PUNJABI UNIVERSITY, PATIALA

SYLLABI
OUTLINES OF TESTS,
AND COURSES OF READINGS

FOR

MASTER OF COMPUTER APPLICATIONS (MCA)

THIRD YEAR (SEMESTER V & VI)

(Sessions 2018-19 and 2019-20)

CHOICE-BASED CREDIT SYSTEM

(As per RUSA Guidelines)

PUNJABI UNIVERSITY,
PATIALA 147002

M.C.A. (MASTER OF COMPUTER APPLICATIONS)
THIRD YEAR - FIFTH SEMESTER EXAMINATIONS
Sessions 2018-19 and 2019-20

Paper Code	Title of Paper	L	T	P	C	Internal Marks		External Marks	
						Max	Pass	Max	Pass
MCA-311	Artificial Intelligence	4	0	0	4	50	20	50	20
MCA-312	Computer Graphics	4	0	0	4	50	20	50	20
MCA-313	Theory of Computation	4	0	0	4	50	20	50	20
MCA-314	E-Commerce	4	0	0	4	50	20	50	20
MCA-315	Programming Lab-V (Computer Graphics)	0	0	6	3	60	24	40	16
MCA-316	*Elective	4	0	0	4	50	20	50	20
	Total	20	0	6	23	310		290	

***Elective**: Any one of the following papers:

Paper Code	Title of Paper
MCA-316 E1	Software Project Management
MCA-316 E2	Cloud Computing
MCA-316 E3	Network Security
MCA-316 E4	Ethical Hacking
MCA-316 E5	Data Science & Machine Learning

***Note:** The electives will be offered to the students depending upon the availability of the teachers. The decision of the Head of the Department in this respect will be final.

CONTINUOUS ASSESSMENT (THEORY PAPERS)

1.	Two tests will be conducted during the semester. Both the tests will be counted for assessment.	:	60% of the total marks allotted for continuous assessment.
2.	Assignment/Quizzes	:	20% of the total marks allotted for continuous assessment.
3.	Attendance	:	10% of the total marks allotted for continuous assessment.
4.	Class Participation and behaviour	:	10% of the total marks allotted for continuous assessment.

CONTINUOUS ASSESSMENT (PRACTICAL LAB)

1.	Two tests will be conducted during the semester. Both the tests will be counted for assessment.	:	60% of the total marks allotted for continuous assessment.
2.	Lab Assignments	:	30% of the total marks allotted for continuous assessment.
3.	Attendance	:	10% of the total marks allotted for continuous assessment.

M.C.A. (MASTER OF COMPUTER APPLICATIONS)

THIRD YEAR - SIXTH SEMESTER EXAMINATIONS

Sessions 2018-19 and 2019-20

CODE	TITLE OF PAPER	MAXIMUM MARKS	TOTAL CREDITS
MCA-321	PROJECT	400	20

Project Guidelines:

1. The students are required to undergo full-semester software development project training during the sixth semester of MCA and should work on a software development project during the training period.
2. The students must prefer doing Industrial Training and try to avoid the training in computer institutes/centres where there is no software development work and mere training is provided. In case students are not able to find training in any industry, they may opt for doing this project training in the Department on some live project related to the automation of any University Department functionality or any Project given by the concerned teacher of the Department.
3. Joint projects will be allowed and joint project reports will also be accepted. However the students should highlight their individual contributions in a joint project. The quantum of individual contribution of particular students in joint projects should be such which can be accepted as equivalent to full-semester project. The same must also be reflected in joint reports.
4. On the completion of the sixth semester, the students are required to submit three copies (including one personal copy of the student) of their project reports to the Department, as per the format decided by the Department. The personal copy of the student, duly signed by the Head of the Department, will be returned to the student after the conduct of the viva-voce.
5. The Department will schedule the presentations and viva-voce of the students. Each student is required to give a detailed presentation (using some presentation software) about the work done and software developed by him/her during the period of project training. The viva-voce will also be conducted by the Project Evaluation Committee of the Department during the presentation by the student.
6. The Project Evaluation Committee of the Department will comprise of the following members:
   i. Head of the Department
   ii. Internal Guide of the student
   iii. One or two nominee(s) of Dean, Academic Affairs
   iv. External Examiner appointed by the Head of the Department

