 2004.
5. Anil Jain, Arun A. Ross, Karthik Nanda kumar, Introduction to biometric, Springer, 2011.
6. Biometric Systems: Technology, Design and Performance Evaluation, J. Wayman, A.K. Jain, D. Maltoni, and D. Maio

**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.

MT-NSL-201

## Mini Project with Seminar

L T P

2- -

**Total Credits: 2**

**Internal Marks: 50**

Students may choose a project based on any subject of Computer Science & Engineering /Network Security. The student will submit a synopsis at the beginning of the semester for approval from the departmental committee in a specified format. The student will have to present the progress of the work through seminars. An assigned teacher will evaluate the performance of the students & marks will be awarded accordingly.

**MT-CSP-204**

**Laboratory 3 (Based on Core Subjects)**

**L T P**

-- 4

**Total Credits: 2**

**External Marks: 40**

**Internal Marks: 10**

Duration of Exam: Hrs.

At least 20 exercises related to the core subjects(i.e.10 exercises from each subject) should be given by the teacher concerned.

**MT-NSP-208**

**Laboratory 4 (Based on Electives)**

**L T P**  
**-- 4**

**Total Credits: 2**  
**External Marks: 40**  
**Internal Marks: 10**

Duration of Exam: Hrs.

At least 20 exercises related to the elective subjects(i.e.10 exercises from each subject) should be given by the teacher concerned.

## SEMESTER III

MT-NSL-301

### Data Warehousing & Mining (Elective V)

L T P  
3 0 -

Total Credits: 3  
External Marks: 80  
Internal Marks: 20

Duration of Exam: 3 Hrs.

**Pre-Requisites** Databases, Probability

#### Course Objective

1. The objective of this course is to introduce data warehousing and mining techniques. Application of data mining in web mining, pattern matching and cluster analysis is included to aware students of broad data mining areas.

#### UNIT-I

##### Module-1:

Introduction to Data Warehousing; Data Mining: Mining frequent patterns, association and correlations; Sequential Pattern Mining concepts, primitives, scalable methods;

#### UNIT-II

##### Module-2:

Classification and prediction; Cluster Analysis – Types of Data in Cluster Analysis, Partitioning methods, Hierarchical Methods; Transactional Patterns and other temporal based frequent patterns,

##### Module-3:

Mining Time series Data, Periodicity Analysis for time related sequence data, Trend analysis, Similarity search in Time-series analysis;

## UNIT-III

### Module-4:

Mining Data Streams, Methodologies for stream data processing and stream data systems, Frequent pattern mining in stream data, Sequential Pattern Mining in Data Streams, Classification of dynamic data streams, Class Imbalance Problem; Graph Mining; Social Network Analysis;

## UNIT-IV

### Module-5:

Web Mining, Mining the web page layout structure, mining web link structure, mining multimedia data on the web, Automatic classification of web documents and web usage mining; Distributed Data Mining.

### Module-6:

Recent trends in Distributed Warehousing and Data Mining, Class Imbalance Problem; Graph Mining; Social Network Analysis

### Course Outcomes

**After completion of course, students would be:**

- a. Study of different sequential pattern algorithms
- b. Study the technique to extract patterns from time series data and its application in real world.
- c. Can extend the Graph mining algorithms to Web mining
- d. Help in identifying the computing framework for Big Data

### References:

1. Jiawei Han and M Kamber, Data Mining Concepts and Techniques, , Second Edition, Elsevier Publication, 2011.
2. Vipin Kumar, Introduction to Data Mining - Pang-Ning Tan, Michael Steinbach, Addison Wesley, 2006.
3. G Dong and J Pei, Sequence Data Mining, Springer, 2007.

**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.

**MT-NSL-302**

## **Web Search and Information Retrieval (Elective V)**

**L T P**

**3 0 -**

**Total Credits: 3**

**External Marks: 80**

**Internal Marks: 20**

Duration of Exam: 3 Hrs.

**Pre-Requisites** Probability Theory, Database Management, Web Programming

### **Course Objective**

1. The objective of the course is to introduce information retrieval models and query languages. Application of web search and information retrieval in social networks is also included.

### **UNIT-I**

#### **Module-1:**

Information retrieval model, Information retrieval evaluation, Searching the Web

#### **Module-2:**

Document Representation, Query languages and query operation, Meta-datasearch,

### **UNIT-II**

#### **Module-3:**

Indexing and searching, Scoring and ranking feature vectors,

### **UNIT-III**

#### **Module-4:**

Ontology, domain specific search, parallel and distributed information retrieval,

### **UNIT-IV**

#### **Module-5:**

Text and multimedia languages, Social networks

## Module-6:

Recent trends in Web search and Information retrieval techniques.

### Course Outcomes

#### After completion of course, students would be:

- a. To identify basic theories and analysis tools as they apply to information retrieval.
- b. To develop understanding of problems and potentials of current IR systems.
- c. To learn and appreciate different retrieval algorithms and systems.
- d. To apply various indexing, matching, organizing, and evaluating methods to IR problem.
- e. To become aware of current experimental and theoretical IR research.

### References:

1. C. D. Manning, P. Raghavan and H. Schütze, Introduction to Information Retrieval, Cambridge University Press, 2008 (available at <http://nlp.stanford.edu/IR-book/>).
2. Chakrabarti, S. (2002). Mining the web: Mining the Web: Discovering knowledge from hypertext data. Morgan-kaufman.
3. B. Croft, D. Metzler, T. Strohman, Search Engines: Information Retrieval in Practice, Addison-Wesley, 2009 (available at <http://ciir.cs.umass.edu/irbook/>).
4. R. Baeza-Yates, B. Ribeiro-Neto, Modern Information Retrieval, Addison-Wesley, 2011 (2nd Edition).

