

PUNJABI UNIVERSITY, PATIALA

**SYLLABI
OUTLINES OF TESTS,
AND COURSES OF READINGS**

FOR

**M. Tech. (Computer Science & Engineering)
Second Year (Semester III and IV)**

Session 2018-19

CHOICE-BASED CREDIT SYSTEM

(As per RUSA Guidelines)

**PUNJABI UNIVERSITY,
PATIALA 147002**

**M. TECH. (COMPUTER SCIENCE AND ENGINEERING)
SECOND YEAR - THIRD SEMESTER
SESSION 2018-2019**

Paper Code	Title of Paper	L	T	P	C	Internal Marks		External Marks	
						Max	Pass	Max	Pass
CS-711	Network Security	5	0	0	5	50	20	50	20
CS-712	Neural Networks and Fuzzy Logic	5	0	0	5	50	20	50	20
CS-713	Digital Image Processing	5	0	0	5	50	20	50	20
CS-714	*Elective	5	0	0	5	50	20	50	20
CS-715	Software Lab - III (Digital Image Processing)	0	0	6	3	60	24	40	16
CS-716	**Research Project	0	0	0	0	0	0	0	0
	Total	20	0	6	23	260		240	

***List of Electives:** Any one of the following papers:

PAPER CODE	TITLE OF PAPER
CS-714 E1	Pattern Recognition
CS-714 E2	Virtualization and Cloud Computing
CS-714 E3	Object Oriented Analysis and Design using UML
CS-714 E4	Natural Language Processing
CS-714 E5	Multimedia Information Systems
CS-714 E6	Mobile Communication
CS-714 E7	Data Mining and Data warehousing

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

****For CS-716:** Research Project, there will not be any internal or university examination. This is a non-credit paper. There will not be any marks for the Research Project.

CONTINUOUS ASSESSMENT (THEORY PAPERS)

1.	Two tests will be conducted during the Semester. Both the tests will be considered for assessment.	:	60% of the marks allotted for Continuous Assessment
2.	Assignment/Quizzes	:	20% of the marks allotted for Continuous Assessment
3.	Attendance	:	10% of the marks allotted for Continuous Assessment.
4.	Class Participation and behavior	:	10% of the marks allotted for Continuous Assessment.

CONTINUOUS ASSESSMENT (PRACTICAL LAB)

1.	Two tests will be conducted during the Semester. Both the tests will be considered for assessment.	:	60% of the marks allotted for Continuous Assessment
2.	Lab Assignment	:	30% of the marks allotted for Continuous Assessment
3.	Attendance	:	10% of the marks allotted for Continuous Assessment.

**M. TECH. (COMPUTER SCIENCE AND ENGINEERING)
SECOND YEAR – FOURTH SEMESTER
SESSION 2018-2019**

Paper Code	Title of Paper	L	T	P	C	External Marks	
						Max	Pass
CS-801	Dissertation	0	0	0	21	400	160
	Total	0	0	0	21	400	

Note: There will not be any marks for internal assessment of the students.

CS-711: NETWORK SECURITY

Maximum Marks: 50
Minimum Pass Marks: 40%

Maximum Time: 3 Hrs.
Lectures to be delivered: 50-60

A) INSTRUCTIONS FOR THE 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 section of the syllabus and will carry 7.5 marks for each question. Section C will consist of 10 short-answer type questions of 2 marks each covering the entire syllabus uniformly and will carry a total of 20 marks.

B) INSTRUCTIONS FOR THE CANDIDATES

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

SECTION A

Introduction: Attacks, Services and Mechanisms, Security attacks, security services, model for internetwork security.

Conventional Encryption: Conventional Encryption Model, Steganography.

Classical Encryption Techniques: Substitution Techniques, Transposition Techniques.

Modern Encryption Techniques: Simplified Data Encryption Standard, Block Cipher Principles, the Data Encryption Standard, Strength of DES.

Encryption Algorithms: Triple DES, International Data Encryption Algorithm, Blowfish.