   The quorum of the Project Evaluation Committee will be of any three members.
7. The Project Evaluation Committee will evaluate the student cumulatively on the basis of the Presentation, Viva-voce and Project Report (hard copy) and marks out of 400 will be awarded to each student. The Letter Grade and Grade Point will be awarded to the student according to marks obtained by him/her out of total 400 marks as per the following scheme:

Marks Obtained	Letter Grade	Performance	Grade Point
361 – 400	O	Outstanding	10
321 – 360	A+	Excellent	9
281 – 320	A	Very Good	8
241 – 280	B+	Good	7
201 – 240	B	Above Average	6
161 – 200	C	Average	5
160	P	Fair	4
Less than 160	F	Fail	0

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MCA-311: Artificial Intelligence

Maximum Marks: 50 **Maximum Time: 3 Hrs.**
Minimum Pass Marks: 40% **Lectures to be delivered: 45-55**

A) Instructions for paper-setter

The question paper will consist of three sections A, B and C. Sections A and B will have four questions each from the respective sections of the syllabus and each question will carry 7.5 marks. Section C will consist of 10 short answer type questions of 2 marks each covering the entire syllabus uniformly and will carry 20 marks in all.

B) Instructions for candidates

1. Candidates are required to attempt five questions in all, selecting two questions each from section A and B and compulsory question of section C.
2. Use of non-programmable scientific calculator is allowed.

SECTION A

Introduction to AI: Definitions, Importance of AI, Early works in AI, AI and related fields, Approaches to AI.
Knowledge Base systems: General concepts, Prepositional Logic, First order Predicate Logic, Well-formed Formulae, Clausal form, Resolution Principle, Deductive and non-deductive Inference.
Probabilistic reasoning: Bayesian Inference, Dampster-Shafer Theory, Heuristic reasoning methods.
Structured Knowledge Representation: Weak vs strong slot-and-filler structures, Semantic nets, Frames, Conceptual dependencies and Scripts.
Object Oriented Representation: Overview, objects, classes, messages, and methods.

SECTION B

Search and Control Strategies: Search Problem, Uninformed search, Informed search techniques, Searching And-Or Graphs.
Matching Techniques: Structures used for matching, Measures for Matching, Pattern matching, partial matching, Fuzzy matching.
Knowledge Acquisition: Types of learning, General Learning Model, Performance measures.
Application areas of AI: Natural Language Processing – Challenges, Steps in Language processing. Expert System Architectures – Rule based systems, Non production systems.

Text Books:

1. Dan W. Patterson, Introduction to Artificial Intelligence and Expert Systems, Pearson Education.
2. Elaine Rich, Kevin Knight, B. Nair, Artificial Intelligence, McGraw Hill Education.

Reference Books:

1. E. Charnaik and D. McDermott, Introduction to artificial Intelligence, Addison-Wesley Publishing.
2. Nils J. Nilsson, Principles of Artificial Intelligence, Springer-Verlag.
3. Patrick Henry Winston, Artificial Intelligence, Pearson Education.
4. N.P. Padhy, Artificial Intelligence and Intelligent Systems, Oxford University Press.

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MCA-312: Computer Graphics

Maximum Marks: 50 **Maximum Time: 3 Hrs.**
Minimum Pass Marks: 40% **Lectures to be delivered: 45-55**

A) Instructions for paper-setter

The question paper will consist of three sections A, B and C. Sections A and B will have four questions each from the respective sections of the syllabus and each question will carry 7.5 marks. Section C will consist of 10 short answer type questions of 2 marks each covering the entire syllabus uniformly and will carry 20 marks in all.