**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.



MT-NSL-303

## Database Security and Access Control (Elective V)

L T P

3 0 -

Total Credits: 3

External Marks: 80

Internal Marks: 20

Duration of Exam: 3 Hrs.

**Pre-Requisites** Database Management

### Course Objective

- a. The objective of the course is to provide fundamentals of database security. Various access control techniques mechanisms were introduced along with application areas of access control techniques.

## UNIT-I

### Module-1:

Introduction to Access Control, Purpose and fundamentals of access control, brief history,

### Module-2:

Policies of Access Control, Models of Access Control, and Mechanisms, Discretionary Access Control (DAC), Non- Discretionary Access Control, Mandatory Access Control (MAC). Capabilities and Limitations of Access Control Mechanisms: Access Control List (ACL) and Limitations, Capability List and Limitations,

## UNIT-II

### Module-3:

Role-Based Access Control (RBAC) and Limitations, Core RBAC, Hierarchical RBAC, Statically Constrained RBAC, Dynamically Constrained RBAC, Limitations of RBAC. Comparing RBAC to DAC and MAC Access control policy,

## UNIT-III

### Module-4:

Biba's integrity model, Clark-Wilson model, Domain type enforcement model, mapping the enterprise view to the system view, Role hierarchies- inheritance schemes, hierarchy structures and inheritance forms, using SoD in real system, Temporal Constraints in

RBAC, MAC AND DAC. Integrating RBAC with enterprise IT infrastructures: RBAC for WFMSs, RBAC for UNIX and JAVA environments Case study: Multi line Insurance Company.

## UNIT-IV

### Module-5:

Smart Card based Information Security, Smart card operating system fundamentals, design and implantation principles, memory organization, smartcard files, file management, atomic operation, smart card data transmission ATR, PPS Security techniques- user identification, smart card security, quality assurance and testing, smart card life cycle-5 phases, smart card terminals.

### Module-6:

Recent trends in Database security and access control mechanisms. Case study of Role-Based Access Control (RBAC) systems.

### Course Outcomes

#### After completion of course, students would be:

- In this course, the students will be enabled to understand and implement classical models and algorithms.
- They will learn how to analyze the data, identify the problems, and choose the relevant models and algorithms to apply.
- They will further be able to assess the strengths and weaknesses of various access control models and to analyze their behaviour.

### References:

- Role Based Access Control: David F. Ferraiolo, D. Richard Kuhn, Ramaswamy Chandramouli.
- <http://www.smartcard.co.uk/tutorials/sct-itsc.pdf> : Smart Card Tutorial.

**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.

**MT-OE-301**

**Business Analytics (Open Elective)**

**L T P**

**3 0 -**

**Total Credits: 3**

**External Marks: 80**

**Internal Marks: 20**

Duration of Exam: 3 Hrs.

**Course Objectives:**

1. Understand the role of business analytics within an organization.
2. Analyze data using statistical and data mining techniques and understand relationships between the underlying business processes of an organization.
3. To gain an understanding of how managers use business analytics to formulate and solve business problems and to support managerial decision making.
4. To become familiar with processes needed to develop, report, and analyze business data.
5. Use decision-making tools/Operations research techniques.
6. Manage business process using analytical and management tools.
7. Analyze and solve problems from different industries such as manufacturing, service, retail, software, banking and finance, sports, pharmaceutical, aerospace etc.

**UNIT-I**

**Module-1:**

Business analytics: Overview of Business analytics, Scope of Business analytics, Business Analytics Process, Relationship of Business Analytics Process and organisation, competitive advantages of Business Analytics.

Statistical Tools: Statistical Notation, Descriptive Statistical methods, Review of probability distribution and data modelling, sampling and estimation methods overview.

**Module-2:**

Trendiness and Regression Analysis: Modelling Relationships and Trends in Data, simple Linear Regression.

Important Resources, Business Analytics Personnel, Data and models for Business analytics, problem solving, Visualizing and Exploring Data, Business Analytics Technology

## UNIT-II

### Module-3:

Organization Structures of Business analytics, Team management, Management Issues, Designing Information Policy, Outsourcing, Ensuring Data Quality, Measuring contribution of Business analytics, Managing Changes.

Descriptive Analytics, predictive analytics, predicative Modelling, Predictive analytics analysis, Data Mining, Data Mining Methodologies, Prescriptive analytics and its step in the business analytics Process, Prescriptive Modelling, nonlinear Optimization.

## UNIT-III

### Module-4:

Forecasting Techniques: Qualitative and Judgmental Forecasting, Statistical Forecasting Models, Forecasting Models for Stationary Time Series, Forecasting Models for Time Series with a Linear Trend, Forecasting Time Series with Seasonality, Regression Forecasting with Casual Variables, Selecting Appropriate Forecasting Models.

Monte Carlo Simulation and Risk Analysis: Monte Carle Simulation Using Analytic Solver Platform, New-Product Development Model, Newsvendor Model, Overbooking Model, Cash Budget Model.

## UNIT-IV

### Module-5:

Decision Analysis: Formulating Decision Problems, Decision Strategies with the without Outcome Probabilities, Decision Trees, The Value of Information, Utility and Decision Making.

### Module-6:

Recent Trends in: Embedded and collaborative business intelligence, Visual data recovery, Data Storytelling and Data journalism.

### Course Outcomes:

After completion of course, students would be able to:

- a. Students will demonstrate knowledge of data analytics.
- b. Students will demonstrate the ability of think critically in making decisions based on data and deep analytics.