SECTION B

Confidentiality using Conventional Encryption: Placement of Encryption Function, Traffic Confidentiality, Key distribution, Random Number Generation.

Public- Key Cryptography: Principles of Public- Key Cryptosystems, RSA algorithm, Key Management, Diffie-Hellman Key Exchange, Elliptic Curve Cryptography.

Message Authentication and Hash Functions: Authentication Requirements, Authentication Functions, Message Authentication Codes, Hash Functions, Security of hash Functions and MACs.

Digital Signatures, Authentication Protocols, SHA-1, RC-4, RC-5.

Text Book:

1. William Stallings, "Cryptography and Network Security: Principles and Practice", Pearson Education.

Reference Books:

1. A.S. Tanenbaum, "Computer Networks", Pearson Education.
2. C. Kaufman, R. Perlman, M. Speciner, "Network Security", Pearson Education.

CS-712: NEURAL NETWORKS AND FUZZY LOGIC

Maximum marks: 50

Minimum pass marks: 40%

Maximum Time: 3 Hrs.

Lectures to be taken: 50-60

A) INSTRUCTIONS FOR THE 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 section of the syllabus and will carry 7.5 marks for each question. Section C will consist of 10 short-answer type questions of 2 marks each covering the entire syllabus uniformly and will carry a total of 20 marks.

B) INSTRUCTIONS FOR THE CANDIDATES

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

SECTION A

Introduction of Neural Networks: Concepts of neural networks, Network Properties, Systems Dynamics.

Inference & Learning : Neural Networks, Learning Algorithm, Data representation, Functional Classification, Neuron Concept, terminology, Notation & representation of Neural Networks.

Perception: Single layer perceptrons, Multilayer Perceptrons, perceptron learning & training.

Back propagation: Concept, Back Propagation, Learning Algorithm. A derivation of Back propagation, Kohonen Network, Gross berg networks.

Counter Propagation Networks: Counter propagation Algorithm & its Applications.

Hopfield nets: Concept, Hopfield net Algorithm for Auto-association, Capacity of Hopfield Nets. Hopfield net Algorithm for optimization, stability of Hopfield nets.

SECTION B

Fuzzy Set: Introduction, uncertainty, Newtonian mechanics, Probability Theory, organized simplicity, disorganized complexity, trans computational problems.

Crisp Sets: An overview, fuzzy sets: Basic types, basic concepts. Fuzzy sets versus crisp sets, additional properties of alpha-cuts, representations of fuzzy sets.

Operations on Fuzzy sets: Types of operations, fuzzy complements, Fuzzy instructions: t-Norms. Fuzzy Unicons: t-co norms, combination of operations, aggregation operations.

Fuzzy Logic : Classical logic, logic, reasoning, propositional logic, logic operation's logic formulas, tautology, inference rules, Boolean algebra, properties of Boolean algebra, quantification, predicate logic, multi-valued logic, fuzzy propositions, fuzzy quantifiers, linguistic hedges, Inference from conditional Fuzzy propositions, Inference from conditional and quantified propositions. Mamdani fuzzy models, Sugeno Fuzzy Models, Tsukamoto Fuzzy Model, Input space partitioning, Fuzzy modeling.

Text Book:

1. Li Min Fu, "Neural Networks in Computer Intelligence", McGraw-Hill, Inc.

Reference Books:

1. George J Klir/Bo Yuan, "Fuzzy sets & Fuzzy Logic, Theory & Applications", PHI.
2. "Neuro Fuzzy & Soft Computing: A Computational approach to learning & Machine Intelligence", J.S.R. Jang, C.T. Sun, E. Mizutani. Pearson Education.
3. Ian Cloete & Jack M. Zurada, "Knowledge based Neuro Computing", University Press.

CS-713: DIGITAL IMAGE PROCESSING

Maximum Marks: 50
Minimum Pass Marks: 40%

Maximum Time: 3 Hrs.
Lectures to be delivered: 50-60

A) INSTRUCTIONS FOR THE 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 section of the syllabus and will carry 7.5 marks for each question. Section C will consist of 10 short-answer type questions of 2 marks each covering the entire syllabus uniformly and will carry a total of 20 marks.