B) Instructions for candidates

1. Candidates are required to attempt five questions in all, selecting two questions each from section A and B and compulsory question of section C.
2. Use of non-programmable scientific calculator is allowed.

SECTION A

Introduction to Computer Graphics: Applications areas, Components of Interactive Computer Graphics System.
Video Display Devices: Refresh cathode ray tube systems – raster scan CRT displays, random scan CRT displays, colour CRT-monitors, direct view storage tube. Flat panel displays – emissive vs non emissive displays, LCD displays, plasma panel displays, 3-D viewing devices, virtual reality.
Scan conversion: Scan converting a Point, Line (Direct, DDA and Bresenham line algorithms), Circle (Direct, Polar, Bresenham and Mid-point circle algorithms), Ellipse (Direct, Polar and Midpoint ellipse algorithms), Area filling techniques (Boundary fill, Flood fill, scan line area fill algorithm), Limitations of scan conversion.
2-dimensional Graphics: 2D Cartesian and Homogeneous co-ordinate system, Geometric transformations (Translation, Scaling, Rotation, Reflection and Shearing), Composite transformations, 2D dimensional viewing transformation and clipping (Cohen –Sutherland, Liang-Barsky, Sutherland-Hodge man algorithms).

SECTION B

3-dimensional Graphics: 3D Cartesian and Homogeneous co-ordinate system, Geometric transformations (Translation, Scaling, Rotation, Reflection), Composite transformations.
Mathematics of Projections: Perspective Projections - Mathematical Description and Anomalies of perspective projections. Parallel Projections – Taxonomy of Parallel Projections and their Mathematical Description. Introduction to 3D viewing pipeline and 3D clipping.
Hidden surface elimination algorithms: z-buffer, scan-line, sub-division, Painter's algorithm.
Illumination Models: Diffuse reflection, Specular reflection, refracted light, texture surface patterns, Halftoning, Dithering.
Surface Rendering Methods: Constant Intensity method, Gouraud Shading, Phong Shading.

Text Book:

1. R.A. Plastock and G. Kalley, Computer Graphics, McGraw Hill.

Reference Books:

1. Donald Hearn and M. Pauline Baker, Computer Graphics, Pearson Education.
2. J.D. Foley, A.V. Dam, S.K. Feiner, J.F. Hughes,. R.L Phillips, Introduction to Computer Graphics, Addison-Wesley Publishing.

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MCA-313 : Theory of Computation

Maximum Marks: 50 **Maximum Time: 3 Hrs.**
Minimum Pass Marks: 40% **Lectures to be delivered: 45-55**

A) Instructions for paper-setter
The question paper will consist of three sections A, B and C. Sections A and B will have four questions each from the respective sections of the syllabus and each question will carry 7.5 marks. Section C will consist of 10 short answer type questions of 2 marks each covering the entire syllabus uniformly and will carry 20 marks in all.

B) Instructions for candidates
1. Candidates are required to attempt five questions in all, selecting two questions each from section A and B and compulsory question of section C.
2. Use of non-programmable scientific calculator is allowed.

SECTION A

Finite Automata: Deterministic Finite Automata, Non Deterministic Finite Automata, Equivalence of NFA and DFA, Finite Automata with Epsilon-moves. 2-Way Finite Automata, Crossing sequences, Moore and Mealy Machine, Applications of Finite Automata i.e. Lexical Analyzers, text editors.
Regular Expression and Languages: Regular expression, Equivalence of finite Automata and Regular expressions, Conversion between Regular Expressions and Finite Automata. Application of Regular Expressions: Regular Expression in UNIX, Lexical analysis, Finding pattern in text.
Regular Languages and Regular sets: Pumping lemma for regular sets, Applications of pumping lemma. Closure properties of Regular Language, The Myhill-Nerode Theorem, Minimization of Finite Automata.