- c. Students will demonstrate the ability to use technical skills in predicative and prescriptive modeling to support business decision-making.
- d. Students will demonstrate the ability to translate data into clear, actionable insights.

### References

1. Business analytics Principles, Concepts, and Applications by Marc J. Schniederjans, Dara G. Schniederjans, Christopher M. Starkey, Pearson FT Press.
2. Business Analytics by James Evans, persons Education.

**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.

**L T P****3 0 -****Total Credits: 3****External Marks: 80****Internal Marks: 20**

Duration of Exam: 3 Hrs.

**Course Objective:**

To impart knowledge on

- To provide exposure to the students about safety and health provisions related to hazardous processes as laid out in Factories act 1948.
- To familiarize students with basic maintenance terms, methods and techniques for planning, scheduling for maintenance management.
- To provide wide exposure to the students about various legislations applicable to an industrial unit

**UNIT-I****Module-1:**

Industrial safety: Accident, causes, types, results and control, mechanical and electrical hazards, types, causes and preventive steps/procedure, describe salient points of factories act 1948 for health and safety, wash rooms, drinking water layouts, light, cleanliness, fire, guarding, pressure vessels, etc, Safety color codes. Fire prevention and firefighting, equipment and methods

**Module-2:**

Fundamentals of maintenance engineering: Definition and aim of maintenance engineering, Primary and secondary functions and responsibility of maintenance department, Types of maintenance, Types and applications of tools used for maintenance, Maintenance cost & its relation with replacement economy, Service life of equipment.

**UNIT-II****Module-3:**

Wear and Corrosion and their prevention: Wear- types, causes, effects, wear reduction methods, lubricants-types and applications, Lubrication methods, general sketch, working

and applications, i. Screw down grease cup, ii. Pressure grease gun, iii. Splash lubrication, iv. Gravity lubrication, v. Wick feed lubrication vi. Side feed lubrication, vii. Ring lubrication, Definition, principle and factors affecting the corrosion. Types of corrosion, corrosion prevention methods

### UNIT-III

#### Module-4:

Fault tracing: Fault tracing-concept and importance, decision tree concept, need and applications, sequence of fault finding activities, show as decision tree, draw decision tree for problems in machine tools, hydraulic, pneumatic, automotive, thermal and electrical equipment's like, I. Any one machine tool, ii. Pump iii. Air compressor, iv. Internal combustion engine, v. Boiler,vi. Electrical motors, Types of faults in machine tools and their general causes.

### UNIT-IV

#### Module-5:

Periodic and preventive maintenance: Periodic inspection-concept and need, degreasing, cleaning and repairing schemes, overhauling of mechanical components, overhauling of electrical motor, common troubles and remedies of electric motor, repair complexities and its use, definition, need, steps and advantages of preventive maintenance. Steps/procedure for periodic and preventive maintenance of: I. Machine tools, ii. Pumps, iii. Air compressors, iv. Diesel generating (DG) sets, Program and schedule of preventive maintenance of mechanical and electrical equipment, advantages of preventive maintenance. Repair cycle concept and importance.

#### Course Outcomes:

At the end of the course, the students will be able to

- To list out important legislations related to health, Safety and Environment.
- To list out requirements mentioned in factories act for the prevention of accidents.
- To understand basic maintenance terms and know methods and techniques for planning, scheduling, carry out and analyze maintenance.
- To get information about the most relevant and future maintenance concepts.

- The students shall also be able to carry out risk and vulnerability analyses and to use maintenance optimization models.
- To obtain an understanding of how maintenance processes becomes an important factor of competitiveness in industrial processes and public administration.

### References

1. Maintenance Engineering Handbook, Higgins & Morrow, Da Information Services.
2. Maintenance Engineering, H. P. Garg, S. Chand and Company.
3. Pump-hydraulic Compressors, Audels, Mcgrew Hill Publication
4. Foundation Engineering Handbook, Winterkorn, Hans, Chapman & Hall London.

**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.



L T P

3 0 -

Total Credits: 3

External Marks: 80

Internal Marks: 20

Duration of Exam: 3 Hrs.

Course Objectives:

1. To impart knowledge in concepts and tools of operation research.
2. To understand mathematical model used in operation research
3. To apply these techniques constructively to make effective business decisions.

### UNIT-I

#### Module-1:

Optimization Techniques, Model Formulation, models, General L.R Formulation, Simplex

Techniques, Sensitivity Analysis, Inventory Control Models

### UNIT-II

#### Module-2:

Formulation of a LPP - Graphical solution revised simplex method - duality theory - dual simplex method - sensitivity analysis - parametric programming.

### UNIT-III

#### Module-3:

Nonlinear programming problem - Kuhn-Tucker conditions min cost flow problem - max flow

problem - CPM/PERT

#### **Module-4:**

Scheduling and sequencing - single server and multiple server models - deterministic inventory models - Probabilistic inventory control models - Geometric Programming.

### **UNIT-IV**

#### **Module-5:**

Competitive Models, Single and Multi-channel Problems, Sequencing Models, Dynamic Programming, Flow in Networks, Elementary Graph Theory, Game Theory Simulation

#### **Course Outcomes:**

After completion of course, students would be able to:

- a. Students should be able to apply the dynamic programming to solve problems of discrete and continuous variables.
- b. Students should be able to apply the concept of non-linear programming.
- c. Students should be able to carry out sensitivity analysis.
- d. Student should be able to model the real world problem and simulate it.

