FACULTY OF ENGINEERING & TECHNOLOGY

SYLLABUS

FOR

MASTER OF TECHNOLOGY
(COMPUTER SCIENCE & ENGG.)
(Two Years Course)

(Credit Based Evaluation and Grading System)
(Session: I – IV)

SESSION: 2019-20

GURU NANAK DEV UNIVERSITY
AMRITSAR

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(ii) Subject to change in the syllabi at any time.
Please visit the University website time to time.
CSB2: M.TECH. (COMPUTER SCIENCE & ENGINEERING) SEMESTER SYSTEM  
(Credit Based Evaluation and Grading System)

SCHEME:

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<th>Sr.No.</th>
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Note:
- PSL-053 ID Course Human Rights & Constitutional Duties (Compulsory Paper) 
  Students can opt. this paper in any odd semester. This ID Paper is one of the total ID 
Papers of this course.
### CSB2: M.TECH. (COMPUTER SCIENCE & ENGINEERING) SEMESTER SYSTEM
*(Credit Based Evaluation and Grading System)*

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**Sub Total:** 15 0 2

**Grand Total:** 17

### List of Electives – I

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**List of Electives–II:**

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**CSB2: M.TECH. (COMPUTER SCIENCE & ENGINEERING) SEMESTER SYSTEM**
*(Credit Based Evaluation and Grading System)*

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CSL–553: PROGRAMMING CONCEPTS

Internal Marks: 20
External Marks: 80

Instructions for the Paper Setters:
Eight questions of equal marks (Specified in the syllabus) are to be set, two in each of the four Sections (A-D). Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each Section. The fifth question may be attempted from any Section.

SECTION-A
Constants, variables, vectors, matrices; arithmetic and vector/matrix operations, operator precedence. Input and display of data; writing programs in MATLAB environment.
Selection structures: IF and SWITCH.
Loops: FOR and WHILE structures. Multiple (nested) loops. Flags. BREAK and CONTINUE statements.

SECTION-B
Arrays, cell arrays, structures, string manipulation, Debugging programs.
User-defined functions, Scripts, Passing arguments, returning values; NARGIN, NARGOUT, GLOBAL variables, Formatted output.

SECTION-C

SECTION-D
Applications: Linear Algebra, Curve Fitting and Exploration, Data Analysis and Statistics
Plotting: Preparing data to be plotted; formatting plots; 2D chart types. Preparing data for 3D plotting; 3D chart types. Working with chart handles. Simple curve fitting.

References:
2. Getting started with MATLAB: A quick introduction for scientists and engineers, Rudra Pratap, Oxford University Press.

Programming exercises based on the subjects covered in first Semester.
CSB2: M.TECH. (COMPUTER SCIENCE & ENGINEERING) SEMESTER-I
(Credit Based Evaluation and Grading System)

CSL–554: DISTRIBUTED OPERATING SYSTEM

Internal Marks: 20
External Marks: 80

Instructions for the Paper Setters:
Eight questions of equal marks (Specified in the syllabus) are to be set, two in each of the four Sections (A-D). Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each Section. The fifth question may be attempted from any Section.

SECTION-A
Communication in Distributed Systems: Remote Procedure Call (RPC), Remote Method Invocation (RMI), CORBA (Common Object Request Broker Architecture), DCOM (Distributed Component Object Model, Process Migration in Distributed Systems.

SECTION-B
Deadlock in Distributed Systems: Distributed Deadlock, Deadlock Prevention, Deadlock Detection, A Distributed Resource Deadlock Algorithm.

SECTION-C

SECTION-D

References:
CSB2: M.TECH. (COMPUTER SCIENCE & ENGINEERING) SEMESTER-I
(Credit Based Evaluation and Grading System)

CSL–555: NETWORK SECURITY

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Internal Marks: 20
External Marks: 80

Instructions for the Paper Setters:
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SECTION-A
Introduction: Attacks, services, mechanisms, security attacks, security services, Model for network security, Internet standards.
Conventional encryption and message confidentiality: Conventional encryption principles, conventional encryption algorithms, cipher block modes of operations, location of encryption devices, key distribution.