SECTION B

Context Free Grammar and Languages: Context free Grammars, Derivation Trees, Leftmost and rightmost derivations, Ambiguity, Properties of Context free Languages- Normal forms for context free grammars - CNF and GNF, The Pumping Lemma for context free Languages; Closure properties of context free languages.
Push Down Automata (PDA): Deterministic Push Down Automata; Non Deterministic Push Down Automata, Equivalence of Push Down Automata and Context free grammar.
Linear Bounded Automata (LBA): Power of LBA, Closure Properties.
Turning Machine (TM): One Tape, multitape.
The notions of time and space complexity in terms of T.M.
Construction of simple problems. Computational complexity.
Chomsky Hierarchy of Languages: Recursive and recursively-enumerable languages.

Text Book:

1. John E. Hopcroft, Rajeev Motwani and J.D. Ullman, Introduction to Automata Theory, Languages and Computation, Pearson Education.

Reference Books:

1. Daniel I.A. Cohen, Introduction to Computer Theory, Wiley.
2. B. M. Moret, The Theory of Computation, Pearson Education Asia.
3. H.R. Lewis and C.H. Papa dimitriou, Elements of the theory of Computation, Pearson Education Asia.

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MCA-314: E-Commerce

Maximum Marks: 50 **Maximum Time: 3 Hrs.**
Minimum Pass Marks: 40% **Lectures to be delivered: 45-55**

A) Instructions for paper-setter

The question paper will consist of three sections A, B and C. Sections A and B will have four questions each from the respective sections of the syllabus and each question will carry 7.5 marks. Section C will consist of 10 short answer type questions of 2 marks each covering the entire syllabus uniformly and will carry 20 marks in all.

B) Instructions for candidates

1. Candidates are required to attempt five questions in all, selecting two questions each from section A and B and compulsory question of section C.
2. Use of non-programmable scientific calculator is allowed.

Section A

E-Commerce: Meaning, advantages & disadvantages. Electronic Commerce Framework, Electronic Commerce and media Convergence, The Anatomy of E-commerce Applications, Types of E-Commerce. Architectural Framework for Electronic Commerce, World Wide Web as the Architecture, Web Background: Hypertext publishing, Security and the Web.

E-Commerce Security: Client-Server Network Security, Emerging Client-Server Security Threats, Firewalls and Network Security, Data and Message Security, Digital signatures, Encrypted Documents and Electronic Mail: PGP and PEM.

Legal, Ethical and other public policy issues related to Electronic Commerce: Protecting privacy, protecting Intellectual property, Copyright, trademarks and patents, Taxation and encryption policies.

Section B

Consumer oriented Electronic commerce: Consumer oriented applications, Mercantile models from the Consumer's perspective-Mercantile models from the Merchant perspective.

Types of Electronic Payment Systems: Digital Token- Based Electronic Payment Systems, Smart cards and Electronic payment Systems, Credit Card-Based Electronic Payment Systems, Risk and Electronic payment Systems, Designing Electronic Payment Systems.

Electronic Data Interchange: EDI Applications in Business, EDI: Legal, Security and Privacy Issue, EDI and Electronic Commerce.

Text Book:

1. Ravi Kalakota Andrew B. Whinston: Frontiers of Electronic Commerce, Addison Wesley.

Reference Books:

1 Efraim Turbon, Jae Lee, David King, Chung: Electronic Commerce- A managerial perspective, Prentice-Hall International.
2 Greenstein, Feinnman: Electronic Commerce, Tata McGraw-Hill.
3 Jeffrey F. Rayport, Bernard J. Jaworski: e-Commerce, Tata McGraw Hill..
4 David Whiteley: e-Commerce, Tata McGraw Hill.
5 Pete Loshin, Paul A. Murphy: Electronic Commerce, Jaico Publishing House.