B) INSTRUCTIONS FOR THE CANDIDATES

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

SECTION A

Digital Image Processing: Definition, Examples of Fields that use Digital Image Processing, Fundamental Steps in Digital Image Processing, Components of an Image Processing System.

Digital Image Fundamentals: Image Sensing, and Acquisition, Image Sampling and Quantization, Basic Relationship between Pixels, Distance Measures, Linear and Non-linear Operations.

Intensity Transformations and Spatial Filtering: Basic Gray Level Transformations, Histogram Processing, Enhancements using Arithmetic/Logic Operations, Basics of Spatial Filtering, Smoothing, Spatial Filters, Sharpening Spatial Filters, Combining Spatial Enhancement Methods.

Filtering in the Frequency Domain: Fourier Series, Fourier transform of Functions of One Continuous Variable, Discrete Fourier Transform (DFT) of one variable and Its Inverse, 2-D Discrete Fourier Transform and Its inverse, Properties of 2-D DFT, Image Smoothing using Frequency Domain Filters, Image Sharpening Using Frequency Domain Filters, Laplacian in Frequency Domain, Homomorphic Filtering, Bandreject and Bandpass Filters, Notch Filters, The Fast Fourier Transform in 1-D

Image Restoration : Noise Models, Restoration in the Presence of Noise Only-Spatial Filtering, Periodic Noise Reduction by Frequency Domain Filtering, Linear, Position-Invariant Degradations, Estimating the Degradation Function, Inverse Filtering, Minimum Mean Square Error (Wiener) Filtering, Constrained Least Squares Filtering, Geometric Mean Filter, Geometric Transformations.

SECTION B

Colour Image Processing: Colour Models, Pseudocolour Image Processing, Basics of Full Colour Image Processing. Colour Transformations, Smoothing and Sharpening. Colour Segmentation.

Wavelets and Multi Resolution Processing: The Haar Transform, series expansion, scaling functions, wavelet functions, wavelet transform in 1-D, Inverse Discrete wavelet Transform in 1-D, Fast wavelet Transform in 1-D, Discrete wavelet Transform in 2-D, wavelet Packets

Image Segmentation: Point Detection, Line Detection and Edge Detection, Edge Linking and Boundary Detection, Basic Global Thresholding, Otsu's Method, Multiple Thresholds, Variable Thresholding, Multivariable Thresholding, Region Growing, Region Splitting and Merging, Use of Motion in Segmentation, Spatial Techniques, Frequency Domain Techniques.

Text Book:

1. R. C. Gonzalez, R. E. Woods, "Digital Image Processing", PHI

Reference Book:

1. A. K. Jain, "Fundamentals of Digital Image Processing", PHI

CS-714 E1: PATTERN RECOGNITION**Maximum marks: 50****Minimum pass marks: 40%****Maximum Time: 3 Hrs.****Lectures to be taken: 50-60****A) INSTRUCTIONS FOR THE 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 section of the syllabus and will carry 7.5 marks for each question. Section C will consist of 10 short-answer type questions of 2 marks each covering the entire syllabus uniformly and will carry a total of 20 marks.

B) INSTRUCTIONS FOR THE CANDIDATES

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

SECTION A

Introduction to Pattern Recognition: What is Pattern Recognition, Pattern Recognition Approaches, Examples of Pattern Recognition Applications. Features, Feature Vectors and Classifiers.

Statistical pattern Recognition: Supervised Learning (training) using parametric and non parametric approaches, linear discriminant functions and discrete and binary feature cases, unsupervised learning and clustering.

SECTION B

Syntactic Pattern Recognition: Syntactic Pattern Recognition via parsing and other grammars, graphical approaches to syntactic Pattern Recognition, learning via grammatical inference.

Neural pattern Recognition: Introduction to Neural Networks, Introduction to Neural pattern associators and matrix approaches, Feedforward Networks and training by back propagation, Content Addressable Memory approaches and unsupervised learning in Neural Pattern Recognition.