SECTION-B
Public Key cryptography and authentication: Approaches to message authentication, Secure Hash Functions and HMAC, Public Key Cryptography, Principles Public Key Cryptography Algorithms, Digital signatures, Key management.
Authentication & Email Security: Kerberos, X.509 Directory Authentication Services-PGP-S/MIME.

SECTION-C

SECTION-D

References:
CSB2: M.TECH. (COMPUTER SCIENCE & ENGINEERING) SEMESTER-I
(Credit Based Evaluation and Grading System)

CSL–548: DATA MINING

Internal Marks: 20
External Marks: 80

Instructions for the Paper Setters:
Eight questions of equal marks (Specified in the syllabus) are to be set, two in each of the four Sections (A-D). Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each Section. The fifth question may be attempted from any Section.

SECTION-A
Introduction to Data Mining, Data Mining Tasks, Components and types of Data Mining Algorithms, Data Mining supporting Techniques, Major Challenges and Issues in Data Mining, Measurement and Data, Data Processing, Data Sets.

SECTION-B
Classifications, Basic Concepts, Decision Tree induction, Bayes Classification Methods, Rule Based Classification, Model Evaluation and Selection, Techniques to Improve Classification Accuracy, Classification: Advanced concepts, Bayesian Belief Networks, Classification by Back Propagation, Support Vector Machine and Classification using frequent patterns.
Cluster Analysis: Basic concepts and Methods, Cluster Analysis, Partitioning methods, Hierarchical methods, Density based Methods, Grid Based Methods, Evaluation of Clustering, Advanced Cluster Analysis: Probabilistic model based clustering, Clustering High, Dimensional Data, Clustering Graph and Network Data, Clustering with Constraints.

SECTION-C
Advanced techniques of data mining: Text mining- extracting attributes, structural approaches, Web Mining, Overview of Data Mining Software and Applications; Case Study: WEKA

REFERENCES:

1. Jiawei Han, Micheline Kamber, Jain Pei, “Data Mining: Concepts and Techniques”, Third Edition (The Morgan Kaufmann Series in Data Management System), 2012.
CSB2: M.TECH. (COMPUTER SCIENCE & ENGINEERING) SEMESTER – II
(Credit Based Evaluation and Grading System)

CSL–560: COMPUTER SYSTEM ARCHITECTURE & ORGANIZATION

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Internal Marks: 20
External Marks: 80

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SECTION-A

Introduction to Computers: Basic Computer Organization: System Buses, Instruction Cycles
CPU Organization: Design specifications for a Simple CPU, Fetching Instructions from Memory, Decoding Instructions, Executing Instructions, Designing the Control Unit Using Hardwired Control and Microprogrammed control approach.
Parallelism in Uniprocessor Systems: Trends in parallel processing, Basic Uniprocessor Architecture, Parallel Processing Mechanism.

SECTION-B

Architectural Classification Schemes: Multiplicity of Instruction-Data Streams, Serial versus Parallel Processing, Parallelism versus Pipelining.
Pipelining: An overlapped Parallelism, Principles of Linear Pipelining, Classification of Pipeline Processors.
Principles of Designing Pipelined Processors: Instruction Prefetch and Branch Handling, Data Buffering and Busing Structures, Internal Forwarding and Register Tagging, Hazard Detection and Resolution.
Superscalar and Superpipeline Design: Superscalar Pipeline Design, Superpipelined Design.

SECTION-C

SIMD Interconnection Networks: Static versus Dynamic Networks, Mesh-Connected Illiac Network, Cube Interconnection Networks.
SECTION-D

System Interconnect Architectures: Network Properties and Routing, Static Connection Networks, Dynamic Connection Networks.


Interconnection Networks: Time Shared for Common Buses, Crossbar Switch and Multiport Memories.

References
CSB2: M.TECH. (COMPUTER SCIENCE & ENGINEERING) SEMESTER – II
(Credit Based Evaluation and Grading System)

CSL–569: SOFTWARE ENGINEERING & TESTING

Credits
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Internal Marks: 20
External Marks: 80

Instructions for the Paper Setters:
Eight questions of equal marks (Specified in the syllabus) are to be set, two in each of the four Sections (A-D). Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each Section. The fifth question may be attempted from any Section.