#### **References**

1. H.A. Taha, Operations Research, An Introduction, PHI, 2008
2. H.M. Wagner, Principles of Operations Research, PHI, Delhi, 1982.
3. J.C. Pant, Introduction to Optimisation: Operations Research, Jain Brothers, Delhi, 2008
4. Hitler Libermann Operations Research: McGraw Hill Pub. 2009
5. Pannerselvam, Operations Research: Prentice Hall of India 2010
6. Harvey M Wagner, Principles of Operations Research: Prentice Hall of India 2010

**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.

## MT-OE-304 Cost Management of Engineering Projects (Open Elective)

**L T P**  
**3 0 -**

**Total Credits: 3**  
**External Marks: 80**  
**Internal Marks: 20**

Duration of Exam: 3 Hrs.

### Course Objective:

1. Establish systems to help streamline the transactions between corporate support departments and the operating unit.
2. Devise transfer pricing system to coordinate the buyer supplier interaction between decentralized organizational operating units.
3. Use PSEUDO profit centers to create profit maximizing behavior in what were formally cost centers.

## UNIT-I

### Module-1:

Introduction and Overview of the Strategic Cost Management Process

### Module-2:

Cost concepts in decision-making; Relevant cost, Differential cost, Incremental cost and Opportunity cost. Objectives of a Costing System; Inventory valuation; Creation of a Database for operational control; Provision of data for Decision-Making

## UNIT-II

### Module-3:

Project: meaning, Different types, why to manage, cost overruns centres, various stages of project execution: conception to commissioning. Project execution as conglomeration of technical and nontechnical activities, Detailed Engineering activities, Pre project execution main clearances and documents Project team: Role of each member.

Importance Project site: Data required with significance. Project contracts, Types and contents, Project execution Project cost control. Bar charts and Network diagram. Project commissioning: mechanical and process.

### UNIT-III

#### Module-4:

Cost Behavior and Profit Planning Marginal Costing; Distinction between Marginal Costing and

Absorption Costing; Break-even Analysis, Cost-Volume-Profit Analysis, Various decision-making problems, Standard Costing and Variance Analysis. Pricing strategies: Pareto Analysis. Target costing, Life Cycle Costing. Costing of service sector, Just-in-time approach, Material Requirement Planning, Enterprise Resource Planning, Total Quality Management and Theory of constraints, Activity-Based Cost Management, Bench Marking; Balanced Score Card and Value-Chain Analysis., Budgetary Control; Flexible Budgets; Performance budgets; Zero-based budgets., Measurement of Divisional profitability pricing decisions including transfer pricing.

### UNIT-IV

#### Module-5:

Quantitative techniques for cost management, Linear Programming, PERT/CPM, Transportation problems, Assignment problems, Simulation, Learning Curve Theory.

#### Course Outcomes:

1. Understand the concept of strategic, cost management and strategic cost analysis-target costing, life cycle costing and kaizen costing and the cost drive concept.
2. Describe the decision making, relevant cost, differential cost, incremental cost and opportunity cost, objectives of a costing system.
3. Understand the meaning and different types of project management and project execution, detailed engineering activities.
4. Understand the project contracts, cost behavior and profit planning types and contents, bar charts, and network diagram.
5. Analyze by using quantitative techniques for cost management like PERT/CPM

## References

1. Cost Accounting A Managerial Emphasis, Prentice Hall of India, New Delhi
2. Charles T. Horngren and George Foster, Advanced Management Accounting
3. Robert S Kaplan Anthony A. Alkinson, Management & Cost Accounting
4. Ashish K. Bhattacharya, Principles & Practices of Cost Accounting A. H. Wheeler publisher
5. N.D. Vohra, Quantitative Techniques in Management, Tata McGraw Hill Book Co. Ltd.

**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.

**MT-OE-305**

## **Composite Materials(Open Elective)**

**L T P**

**3 0 -**

**Total Credits: 3**

**External Marks: 80**

**Internal Marks: 20**

Duration of Exam: 3 Hrs.

### **Course Objectives:**

1. To develop and understanding of design, processing and behavior of composite materials.
2. To understand the concepts such as linear elastic analysis, an isotropic material behavior, damage criteria and the analysis of laminated plates.
3. To understand metal matrix composite and polymer matrix composites.

## **UNIT-I**

### **Module-1: Introduction**

Definition – Classification and characteristics of Composite materials, Advantages and application of composites. Functional requirements of reinforcement and matrix, Effect of reinforcement (size, shape, distribution, volume fraction) on overall composite performance.

### **Module-2: Reinforcements**

Preparation-layup, curing, properties and applications of glass fibers, carbon fibers, Kevlar fibers and Boron fibers. Properties and applications of whiskers, particle reinforcements. Mechanical Behavior of composites: Rule of mixtures, Inverse rule of mixtures. Isostrain and Isostress conditions

## **UNIT-II**

### **Module-3: Manufacturing Of Metal Matrix Composites**

Casting – Solid State diffusion technique, Cladding – Hot isostatic pressing, Properties and applications. Manufacturing of Ceramic Matrix Composites: Liquid Metal Infiltration – Liquid phase sintering. Manufacturing of Carbon – Carbon composites: Knitting, Braiding, Weaving. Properties and applications

## UNIT-III

### Module-4: Manufacturing Of Polymer Matrix Composites

Preparation of Moulding compounds and prepregs – hand layup method – Autoclave method – Filament winding method – Compression moulding – Reaction injection moulding. Properties and applications

## UNIT-IV

### Module-5: Strength

Laminar Failure Criteria-strength ratio, maximum stress criteria, maximum strain criteria, interacting failure criteria, hygrothermal failure. Laminate first ply failure-insight strength; Laminate strength-ply discount truncated maximum strain criterion; strength design using caplet plots; stress concentrations.