Text Book:

1. Robert J. Schalkoff, "Pattern Recognition: Statistical, Syntactic and Neural Approaches", John Wiley and Sons, NY.

Reference Book:

1. "Pattern Recognition", Academic Press.

CS-714 E2: VIRTUALIZATION AND CLOUD COMPUTING

Maximum Marks: 50**Minimum Pass Marks: 40%****Maximum Time: 3 Hrs.****Lectures to be delivered: 50-60****A) INSTRUCTIONS FOR THE 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 section of the syllabus and will carry 7.5 marks for each question. Section C will consist of 10 short-answer type questions of 2 marks each covering the entire syllabus uniformly and will carry a total of 20 marks.

B) INSTRUCTIONS FOR THE CANDIDATES

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

SECTION A

Virtualization Basics: What is Virtualization, Virtualization theory, VMDK File Structure, CPU Virtualization, Memory Virtualization, Storage Virtualization, Network Virtualization, Virtual machine

Cloud Computing Basics: Overview, Applications, Intranet and the Cloud, First Movers on the cloud, the need for Cloud Computing, Benefits of cloud Computing, Limitations of Cloud Computing, security concerns and regulatory issues, over view of different cloud computing applications

Introduction to Cloud Computing: What and what is not cloud computing, Moving from collaboration to cloud, Cloud Architectures, cloud storage, cloud Services, reasons for cloud computing, pros and cons of cloud computing, benefits of cloud computing, users of cloud computing

Cloud Computing Technologies: Hardware and Infrastructure: Clients, Security, Network, services

Local Clouds: server solutions, Thin Clients

SECTION B

Accessing the Clouds: Platforms, WEB applications, WEB APIS, WB Browsers

Cloud Storage: Overview, Storage provides,

Cloud Standards: Applications, Client, Infrastructure, Services

Cloud Computing Mechanisms: Software as a service: Overview, Driving Forces

Issues in cloud computing: Implementing real time application over cloud Platform, Issues in Inter-cloud environments, QoS Issues in Cloud, Dependability, data migration, streaming in Cloud, Application development in Clouds

Development Platforms: Google, Sales Force, Azure,

Migrating to the clouds: Cloud services for individuals, Mid-market, and Enterprise wide, Migration, best practices, analyzing the service

Text Books:

1. Cloud Computing a Practical approach, Anthony T Velte, Toby J Velte, Robert Elsenpeter, Tata McGraw-Hill.
2. Cloud Computing-Web Based applications that change the way you work and collaborate online, Michael Miller, Pearson Education,
3. Virtualization for Dummies: Wiley-India

Reference Books:

1. Cloud Computing, Antonopoulos, Nick; Gillam, Lee, Springer.
2. Cloud Computing for Dummies by Judith Hurwitz, R.Bloor, M.Kanfman, F.Halper (Wiley India Edition).
3. Enterprise Cloud Computing by Gautam Shroff, Cambridge.
4. Cloud Security by Ronald Krutz and Russell Dean Vines, Wiley-India.

CS-714 E3: OBJECT ORIENTED ANALYSIS AND DESIGN USING UML

Maximum Marks: 50

Maximum Time: 3 Hrs.

Minimum Pass Marks: 40%

Lectures to be delivered: 50-60

A) INSTRUCTIONS FOR THE 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 section of the syllabus and will carry 7.5 marks for each question. Section C will consist of 10 short-answer type questions of 2 marks each covering the entire syllabus uniformly and will carry a total of 20 marks.

B) INSTRUCTIONS FOR THE CANDIDATES

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

SECTION A

Introduction to Object: Object Orientation, Development, Modeling, Object Modeling technique.

Object modeling: Objects and classes, Links and Association, Generalization and inheritance, Grouping constructs, Aggregation, Abstract Classes, Generalization as extension and restriction, Multiple inheritance, Meta data, Candidate keys, Constraints.

Dynamic modeling: Events and states, Nesting, Concurrency, Advanced Dynamic Modeling concepts

Functional modeling: Functional Models, Data flow diagrams, Specifying operations, Constraints, Relation of Functional model to Object and Dynamic Models.