SECTION-A

Introduction to S/W Testing – Fundamentals of testing process, broad categories of testing – General principles of testing – Major Software Testing Techniques- White-box testing, basis path testing: flow graph notation, cyclomatic complexity; Control structure testing: condition testing, data-flow testing, loop testing ; Black Box testing : Graph based testing methods-BVA

SECTION-B
Software Testing Strategies – Approach-verification and validation; Strategic issues; testing conventional software – Unit testing, Integration testing, Validation testing, System testing; Debugging process, strategies, correcting error - The Testing Phases - Test strategy and Test plan – Test strategy template - Test plan template – Requirement traceability –Test scenario – Test Case.

SECTION-C
Software Product metrics: measures, metrics, indicators of quality challenge- measurement principles, attributes of software metrics- McCall and ISO 9126 factors- metrics for analysis model- metrics for design model-architectural design, object-oriented design metrics, CK, MOOD, LK metric suites, component-level design metrics, operation-oriented metrics and interface design metrics-metrics for source coding, metrics for testing, metrics for maintenance.
**CSB2: M.TECH. (COMPUTER SCIENCE & ENGINEERING) SEMESTER – II**  
*(Credit Based Evaluation and Grading System)*

**SECTION-D**

**Test Estimation techniques**: Approaches of Test effort estimation, Delphi Technique, Analogy based estimation, Software size based estimation, Test case enumeration based estimation, Task (Activity) based Test estimation, Testing size based estimation, Sizing a Testing project, Merits and demerits of various Test Estimation techniques.

**Test Automation Tool**: Introduction to Selenium Tool, Selenium IDE, Selenium Remote control, Selenium Grid.

**References**

5. Software Testing Foundations - Andreas Spillner, Tilo Linz, Hans Schäfer
6. Software Estimation Best practices, Tools & Techniques – Murali Chemuturi
CSL–567: WIRELESS NETWORKS

Internal Marks: 20
External Marks: 80

Instructions for the Paper Setters:
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SECTION-A

SECTION-B
WAP: History of WAP, Architecture, and Components.

SECTION-C
Cellular Technology: Design and Principles of Cellular Operation, Cellular Telephony Operations, GSM

SECTION-D

References:
3. Introduction to Wireless Technology by Rogers (2003), Pearson Education.
CSB2: M.TECH. (COMPUTER SCIENCE & ENGINEERING) SEMESTER – II
(Credit Based Evaluation and Grading System)

CSP–569: TERM PAPER- II

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CSL–564: ADVANCED SOFTWARE ENGINEERING

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Internal Marks: 20
External Marks: 80

Instructions for the Paper Setters:
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SECTION-A

SECTION-B
Software Re-engineering: Introduction Re-engineering, Restructuring and Reverse Engineering, Re-engineering existing systems, Data Re-engineering and migration, Software Reuse and Re-engineering.
Object-Oriented (OO) Measurements: Introduction, Why metrics?, Classification of OO metrics, Study of Design Metrics- method size, method internals, class size, class inheritance, Method inheritance, class intervals and class externals.

SECTION-C

SECTION-D
Software Agents: Definition, Applications, Types and Classes, Multi-Agent systems, Characteristics & Properties Agents.

References:
CSL--565: NETWORK PROGRAMMING

Credits

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Internal Marks: 20
External Marks: 80

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SECTION-A
Introduction: TCP/IP Architecture, TCP/IP addressing, services, FTP, SMTP, TFTP, SNMP, Network file system, domain name system, transport layer protocols, user datagram protocol, transmission control protocol.

SECTION-B
Interprocess Communications: File and record locking, pipes, FIFO’s, stream and messages, message queues, samphorers.

SECTION-C
Sockets: Sockets system cells, reserved parts, stream pipes, socket option, asynchronous I/O, Sockets and signals Transport Lay Interface: Elementary TLI functions, stream and stream pipes, asynchronous I/O multiplexing.