### Course Outcomes:

1. Identify, describe and evaluate the properties of fiber reinforcement, polymer matrix material and commercial composite.
2. Develop competency in one or more common composite manufacturing techniques and be able to select the appropriate technique.
3. Analyze the elastic properties and simulate the mechanical performance of composite laminates.
4. Apply knowledge of composite mechanical performance and manufacturing method to a composite design projects.

### Text Books:

1. Material Science and Technology – Vol 13 – Composites by R.W.Cahn – VCH, West Germany.
2. Materials Science and Engineering, An introduction. WD Callister, Jr., Adapted by R.Balasubramaniam, John Wiley & Sons, NY, Indian edition, 2007.

### References

1. Hand Book of Composite Materials-ed-Lubin.
2. Composite Materials – K.K.Chawla.
3. Composite Materials Science and Applications – Deborah D.L. Chung.
4. Composite Materials Design and Applications – Danial Gay, Suong V. Hoa, and Stephen W.Tasi.

**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.



L T P

3 0 -

Total Credits: 3

External Marks: 80

Internal Marks: 20

Duration of Exam: 3 Hrs.

**Course Objectives:**

1. To enable students to understand the concept of waste to energy.
2. To learn about the best available technology for waste to energy.
3. To learn about the types of pyrolysis and methods, manufacturing of pyrolytic oils and gases.
4. To understand the properties of bio-gas and design and constructional features of biogas plant.

**UNIT-I****Module-1: Introduction To Energy From Waste**

Waste: Classification of waste as fuel – Agro based, Forest residue, Industrial waste - MSW – Conversion devices – Incinerators, gasifiers, digestors.

**Module-2: Biomass Pyrolysis**

Pyrolysis – Types, slow fast – Manufacture of charcoal – Methods – Yields and application – Manufacture of pyrolytic oils and gases, yields and applications

**UNIT-II****Module-3: Biomass Gasification**

Gasifiers – Fixed bed system – Downdraft and updraft gasifiers – Fluidized bed gasifiers – Design, construction and operation – Gasifier burner arrangement for thermal heating – Gasifier engine arrangement and electrical power – Equilibrium and kinetic consideration in gasifier operation.

**UNIT-III****Module-4: Biomass Combustion**

Biomass stoves – Improved chullahs, types, some exotic designs, Fixed bed combustors, Types, inclined grate combustors, Fluidized bed combustors, Design, construction and operation - Operation of all the above biomass combustors.

## UNIT-IV

### Module-5: Biogas

Biogas: Properties of biogas (Calorific value and composition) - Biogas plant technology and status - Bio energy system - Design and constructional features - Biomass resources and their classification - Biomass conversion processes - Thermo chemical conversion – Direct combustion - biomass gasification - pyrolysis and liquefaction - biochemical conversion - anaerobic digestion – Types of biogas Plants – Applications - Alcohol production from biomass - Bio diesel production - Urban waste to energy conversion - Biomass energy programme in India

### Course Outcomes:

1. Apply the knowledge about the operations of waste to energy plants.
2. Analyze the various aspects of waste to energy management system.
3. Carry out techno economic feasibility for waste to energy plants.

### References

1. Non Conventional Energy, Desai, Ashok V., Wiley Eastern Ltd., 1990.
2. Biogas Technology - A Practical Hand Book - Khandelwal, K. C. and Mahdi, S. S., Vol. I & II, TataMcGraw Hill Publishing Co. Ltd., 1983.
3. Food, Feed and Fuel from Biomass, Challal, D. S., IBH Publishing Co. Pvt. Ltd., 1991.
4. Biomass Conversion and Technology, C. Y. WereKo-Brobby and E. B. Hagan, John Wiley & Sons, 1996.

**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.

**MT-NSP-304**

**Dissertation-I /Industrial Project**

**L T P**  
**0 0 16**

**Total Credits: 8**  
**External Marks: 200**  
**Internal Marks: 50**

Duration of Exam: Hrs.

Dissertation phase-I mainly focus on the problem defining and literature survey specific to the problem. The student will submit a synopsis at the beginning of the semester for the approval from the project committee in a specified format that clearly define the problem.

**MT-NSP-305**

## **Industrial Training**

**L T C**  
**0 0 2**

**Total Credits: 2**  
**External Marks: 50**

Practical training conducted after second semester will be evaluated in the third semester based on Viva-Voce.

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

## SEMESTER-IV

**MT-NSP-401**

**Dissertation Phase-II**

**L T P**  
**0 0 32**

**Total Credits: 16**  
**External Marks: 400**  
**Internal Marks: 100**

The student will submit a synopsis at the beginning of the semester for the approval from the project committee in a specified format. Synopsis must be submitted within a two weeks. The first defence, for the dissertation work, should be held with in a one month. Dissertation Report must be submitted in a specified format to the project committee for evaluation purpose.

# SEMESTER I

## Audit Courses I

### MT-AU-101 English for Research Paper Writing

**L T P**  
**3 0 -**

**Total Credits: 3**  
**External Marks: 80**  
**Internal Marks: 20**

Duration of Exam: 3 Hrs.

#### Course Objectives:

Students will be able to:

1. Understand that how to improve your writing skills and level of readability.
2. Learn about what to write in each section.
3. Understand the skills needed when writing a Title.
4. Ensure the good quality of paper at very first-time submission

### UNIT-I

#### Module-1:

Planning and Preparation, Word Order, Breaking up long sentences, Structuring Paragraphs and Sentences, Being Concise and Removing Redundancy, Avoiding Ambiguity and Vagueness.