Design Methodology, Analysis: Object modeling, Dynamic modeling, Functional modeling, Adding operations, Iterating Analysis.

System design: Subsystems Concurrency, Allocation to processor and tasks, Management of data stores, Handling Global Resources, Handling boundary Conditions, Setting Trade-off priorities.

Object Design: Overview, Combining the three models, Designing Algorithms, Design Optimization, Implementation of Control, Adjustment of Inheritance, Design of Associations, Object Representation, Physical Packaging, Document Design Decision.

Comparison of methodologies: Structured Analysis/Structured Design, Jackson Structured Development.

Implementation: Using Programming Language, Database System, outside Computer.

Programming Style: Object Oriented Style, Reusability, Extensibility, Robustness, Programming-in-the-large.

SECTION B

UML: Basics, Emergence of UML, Types of Diagrams.

Use Case: Actors, Use Case Diagram, Relationships between Use Cases.

Classes: Class Diagram, Classes, Objects, Attributes, Operations, Methods, Interfaces, Constraints, Generalization, Specialization, Association, Aggregation.

Behavioral Diagrams: Activity Diagram, Collaboration Diagram, Sequence Diagram, State chart Diagram.

Implementation Diagrams: Component Diagram, Deployment Diagram

Text Books:

1. Rombough, "Object Oriented Modeling and Design", Pearson Education.
2. Bernd Oestereich, "Developing Software With UML", Pearson Education.

Reference Books:

1. BOOCH, "Object Oriented Analysis and Design", Addison Wesley
2. Pierre-Alain Muller, "Instant UML", Shroff Publishers.
3. Booch, Rumbaugh, Jacobson, "The Unified Modeling Language User Guide", Addison Wesley.
4. Booch, Rumbaugh, Jacobson, "The Unified Modeling Language Reference Manual", Addison Wesley.
5. Rebecca Wirfs-Brock, "Design Object Oriented Software", PHI

CS-714 E4: NATURAL LANGUAGE PROCESSING

Maximum marks: 50

Minimum pass marks: 40%

Maximum Time: 3 Hrs.

Lectures to be delivered: 50-60

A) INSTRUCTIONS FOR THE 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 section of the syllabus and will carry 7.5 marks for each question. Section C will consist of 10 short-answer type questions of 2 marks each covering the entire syllabus uniformly and will carry a total of 20 marks.

B) INSTRUCTIONS FOR THE CANDIDATES

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

SECTION A

Introduction to NLP: Definition, History, Applications, Goals.

Regular expressions and Automata, Morphology and Finite State Transducers.

N-grams: Introduction, Simple (Unsmoothed) N-Grams, Smoothing: Add-one smoothing, Witten-Bell Discounting, Good-Turing Discounting, Back off, Deleted Interpolation. Entropy

HMM: Overview, Viterbi Algorithm

Syntax: Word Classes and Part-of Speech Tagging, Context Free Grammars for English, Parsing with Context-Free Grammars.

SECTION B

Word Sense Disambiguation: Selection Restriction Based Disambiguation, Robust WSD: Machine Learning, Supervised Learning Approaches, Bootstrapping Approaches, Unsupervised Methods, Dictionary Based Approaches.

Machine Translation: Introduction, Language Similarities and Differences, Approaches, Steps involved in machine translation system design.

Text Book:

1. Jurafsky, D. & J. Martin, "Speech and Language Processing: An Introduction to Natural Language Processing Computational Linguistics, and Speech Recognition" Prentice Hall.

Reference Books:

1. Grosz, B.J., Sparck Jones, K. & Webber, B.L. (eds) "Readings in natural language processing", Los Altos, CA. Morgan Kaufmann.
2. Allen, J., "Natural Language Understanding", Redwood City, Benjamin/Cummings.
3. Bharti, Akshar, Chaitanya Vineet, Sangal Rajeev, "Natural Language Processing", Prentice Hall.