SECTION-D
Remote Procedure Calls: Remote login, remote command execution, external data representation.

References:
CSL566: ADVANCED CLOUD COMPUTING

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SECTION-A
Virtualization: Definition, Type of Virtualization, Benefits, Limitations, Virtualization and Cloud, Virtual Appliance.

SECTION-B
Cloud Terminology: Resource Provisioning, Bill Management, Multitenancy and Isolation, Service Level Agreement (SLA) and Quality of Service (QoS), Mobile Cloud Computing.

SECTION-C

SECTION-D
Big-Data and Internet of Things (IoT): Definition of Big-Data, Structured and Unstructured Data, V’s of Big-Data, Hadoop, Definition of IoT, Characteristics of IoT, Combining Big-Data, IoT and Cloud Computing.
Textbooks/Journals:

Reference Books:
CSB2: M.TECH. (COMPUTER SCIENCE & ENGINEERING) SEMESTER-III
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CSL–656: Introduction to Data Science

Internal Marks: 20
External Marts: 80

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UNIT-I

1. Introduction: Data Science
   - Big Data and Data Science hype and getting past the hype
   - Why now? Datafication
   - Current landscape of perspectives
   - Skill sets needed
2. Statistical Inference
   - Populations and samples
   - Statistical modeling, probability distributions, fitting a model
3. Exploratory Data Analysis and the Data Science Process
   - Basic tools (plots, graphs and summary statistics) of EDA
   - Philosophy of EDA
   - The Data Science Process
   - Case Study: RealDirect (online real estate firm)

UNIT-II

4. Three Basic Machine Learning Algorithms
   - Linear Regression
   - k-Nearest Neighbors (k-NN)
   - k-means
5. More on Machine Learning Algorithm and Usage in Applications
   - Motivating application: Filtering Spam
   - Why Linear Regression and k-NN are poor choices for Filtering Spam
   - Naive Bayes and why it works for Filtering Spam
   - Data Wrangling: APIs and other tools for scrapping the Web
6. Feature Generation and Feature Selection (Extracting Meaning from Data)
   - Motivating application: user (customer) retention
   - Feature Generation (brainstorming, role of domain expertise, and place for imagination)
   - Feature Selection algorithms
   - Filters; Wrappers; Decision Trees; Random Forests
UNIT-III

7. Mining Social-Network Graphs
   - Social networks as graphs
   - Clustering of graphs
   - Direct discovery of communities in graphs
   - Partitioning of graphs
   - Neighborhood properties in graphs

8. Data Visualization
   - Basic principles, ideas and tools for data visualization
   - Examples of inspiring (industry) projects
   - Exercise: create your own visualization of a complex dataset

9. Data Engineering
   - Map Reduce: word count problem, other examples of Map-reduce,
   - Introduction to Pregel
   - Hadoop Architecture

10. Data Science and Ethical Issues
    - Discussions on privacy, security, ethics
    - Next-generation data scientists

References:

The dissertation will normally contain:

1. A clear indication, at appropriate stages, of original and creative elements. The level of originality expected is likely to include the application of existing techniques to new environments, the use of original materials, the re–working of existing materials, and the use of comparative approaches to the provision of information technology;

2. A discussion of its scope and aims, and its theoretical and professional significance, including a discussion of the context in which the problem is seen as important;

3. An analysis of the topic within a critical review of the relevant literature;

4. An evaluation of methods used in the dissertation, their reliability, validity, and a comparison with alternative methods;

5. An account of the process of obtaining the data required for the dissertation and the results obtained;

6. An analysis of the results of the dissertation to include a discussion of their significance, their relationship to other research, and any methodological or theoretical implications; and

7. The relationship of the findings to existing professional understanding and, where appropriate, potential implementation difficulties.

It is not intended to restrict students to a precisely defined format for the dissertation but it should follow the standard practices of dissertation writing. Although a written report will normally be expected, it should be accompanied by soft copy on CD.