### UNIT-II

#### Module-2:

Clarifying Who Did What, Highlighting Your Findings, Hedging and Criticizing, Paraphrasing and Plagiarism, Sections of a Paper, Abstracts Introduction

### **Module-3:**

Review of the Literature, Methods, Results, Discussion, Conclusions, the Final Check

### **UNIT-III**

### **Module-4:**

Key skills are needed when writing a Title, key skills are needed when writing an Abstract, key skills are needed when writing an Introduction, skills needed when writing a Review of the Literature

### **UNIT-IV**

### **Module-5:**

Skills are needed when writing the Methods, skills needed when writing the Results, skills are needed when writing the Discussion, skills are needed when writing the Conclusions.

### **Module-6:**

Useful phrases, how to ensure paper is as good as it could possibly be the first-time submission

### **Course Outcomes:**

1. To understand and improve writing skills and level of readability.
2. To understand how to write a research paper.
3. To create good quality paper with first time submission.

### **References**

1. Goldbort R (2006) Writing for Science, Yale University Press (available on Google Books)
2. Day R (2006) How to Write and Publish a Scientific Paper, Cambridge University Press

3. Highman N (1998), Handbook of Writing for the Mathematical Sciences, SIAM. Highman'sbook .

4. Adrian Wallwork , English for Writing Research Papers, Springer New York DordrechtHeidelberg London, 2011

**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.



MT-AU-102

## Sanskrit for Technical Knowledge

**L T P**  
**3 0 -**

**Total Credits: 3**  
**External Marks: 80**  
**Internal Marks: 20**

Duration of Exam: 3 Hrs.

### Course Objectives:

1. To get a working knowledge in illustrious Sanskrit, the scientific language in the world.
2. Learning of Sanskrit to improve brain functioning.
3. Learning of Sanskrit to develop the logic in mathematics, science & other subjects enhancing the memory power.
4. The engineering scholars equipped with Sanskrit will be able to explore the huge knowledge from ancient literature

### UNIT-I

#### Module-1:

Alphabets in Sanskrit, Past/Present/Future Tense, Simple Sentences

### UNIT-II

#### Module-2:

Order, Introduction of roots, Technical information about Sanskrit Literature

### UNIT-III

#### Module-3:

Technical concepts of Engineering-Electrical, Mechanical, Architecture, Mathematics

### UNIT-IV

#### Module-4:

Technical concepts of Engineering- Architecture, Mathematics

## Course Outcomes:

After completion of course, students would be able to:

- a. Understanding basic Sanskrit language.
- b. Ancient Sanskrit literature about science & technology can be understood.
- c. Being a logical language will help to develop logic in students

## References

1. "Abhyaspustakam" – Dr. Vishwas, Samskrita-Bharti Publication, New Delhi
2. "Teach Yourself Sanskrit" PrathamaDeeksha-VempatiKutumbshastri, RashtriyaSanskritSansthanam, New Delhi Publication
3. "India's Glorious Scientific Tradition" Suresh Soni, Ocean books (P) Ltd., New Delhi. Course Output

**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.

**L T P**  
**3 0 -**

**Total Credits: 3**  
**External Marks: 80**  
**Internal Marks: 20**

Duration of Exam: 3 Hrs.

**Course Objectives:**

Students will be able to

1. Understand value of education and self- development.
2. Imbibe good values in students.
3. Let the should know about the importance of

**UNIT-I**

**Module-1:**

Values and self-development –Social values and individual attitudes, Work ethics, Indian vision of humanism, Moral and non- moral valuation, Standards and principles, Value Judgments

**UNIT-II**

**Module-2:**

Importance of cultivation of values, Sense of duty. Devotion, Self-reliance, Confidence, Concentration, Truthfulness, Cleanliness, Honesty, Humanity, Power of faith, National Unity, Patriotism, Love for nature, Discipline

**UNIT-III**

**Module-3:**

Personality and Behavior Development - Soul and Scientific attitude, Positive Thinking, Integrity and discipline, Punctuality, Love and Kindness, Avoid fault Thinking, Free

from anger, Dignity of labour, Universal brotherhood and religious tolerance, True friendship, Happiness Vs suffering, love for truth, Aware of self-destructive habits, Association and Cooperation, Doing best for saving nature

## UNIT-IV

### Module-4:

Character and Competence –Holy books vs Blind faith, Self-management and Good health, Science of reincarnation, Equality, Nonviolence ,Humility, Role of Women, All religions and same message, Mind your Mind, Self-control, Honesty, Studying effectively

### Course Outcomes:

After completion of course, students would be able to:

- a. Knowledge of self-development
- b. Learn the importance of Human values
- c. Developing the overall personality.

### References

1 Chakroborty, S.K. “Values and Ethics for organizations Theory and practice”, Oxford University Press, New Delhi

**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.

**L T P**  
**3 0 -**

**Total Credits: 3**  
**External Marks: 80**  
**Internal Marks: 20**

Duration of Exam: 3 Hrs.

**Course Objectives:**

Students will be able to:

1. Understand the premises informing the twin themes of liberty and freedom from a civil rights
2. To address the growth of Indian opinion regarding modern Indian intellectuals' constitutional role and entitlement to civil and economic rights as well as the emergence of nationhood in the early years of Indian nationalism.
3. To address the role of socialism in India after the commencement of the Bolshevik Revolution in 1917 and its impact on the initial drafting of the Indian Constitution

**UNIT-I**

**Module-1: History of Making of the Indian Constitution**

History, Drafting Committee, (Composition & Working)

**Module-2: Philosophy of the Indian Constitution:**

Preamble, Salient Features

**Module-3: Contours of Constitutional Rights & Duties**

Fundamental Rights, Right to Equality, Right to Freedom, Right against Exploitation, Right to Freedom of Religion, Cultural and Educational Rights, Right to Constitutional Remedies, Directive Principles of State Policy, Fundamental Duties.