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MCA-315: Programming Lab -V (Computer Graphics)

Maximum Marks: 100* **Maximum Time: 3 Hrs.**
Minimum Pass Marks: 40% **Practical units to be conducted: 55-65**

This laboratory course will mainly comprise of exercises based on paper MCA-312: Computer Graphics

*The splitting of marks is as under

- Maximum Marks for Continuous Assessment: 60
- Maximum Marks for University Examination: 40

CONTINUOUS ASSESSMENT (PRACTICAL LAB)

1.	Two tests will be conducted during the semester. Both the tests will be counted for assessment.	:	60% of the total marks allotted for continuous assessment.
2.	Lab Assignments	:	30% of the total marks allotted for continuous assessment.
3.	Attendance	:	10% of the total marks allotted for continuous assessment.

NOTE: The examiner will give due weightage to Logic development/ Program execution, Lab records and viva-voce of the student while awarding marks to the student during end-semester final practical examination.

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MCA-316 E1: Software Project Management

Maximum Marks: 50 **Maximum Time: 3 Hrs.**
Minimum Pass Marks: 40% **Lectures to be delivered: 45-55**

A) Instructions for paper-setter

The question paper will consist of three sections A, B and C. Sections A and B will have four questions each from the respective sections of the syllabus and each question will carry 7.5 marks. Section C will consist of 10 short answer type questions of 2 marks each covering the entire syllabus uniformly and will carry 20 marks in all.

B) Instructions for candidates

1. Candidates are required to attempt five questions in all, selecting two questions each from section A and B and compulsory question of section C.
2. Use of non-programmable scientific calculator is allowed.

Section A

Introduction to Software Project Management: Introduction, Software, Difference between software and Program, Characteristics of Software, What is a Project? Why Software Project Management? Activities Covered by Software Project Manager, Structure of Software Project Management Document, Software Project Management Life Cycle, Role of Metrics and Measurement.

Project Size Measurement using KLOC and Function Point Metric, Cost Estimation Analysis,
COCOMO Model, PERT, Gantt chart and Critical Math Management for Project Scheduling.
Software Project Development Models: Waterfall Model, Prototype Model, Spiral Model and RAD Model, Merits and Demerits of different models.

Section B

Managing and Evaluating the Project**:** Managing the task: Project Monitoring and control, managing the plan, reviews, feedback and reporting mechanisms, configuration management, quality control and quality assurance, managing change, readjusting goals and milestones, risk management, testing phases, formalized support activities;

Managing the team: Team organizations, recruiting and staffing-picking the right people, technical leadership, avoiding obsolescence-training etc.

Risk Management: What is risk management and why it is important Risk Management Cycle,
Risk Identification; Common Tools and Techniques, Risk quantification, Risk Monitoring, Risk mitigation.

Text Book:

1. Walker Royce, Software Project Management, Pearson Education.

Reference Books:

1. Pankaj Jalote, Software Project Management in Practice, Pearson Education Asia.
2. Tom Glib, Principles of Software Engineering Management, Addison-Wesley.
3. Joel Henry, Software Project Management, Pearson Education.

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MCA-316 E2: Cloud Computing

Maximum Marks: 50 **Maximum Time: 3 Hrs.**
Minimum Pass Marks: 40% **Lectures to be delivered: 45-55**

A) Instructions for paper-setter

The question paper will consist of three sections A, B and C. Sections A and B will have four questions each from the respective sections of the syllabus and each question will carry 7.5 marks. Section C will consist of 10 short answer type questions of 2 marks each covering the entire syllabus uniformly and will carry 20 marks in all.

B) Instructions for candidates

1. Candidates are required to attempt five questions in all, selecting two questions each from section A and B and compulsory question of section C.
2. Use of non-programmable scientific calculator is allowed.