The evaluation shall be done as per the common ordinances for courses under Credit Based Continuous Evaluation Grading System
CSB2: M.TECH. (COMPUTER SCIENCE & ENGINEERING) SEMESTER-III
(Credit Based Evaluation and Grading System)
ELECTIVES II

CSL650: PARALLEL COMPUTING

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UNIT–I
Paradigms of Parallel Computing: Synchronous – Vector/Array, SIMD, Systolic
Asynchronous – MIMD, reduction Paradigm, Hardware taxonomy: Flynn’s classification, Handler’s classification. Software taxonomy: Kung’s taxonomy, SPMD.
Abstract Parallel Computational Models: Combinational circuits, Sorting Network, PRAM Models, Interconnection RAMs.

UNIT–II
Parallelism approaches – Data parallelism, control parallelism.
Performance Metrics: Laws governing performance measurements: Amdahl’s law, Gustafson’s law, Sun–Ni law, Metrics such as Speedup, efficiency, iso-efficiency, utilization, sizeup, communication overheads etc., Benchmarks.

UNIT–III
Scheduling and Parallelization: Load Scheduling, Types of scheduling algorithm, Load Balancing, Loop Scheduling, Parallelization of sequential programs.
Overview of Parallel Programming Development & Support Environments: Shared memory programming, distributed memory programming, object oriented programming, data–parallel programming, functional and data flow programming.

References:
CSL–652: ARTIFICIAL NEURAL NETWORKS

Internal Marks: 20
External Marks: 80

Instructions for the Paper Setters:
Eight questions of equal marks (Specified in the syllabus) are to be set, two in each of the four Sections (A-D). Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each Section. The fifth question may be attempted from any Section.

UNIT–I
Neural Network Learning: Basic learning rules, supervised & unsupervised learning, LMS Algorithm.

UNIT–II

UNIT–III

References:
CSL–653: DIGITAL IMAGE PROCESSING

Internal Marks: 20
External Marks: 80

Instructions for the Paper Setters:
Eight questions of equal marks (Specified in the syllabus) are to be set, two in each of the four Sections (A-D). Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each Section. The fifth question may be attempted from any Section.

UNIT–I


UNIT–II


UNIT–III

Image Segmentation: Detection of Discontinuities, Edge Linking and Boundary Detection, Thresholding, Region Oriented Segmentation, Motion based segmentation.

Representation and Description: Representation, Boundary Descriptors, Regional Descriptors, Use of Principal Components for Description, Introduction to Morphology, Some basic Morphological Algorithms.

Object Recognition: Patterns and Pattern Classes, Decision – Theoretic Methods, Structural Methods.

References:
CSB2: M.TECH. (COMPUTER SCIENCE & ENGINEERING) SEMESTER-III
(Credit Based Evaluation and Grading System)
ELECTIVES II

CSL–655: SOFTWARE PROJECT MANAGEMENT

Credits
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Internal Marks: 20
External Marts: 80

Instructions for the Paper Setters:
Eight questions of equal marks (Specified in the syllabus) are to be set, two in each of the four Sections (A-D). Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each Section. The fifth question may be attempted from any Section.

UNIT–I

Planning Fundamentals: Major issues in software project planning, Planning activities Project, master schedule, Software risk management, Risk monitoring, Risk analysis

Software cost: Major issues in estimating software cost, Cost estimation methods, Experience based model, Parameter based model, COCOMO, Versions of COCOMO, Software size estimation, Function points, Software project schedule, Rayleigh model.

UNIT–II

Functional organization: Project organization, Matrix organization, Staffing, Quality replacements, Turnover management.

Directing a software engineering project: Issues, activities, Conflict management.

UNIT–III

Issues in controlling a software project: Controlling activities, Threads of control, Work breakdown structures, Earned value tracking

References:
CSB2: M.TECH. (COMPUTER SCIENCE & ENGINEERING) SEMESTER-IV
(Credit Based Evaluation and Grading System)

CSD–660: DISSERTATION (PART–II)

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In continuation from 3rd Semester

The evaluation shall be done as per the common ordinances for courses under Credit Based Continuous Evaluation Grading System