CS-714 E5: MULTIMEDIA INFORMATION SYSTEMS

Maximum Marks: 50
Minimum Pass Marks: 40%

Maximum Time: 3 Hrs.
Lectures to be delivered: 50-60

A) INSTRUCTIONS FOR THE 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 section of the syllabus and will carry 7.5 marks for each question. Section C will consist of 10 short-answer type questions of 2 marks each covering the entire syllabus uniformly and will carry a total of 20 marks.

B) INSTRUCTIONS FOR THE CANDIDATES

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

SECTION A

Multimedia Communications: Multimedia information representation, multimedia networks, multimedia applications, applications and networking terminology.

Multimedia Information Representation: Digitization Principles, text, images, audio, video.

Text and Image Compression: Text compression-Static Huffman Coding, Dynamic Huffman Coding, LZW Coding

Image Compression: File formats: GIF and TIFF, digitized documents, Modified READ, JPEG, Forward DCT, Quantization, Entropy Encoding, Frame building, JPEG decoding.

Audio and Video Compression: Introduction, audio compression (DPCM, ADPCM, APC, LPC, CELP), perceptual coding, MPEG audio coders, Dolby audio coders.

Video compression: Video compression principles, frame types, motion estimation and compensation, implementation issues, H.₂₆₁, H.₂₆₃, MPEG: MPEG-1, MPEG-2, MPEG-4, MP@ML, HDTV.

SECTION B

Standards for Multimedia Communications: Introduction, Reference Models, TCP/IP reference model, protocol basics, standards relating to interpersonal communication, circuit-mode networks, H.₃₂₀, H.₃₂₁/H.₃₁₀, H.₃₂₂, H.₃₂₃, IETF, Electronic mail.

Standards Relating to Interactive Applications over Internet: Information browsing, electronic commerce, Intermediate systems.

Standards for Entertainment Applications-video-on Demand, Interactive TV.

Entertainment Networks and High Speed Modems: Cable TV networks, HFC networks, multi-access channel operations, protocol stack, configuration and management, cable MAC, Time synchronization, Ranging, Frame transmission, frame formats, fragmentation.

Satellite TV Networks: Broadcast TV principles, Digital TV, Interactive services, Terrestrial TV networks, Broadcast TV principles, COFDM principles, High speed PSTN access technologies, ADSL, VDSL.

Application Support Functions: Introduction, ASN.₁ Type definitions, Transfer syntax, Security, Data Encryption, The data encryption standard, DES, Triple DES, IDEA, The RSA algorithm, Non repudiation, Authentication, Public Key Certification Authorities.

Text Book:

1. Prabhat K. Andleigh, Kiran Thakrar, "Multimedia Systems Design", PHI.

Reference Book:

1. Multimedia Information Networking, Nalin K. Sharda, PHI.

CS-714 E6: MOBILE COMMUNICATION

Maximum Marks: 50
Minimum Pass Marks: 40%

Maximum Time: 3 Hrs.
Lectures to be delivered: 50-60

A) INSTRUCTIONS FOR THE 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 section of the syllabus and will carry 7.5 marks for each question. Section C will consist of 10 short-answer type questions of 2 marks each covering the entire syllabus uniformly and will carry a total of 20 marks.

B) INSTRUCTIONS FOR THE CANDIDATES

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

SECTION A

Introduction: History of wireless Communication, Reference Model, Applications,
Classification of Mobile Communication Systems: Introduction, Paging Systems, Wireless Telephony, Trunking Systems, Cellular Systems, Personal Satellite Communication Systems, Wireless access to the Local Area Networks.
Wireless Transmission: Frequencies for radio transmission, signals, antennas, signal propagation, multiplexing, modulation, spread spectrum, cellular systems.

Medium Access Control: MAC: hidden and exposed terminals, near and far terminals. SDMA, FDMA, TDMA, CDMA, Comparison of SDMA, FDMA, TDMA, CDMA.
Telecommunication Systems: GSM, DECT, TETRA, UMTS and IMT-2000.