Section A

Introduction: Definition of Cloud, Basics of Cloud Computing, Characteristics of Cloud, Benefits of Cloud, Driving factors towards the use of Cloud Computing, Comparing Cloud with
Grid Computing Systems, Workload Patterns for the Cloud, Selection criteria for migrating into
Cloud, Application of Cloud Computing.
Basic Concepts and Virtualization: Cloud Computing Evolution, Big Data Concept, Elasticity and scalability, Virtualization: characteristics of virtualization, Benefits of virtualization, Forms of CPU virtualization, Hypervisors, VMWare, Multitenancy, Application programming interfaces (API), Billing and metering of Cloud services, Economies of scale, Management, Tooling, and automation in Cloud Computing, SLA in Cloud Computing.
Cloud Computing Service Delivery Models: Cloud service delivery models, Cloud Reference
Model, Infrastructure as a service (IaaS) architecture, details, examples and applications, Platform as a service (PaaS) architecture, details, examples and applications, Software as a service (SaaS) architecture, details, examples and applications, NIST architecture.

Section B

Cloud Deployment Models: Cloud deployment models, Private Clouds, Public Clouds, Hybrid
Clouds, Community, Virtual private Clouds, Heterogeneous and Homogenous Clouds, Vertical and special purpose Clouds, Migration paths for Cloud, Selection criteria for Cloud deployment.
Cloud Security: Cloud Security challenges and risks, Principal Characteristics of Cloud
Computing security, Cloud Computing Security Reference Model, How security gets integrated,
Principal security dangers to Cloud Computing, Virtualization and Multitenancy, Internal security breaches, Data corruption or loss, User account and service hijacking, Steps to reduce Cloud Security breaches, Identity and access management, Cloud forensics, Digital signature, SSL.

Case Studies: Google Cloud platform, Windows Azure platform.

Text Books:

1. Rajkumar Buyya, James Broberg, Andrzej M. Goscinski, Cloud Computing: Principles and Paradigms, Wiley.

Reference Books:

1. Barrie Sosinsky, Cloud Computing Bible, Wiley.
2. Michael Miller, Cloud Computing, QUE Publications.
3. Judith Hurwitz, Robin Bloor, Marcia Kaufman, Fern Halper, Cloud Computing for Dummies, Wiley.

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MCA-316 E3: Network Security

Maximum Marks: 50 **Maximum Time: 3 Hrs.**
Minimum Pass Marks: 40% **Lectures to be delivered: 45-55**

A) Instructions for paper-setter

The question paper will consist of three sections A, B and C. Sections A and B will have four questions each from the respective sections of the syllabus and each question will carry 7.5 marks. Section C will consist of 10 short answer type questions of 2 marks each covering the entire syllabus uniformly and will carry 20 marks in all.

B) Instructions for candidates

1. Candidates are required to attempt five questions in all, selecting two questions each from section A and B and compulsory question of section C.
2. Use of non-programmable scientific calculator is allowed.

Section A

Basic Encryption And Decryption: Attackers and Types of threats, challenges for information security, Encryption Techniques, Classical Cryptographic Algorithms: Monoalphabetic Substitutions such as the Caesar Cipher, Cryptanalysis of Monoalphabetic ciphers, Polyalphabetic Ciphers such as Vigenere, Vernam Cipher, Stream and Block Ciphers.
Secret Key Systems: The Data encryption Standard (DES), Analyzing and Strengthening of DES, Introduction to Advance Encryption Standard (AES)
Public Key Encryption Systems: Concept and Characteristics of Public Key Encryption system, Introduction to Merkle-Hellman Knapsacks, Rivets – Shamir-Adlman (RSA) Encryption.

Section B

Hash Algorithms: Hash Algorithms, Message Digest Algorithms such as MD4 and MD5, Secure Hash Algorithms such as SHA1 and SHA2.
Network Security: Network Security Issues such as Impersonation, Message Confidentiality, Message Integrity, Code Integrity, Denial of Service, Firewalls, DMZs, Virtual Private Networks, Network Monitoring and Diagnostic Devices.
Web Security: Web Servers, Secure Electronic Mail, Enhanced Email, Pretty Good Privacy, Public Key Cryptography Standards
Ethical Hacking: Introduction to Ethical Hacking, Terminology, Hackers, Crackers, and Other Related Terms, Hactivism, Threats, Hacking History, Ethical Hacking Objectives and Motivations.