## UNIT-II

### Module-4: Organs of Governance

Parliament, Composition, Qualifications and Disqualifications, Powers and Functions, Executive, President, Governor, Council of Ministers, Judiciary, Appointment and Transfer of Judges, Qualifications, Powers and Functions

## UNIT-III

### Module-5: Local Administration

District's Administration head: Role and Importance, Municipalities: Introduction, Mayor and role of Elected Representative, CEO of Municipal Corporation, Pachayati raj: Introduction, PRI: ZilaPachayat, Elected officials and their roles, CEO ZilaPachayat: Position and role, Block level: Organizational Hierarchy (Different departments), Village level: Role of Elected and Appointed officials, Importance of grass root democracy

## UNIT-IV

### Module-6: Election Commission

Election Commission: Role and Functioning, Chief Election Commissioner and Election Commissioners, State Election Commission: Role and Functioning, Institute and Bodies for the welfare of SC/ST/OBC and women

### Course Outcomes:

After completion of course, students would be able to:

- a. Discuss the growth of the demand for civil rights in India for the bulk of Indians before the arrival of Gandhi in Indian politics.
- b. Discuss the intellectual origins of the framework of argument that informed the conceptualization of social reforms leading to revolution in India.
- c. Discuss the passage of the Hindu Code Bill of 1956

### References

1. The Constitution of India, 1950 (Bare Act), Government Publication.
2. Dr. S. N. Busi, Dr. B. R. Ambedkar framing of Indian Constitution, 1st Edition, 2015.

3. M. P. Jain, Indian Constitution Law, 7th Edn., Lexis Nexis, 2014.
4. D.D. Basu, Introduction to the Constitution of India, Lexis Nexis, 2015.

**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.

## SEMESTER II

### Audit Courses II

#### MT-AU-201 Disaster Management

L T P  
3 0 -

Total Credits: 3  
External Marks: 80  
Internal Marks: 20

Duration of Exam: 3 Hrs.

#### Course Objectives:

Students will be able to

1. Learn to demonstrate a critical understanding of key concepts in disaster risk reduction and humanitarian response.
2. Critically evaluate disaster risk reduction and humanitarian response policy and practice from multiple perspectives.
3. Develop an understanding of standards of humanitarian response and practical relevance in specific types of disasters and conflict situations.
4. critically understand the strengths and weaknesses of disaster management approaches, planning and programming in different countries, particularly their home country or the countries they work in

#### UNIT-I

##### Module-1: Introduction

Disaster: Definition, Factors and Significance; Difference between Hazard and Disaster; Natural and Manmade Disasters: Difference, Nature, Types and Magnitude.

##### Module-2: Repercussions of Disasters and Hazards

Economic Damage, Loss of Human and Animal Life, Destruction of Ecosystem, Natural Disasters: Earthquakes, Volcanisms, Cyclones, Tsunamis, Floods, Droughts And Famines, Landslides And Avalanches, Man-made disaster: Nuclear Reactor Meltdown, Industrial Accidents, Oil Slicks And Spills, Outbreaks Of Disease And Epidemics, War And Conflicts.



## UNIT-II

### Module-3: Disaster Prone Areas in India

Study of Seismic Zones; Areas Prone To Floods And Droughts, Landslides And Avalanches; Areas Prone To Cyclonic And Coastal Hazards With Special Reference To Tsunami; Post-Disaster Diseases And Epidemics.

## UNIT-III

### Module-4: Disaster Preparedness and Management

Preparedness: Monitoring Of Phenomena Triggering A Disaster Or Hazard; Evaluation Of Risk: Application Of Remote Sensing, Data From Meteorological And Other Agencies, Media Reports: Governmental And Community Preparedness.

## UNIT-IV

### Module-5: Risk Assessment

Disaster Risk: Concept and Elements, Disaster Risk Reduction, Global and National Disaster Risk Situation. Techniques of Risk Assessment, Global Co-Operation in Risk Assessment and Warning, People's Participation in Risk Assessment. Strategies for Survival

### Module-6: Disaster Mitigation

Meaning, Concept and Strategies of Disaster Mitigation, Emerging Trends In Mitigation. Structural Mitigation and Non-Structural Mitigation, Programs Of Disaster Mitigation in India

### Course Outcomes:

1. Understanding of key concepts in disaster management
2. Critically evaluate disaster risk reduction
3. Understand the strengths and weaknesses of disaster management approaches
4. Developing an understanding of standards of humanitarian response

## References

1. R. Nishith, Singh AK, “Disaster Management in India: Perspectives, issues and strategies “NewRoyal book Company.
2. Sahni, PardeepEt.Al. (Eds.),” Disaster Mitigation Experiences And Reflections”, Prentice Hall OfIndia, New Delhi.
3. Goel S. L. , Disaster Administration And Management Text And Case Studies” ,Deep &DeepPublication Pvt. Ltd., New Delhi

**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.

**L T P**  
**3 0 -**

**Total Credits: 3**  
**External Marks: 80**  
**Internal Marks: 20**

Duration of Exam: 3 Hrs.

**Course Objectives:**

1. Review existing evidence on the review topic to inform programme design and policy making undertaken by the DfID, other agencies and researchers.
2. Identify critical evidence gaps to guide the development.