SECTION B

Channel Assignment Techniques: Centralized DCA, Decentralized DCA, Fully Decentralized DCA, Hybrid Schemes.
Wireless LAN: IEEE 802.11, 802.11b, HIPERLAN, Bluetooth, Security in Wireless LAN, Wi Max
Wireless ATM: WATM working group, WATM services, Reference model for WATM, Functions.

Mobile Network Layer: Mobile IP, Dynamic host configuration protocol, Ad hoc networks.
Mobile transport layer: Traditional TCP, Indirect TCP, Snooping TCP, Mobile TCP, Fast retransmit/ fast recovery, time out freezing, selective retransmission.

Text Books:

1. J. Schiller, "Mobile Communications", Addison-Wesley.
2. Principles of Mobile Communication by Gordon stuber.

Reference Books:

1. A.S. Tanenbaum, "Computer Networks", Pearson Education.
2. Ivan Stojmenovi & Cacute, "Handbook of Wireless Networks and Mobile Computing", Wiley.
3. Hansmann, "Principles Of Mobile Computing", Wiley India.
4. Mobile Communication Systems by KrzysztoJ Wesolowski.

CS-714 E7: DATA MINING AND DATA WAREHOUSING

Maximum Marks: 50
Minimum Pass Marks: 40%

Maximum Time: 3 Hrs.
Lectures to be delivered: 50-60

A) INSTRUCTIONS FOR THE 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 section of the syllabus and will carry 7.5 marks for each question. Section C will consist of 10 short-answer type questions of 2 marks each covering the entire syllabus uniformly and will carry a total of 20 marks.

B) INSTRUCTIONS FOR THE CANDIDATES

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

SECTION A

Data Warehousing and Business Analysis: Data warehousing Components –Building a Data warehouse – Mapping the Data Warehouse to a Multiprocessor Architecture – DBMS Schemas for Decision Support – Data Extraction, Cleanup, and Transformation Tools –Metadata – reporting – Query tools and Applications – Online Analytical Processing (OLAP) – OLAP and Multidimensional Data Analysis.

Data Mining: Data Mining Functionalities – Data Preprocessing – Data Cleaning – Data Integration and Transformation – Data Reduction – Data Discretization and Concept Hierarchy Generation. Association Rule Mining: Efficient and Scalable Frequent Item set Mining Methods – Mining Various Kinds of Association Rules – Association Mining to Correlation Analysis – Constraint-Based Association Mining.

SECTION B

Classification and Prediction: Issues Regarding Classification and Prediction – Classification by Decision Tree Introduction – Bayesian Classification – Rule Based Classification – Classification by Back propagation – Support Vector Machines – Associative Classification – Lazy Learners – Other Classification Methods – Prediction – Accuracy and Error Measures – Evaluating the Accuracy of a Classifier or Predictor – Ensemble Methods – Model Section.

Cluster Analysis: Types of Data in Cluster Analysis – A Categorization of Major Clustering Methods – Partitioning Methods – Hierarchical methods – Density-Based Methods – Grid-Based Methods – Model-Based Clustering Methods – Clustering High Dimensional Data – Constraint-Based Cluster Analysis – Outlier Analysis.

Text Book:

1. Jiawei Han, Micheline Kamber and Jian Pei, Data Mining Concepts and Techniques, Elsevier.

Reference Books:

1. Alex Berson and Stephen J. Smith, Data Warehousing, Data Mining & OLAP, Tata McGraw – Hill Edition.
2. K.P. Soman, Shyam Diwakar and V. Ajay, Insight into Data mining: Theory and Practice, Prentice Hall of India.
3. G. K. Gupta, Introduction to Data Mining with Case Studies, Prentice Hall of India.
4. Pang-Ning Tan, Michael Steinbach and Vipin Kumar, Introduction to Data Mining, Pearson Education.