Text Book:

1. Atul Kahate, Cryptography & Network Security, McGraw Hill Education.

Reference Books:

1. William Stallings, Cryptography and Network Security - Principles and Practice, Pearson.
2. Forouzan, Cryptography and Network Security, Mc Graw Hill India.

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MCA-316 E4: Ethical Hacking

Maximum Marks: 50 **Maximum Time: 3 Hrs.**
Minimum Pass Marks: 40% **Lectures to be delivered: 45-55**

A) Instructions for paper-setter

The question paper will consist of three sections A, B and C. Sections A and B will have four questions each from the respective sections of the syllabus and each question will carry 7.5 marks. Section C will consist of 10 short answer type questions of 2 marks each covering the entire syllabus uniformly and will carry 20 marks in all.

B) Instructions for candidates

1. Candidates are required to attempt five questions in all, selecting two questions each from section A and B and compulsory question of section C.
2. Use of non-programmable scientific calculator is allowed.

On completion of this course, the students will be able to

- Apply knowledge into an interactive environment where they are shown how to scan, test, hack and secure their own systems.
- Remember in-depth knowledge and practical experience with the current essential security systems.
- Understand how perimeter defences work and then be led into scanning and attacking their own networks, no real network is harmed.
- Evaluate how intruders escalate privileges and what steps can be taken to secure a system.
- Analyze Intrusion Detection, Policy Creation, Social Engineering, DDoS Attacks, Buffer Overflows and Virus Creation.

Section A

Introduction: Understanding the importance of security, Concept of ethical hacking and essential Terminologies-Threat, Attack, Vulnerabilities, Target of Evaluation, Exploit. Phases involved in hacking.
Footprinting: Introduction to footprinting, Understanding the information gathering methodology of the hackers, Tools used for the reconnaissance phase.
Scanning: Detecting live systems-on the target network,- Discovering services running listening on target systems, Understanding port scanning techniques, Identifying TCP and LIDP services running on the target network, Understanding active and passive fingerprinting.
System-Hacking-Aspect of remote password-guessing Role of eavesdropping, Various methods of password cracking, Keystroke Loggers, Sniffers, Comprehending Active and Passive Sniffing, ARP Spoofing and Redirection, DNS and IP Sniffing, HTTPS Sniffing, DoS.

Section B

Session Hijacking: Understanding Session Hijacking, Phases involved in Session Hijacking, Types of Session Hijacking, Session Hijacking Tools.
Hacking Webservers: Hacking Web Applications, SQL Injections.
Hacking Wireless Networks: Introduction to 802.11,Role of WEP, Cracking WEP Keys, Sniffing Traffic, Wireless DoS attacks, WLAN Scanners, WLAN Sniffers, Hacking Tools, Securing Wireless Networks.
Cryptography: Understand the use of Cryptography over the Internet through PKI, RSA, MD5, Secure Hash Algorithm and Secure Socket Layer.

Text Books:

1. Rajat Aare, Network Security and Ethical Hacking, Luniver Press, 2006
2. Ankit Podia, Menu Zacharia, Network intrusion alert cm ethical hacking guide to intrusion detection, Thomson Course Technology PTR, 2007

Reference Books:

1. Thomas Mathew, Ethical Hacking, 0571 Publisher, 2003.

2. Joel SeatnbraV and George Kurtz, Hacking Exposed: Network Security Secrets & Solutions, Stuart McClure, McGraw-Hill, 2005

Course learning outcomes (CLOs):

On completion of this course, the students will be able to

1. Apply knowledge into an interactive environment where they are shown how to scan, test, hack and secure their own systems.
2. Remember in-depth knowledge and practical experience with the current essential security systems.
3. Understand how perimeter defences work and then be led into scanning and attacking their own networks, no real network is harmed.
4. Evaluate how intruders escalate privileges and what steps can be taken to secure a system.
5. Analyze Intrusion Detection, Policy Creation, Social Engineering, DDoS Attacks, Buffer Overflows and Virus Creation.