**UNIT-I**

**Module-1: Introduction and Methodology:**

Aims and rationale, Policy background, Conceptual framework and terminology, Theories of learning, Curriculum, Teacher education, Conceptual framework, Research questions, Overview of methodology and Searching

**Module-2:**

Thematic overview: Pedagogical practices are being used by teachers informal and informal classrooms in developing countries, Curriculum, Teacher education

**UNIT-II**

**Module-3:**

Evidence on the effectiveness of pedagogical practices, Methodology for the in depth stage: quality assessment of included studies, How can teacher education (curriculum and practicum) and the school, curriculum and guidance materials best support effective pedagogy?, Theory of change, Strength and nature of the body of evidence for effective pedagogical, practices, Pedagogic theory and pedagogical approaches, Teachers' attitudes and beliefs and Pedagogic strategies

## UNIT-III

### Module-4:

Professional development: alignment with classroom practices and followupsupport, Peer support, Support from the head teacher and the community, Curriculum and assessment, Barriers to learning: limited resources and large class sizes

## UNIT-IV

### Module-5: Research gaps and future directions

Research design, Contexts, Pedagogy, Teacher education, Curriculum and assessment, Dissemination and research impact

### Course Outcomes:

After completion of course, students would be able to understand

- a. What pedagogical practices are being used by teachers in formal and informal classrooms in developing countries?
- b. What is the evidence on the effectiveness of these pedagogical practices, in what conditions, and with what population of learners?
- c. How can teacher education (curriculum and practicum) and the school curriculum and guidance materials best support effective pedagogy?

### References

1. Ackers J, Hardman F (2001) Classroom interaction in Kenyan primary schools, Compare, 31 (2): 245-261.
2. Agrawal M (2004) Curricular reform in schools: The importance of evaluation, Journal of Curriculum Studies, 36 (3): 361-379.
3. Akyeampong K (2003) Teacher training in Ghana - does it count? Multi-site teacher educationresearch project (MUSTER) country report 1. London: DFID.
4. Akyeampong K, Lussier K, Pryor J, Westbrook J (2013) Improving teaching and learning of basicmaths and reading in Africa: Does teacher preparation count? International Journal Educational Development, 33 (3): 272–282.
5. Alexander RJ (2001) Culture and pedagogy: International comparisons in primary education.Oxford and Boston: Blackwell.

6. Chavan M (2003) Read India: A mass scale, rapid, 'learning to read' campaign.

7. [www.pratham.org/images/resource%20working%20paper%202.pdf](http://www.pratham.org/images/resource%20working%20paper%202.pdf).

**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.

**L T P**  
**3 0 -**

**Total Credits: 3**  
**External Marks: 80**  
**Internal Marks: 20**

Duration of Exam: 3 Hrs.

**Course Objectives:**

1. To achieve overall health of body
2. To overcome stress.

**UNIT-I**

**Module-1:**

Definitions of Eight parts of yog.(Ashtanga )

**UNIT-II**

**Module-2:**

Yam and Niyam, Do`s and Don`t`s in life.

- i) Ahinsa, satya, astheya, bramhacharya and aparigraha
- ii) Shaucha, santosh, tapa, swadhyay, ishwarpranidhan

**UNIT-III**

**Module-3:**

Asan and Pranayam

- i) Various yog poses and their benefits for mind & body

**UNIT-IV**

**Module-4:**

Asan and Pranayam

- i) Regularization of breathing techniques and its effects-Types of pranayama

### **Course Outcomes:**

After completion of course, students would be able to:

- a. Develop healthy mind in a healthy body thus improving social health also.
- b. Improve efficiency.

### **References**

1. ‘Yogic Asanas for Group Training-Part-I’ :Janardan Swami YogabhyasiMandal, Nagpur
2. “Rajayoga or conquering the Internal Nature” by Swami Vivekananda, AdvaitaAshrama(Publication Department), Kolkata

**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.

# MT-AU-204 Personality Development through Life Enlightenment Skills

**L T P**  
**3 0 -**

**Total Credits: 3**  
**External Marks: 80**  
**Internal Marks: 20**

Duration of Exam: 3 Hrs.

## Course Objectives:

1. To learn to achieve the highest goal happily
2. To become a person with stable mind, pleasing personality and determination.
3. To awaken wisdom in students

## UNIT-I

### Module-1:

Neetisatakam-Holistic development of personality

- Verses- 19,20,21,22 (wisdom)
- Verses- 29,31,32 (pride & heroism)
- Verses- 26,28,63,65 (virtue)
- Verses- 52,53,59 (dont's)
- Verses- 71,73,75,78 (do's)

## UNIT-II

### Module-2:

- Approach to day to day work and duties.
- ShrimadBhagwadGeeta : Chapter 2-Verses 41, 47,48,
- Chapter 3-Verses 13, 21, 27, 35, Chapter 6-Verses 5,13,17,23, 35,
- Chapter 18-Verses 45, 46, 48.

## UNIT-III

### Module-3:

- Statements of basic knowledge.
- ShrimadBhagwadGeeta: Chapter2-Verses 56, 62, 68
- Chapter 12 -Verses 13, 14, 15, 16,17, 18



## UNIT-IV

### Module-4:

- Personality of Role model. ShrimadBhagwad Geeta:Chapter2-Verses 17, Chapter 3-Verses 36,37,42,
- Chapter 4-Verses 18, 38,39
- Chapter18 – Verses 37,38,63

### Course Outcomes:

After completion of course, students would be able to:

- a. Study of Shrimad-Bhagwad-Geeta will help the student in developing his personality and achieve the highest goal in life.
- b. The person who has studied Geeta will lead the nation and mankind to peace and prosperity
- c. Study of Neetishatakam will help in developing versatile personality of students.

### References

1. “Srimad Bhagavad Gita” by Swami SwarupanandaAdvaita Ashram (PublicationDepartment), Kolkata
2. Bhartrihari’s Three Satakam (Niti-sringar-vairagya) by P.Gopinath,Rashtriya Sanskrit Sansthanam, New Delhi.

**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.