CS-715: SOFTWARE LAB – III (Digital Image Processing)**Maximum Marks: 100*****Minimum Pass Marks: 40%****Maximum Time: 3 Hrs.****Practical Sessions to be Conducted: 55-65**

The Laboratory assignments for this lab will include the assignments mainly from the papers CS-713: Digital Image Processing

*The splitting of marks is as under

Maximum Marks for Continuous Assessment: 60

Maximum Marks for University Examination: 40

Continuous Assessment (Practical Labs) *Maximum Marks for Continuous Assessment : 60
1. Two tests will be conducted during the semester. Both the tests will be considered for assessment: 60% of the marks allotted for continuous assessment. 2. Lab Assignments: 30% of the marks allotted for continuous assessment. 3. Attendance: 10% of the marks allotted for continuous assessment.
University Examination (Practical Labs) *Maximum Marks for University Examination : 40
The evaluation will be done jointly by the team of internal and external examiner. The examiners 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.

CS-716: Research Project

Objectives: Problem identification for research work, Literature survey to identify research gaps for research work, Finalize title of research work and to develop research paper writing skills.

Each student will be required to identify a research problem and perform survey of literature in the area of the research problem identified. The title and objectives for the research work will be finalized by the student in consultation with the Supervisor. Student must have sufficient knowledge about the existing techniques in the research area on which he/she wants to work. Each student is required to submit his/her research synopsis by January 15. However, student can submit his/her synopsis up to January 31, with a fine of Rs. 5,000/-. After January 31, the synopsis will be accepted with a fine of Rs. 10,000/-. However synopsis will not be accepted after April 30. Submission of synopsis after April 30 shall be permitted only after depositing fee for full semester (including tuition fee, other funds and examination fee). In any case, the total period of extension in submission of synopsis cannot exceed 2 semesters after April 30.

The student will be required to give presentation to the Synopsis Evaluation Committee having following members:

- i. Head of the Department
- ii. Supervisor of the student
- iii. Two teachers of the Department nominated by Head of the Department (at least one teacher must be present).

This is a non-credit paper. There will not be any marks for the synopsis. After presentation and viva of the student, the evaluation committee will either accept or reject the synopsis. The decision of the evaluation committee will be displayed on the Department's notice board within 7 working days from the presentation of the synopsis by the student. In case of rejection of the synopsis, the student will submit the revised synopsis along with a fee of Rs. 10,000/- up to April 30. Submission of revised synopsis after April 30 shall be permitted only after depositing fee for full semester (including tuition fee, other funds and examination fee). In any case, the total period of extension in submission of synopsis cannot exceed 2 semesters after April 30.

Furthermore, each student is required to give a certificate, duly signed by the student and counter signed by the supervisor, certifying that the synopsis of the student is free of any kind of plagiarism along with the report of plagiarism detection tool/website as mandated by Punjabi University (if any).

CS-801: Dissertation

Maximum Marks: 400*

Minimum Pass Marks: 160

*The break-up of marks will be:

- Dissertation Evaluation – 200 Marks
- Seminar and Viva voce – 200 Marks

Objectives: Implement some of the existing techniques and develop some new algorithm/tool and produce meaningful research outputs.

Each student will be required to implement some of the existing techniques and/or develop new techniques related to the research title chosen under Paper: CS-716 (Research Project) and accomplish the objectives set therein. Student will be required to complete a Dissertation and submit the final dissertation any time after April 30 but not later than August 31. Before submission of dissertation, the student must have published/presented at least one paper, related to his/her area of research, in some national/international journal/conference of repute (proof of publication/presentation must be attached with the Dissertation).

In lieu of the thesis work, the student may pursue Software development/Industrial project in industry. However, before proceeding on such a project, the student will have to obtain prior permission from the Head of the Department through Internal supervisor. Joint projects may also be allowed subject to the condition that students shall highlight their individual contributions in the joint project at the time of viva-voce.

Furthermore, each student is required to give a certificate, duly signed by the student and counter signed by the supervisor, certifying that the dissertation of the student is free of any kind of plagiarism along with the report of plagiarism detection tool/website as mandated by Punjabi University (if any).

There will not be any marks for internal assessment of the student. Each student is required to present the seminar and give viva-voce to defend his/her dissertation before the Dissertation Evaluation Committee having following members:

- i. Head of the Department/HoD's Nominee
- ii. Supervisor of the student
- iii. External examiner