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MCA-316 E5: Data Science and Machine Learning

Maximum Marks: 50 **Maximum Time: 3 Hrs.**
Minimum Pass Marks: 40% **Lectures to be delivered: 45-55**

A) Instructions for paper-setter

The question paper will consist of three sections A, B and C. Sections A and B will have four questions each from the respective sections of the syllabus and each question will carry 7.5 marks. Section C will consist of 10 short answer type questions of 2 marks each covering the entire syllabus uniformly and will carry 20 marks in all.

B) Instructions for candidates

1. Candidates are required to attempt five questions in all, selecting two questions each from section A and B and compulsory question of section C.
2. Use of non-programmable scientific calculator is allowed.

On completion of this course, the students will be able to:

- To analyze the need and usage of various facets of data and data science process.
- To understand and apply various visualization techniques.
- To perform exploratory data analysis.
- Analyze methods and theories in the field of machine learning and provide an introduction to the basic principles, techniques, and applications of machine learning, classification tasks, decision tree learning.
- Apply classification, regression and clustering in real world problems.
- To understand the steps in model fitting and parameters fine-tuning.
- To apply model validation techniques.

Section A

Introduction to Data Science: Meaning of Data Science, Relationship between Big Data and Data Science, Benefits and uses of data science and big data. Facets of data: Structured versus Unstructured data, natural language, machine-generated data, graph-based data, audio, image and video data, Data Science Process: Goal setting, retrieving data, data preparation, data cleansing and transformation, exploratory data analysis, data visualization, Model building and performance evaluation, presentation.

Data set and its features, Meaning of the terms: observations and variables, Discrete and continuous variables, quantitative and qualitative variables, dependent and independent variables, variables classified on scale: Nominal, Ordinal, Interval and Ratio variables. Data Munging and data munging tasks: renaming variables, Data type conversion, encoding, decoding and recoding data, Merging datasets, transforming data, imputation, handling anomalous values, missing values and outliers.

Section B

Machine Learning: Meaning, definition and applications of machine learning, Steps involved in a machine learning project, Building a machine learning model: representing training examples, target function, representation of target function, learning algorithms, Basic terminology: features, feature vector, instance space, target function, training data, hypothesis space, inductive bias and Occam's razor principle. Bias versus variance, overfitting and underfitting.

Types of machine learning: supervised learning (classification and regression), unsupervised learning (clustering), reinforcement learning. Classification: binary versus multi-class classification, ZeroR classifier. Simple linear regression model, multiple linear regression model. Clustering: meaning and applications of clustering, requirements of a good clustering algorithm, K-means clustering technique.

Generalization of performance of the learning system, Evaluating the performance of learning algorithms: confusion matrix, sensitivity and specificity, accuracy, precision and recall, k-folds cross validation.

Text Book:

1. Joel Grus, Data Science from Scratch, O'Reilly.
2. Tom M. Mitchell, Machine Learning, McGraw Hill Education.

References:

1. Davy Cielen, Arno D.B. Meysman, Mohamed Ali, Introducing Data Science - Big Data, Machine Learning and More Using Python Tools, Manning Publications Co.
2. Rachel Schutt & Cathy O'Neil, Doing Data Science, O'Reilly
3. Jiawei Han, Micheline Kamber, Jian Pei , Data Mining Concepts and Techniques, Morgan Kaufmann.
4. Ethem Alpaydin, Introduction to Machine Learning, PHI.
5. Shai Shalev-Shwartz, Understanding Machine Learning: From Theory to Algorithms, Cambridge University Press.