TEACHING AND EXAMINATION SCHEME
Master of Technology (Computer Science)
W.E.F. 2019-2020
Semester I

	Paper Name (Theory)	Lec	Tut	Exam Hours	MAX MARKS	
					Sess-ional	Sem Exam
mtc-101	Information & Network Security	5	1	3	20	80
mtc-102	High Performance Computing	5	1	3	20	80
mtc-103	Wireless Ad hoc Networks	5	1	3	20	80
mtc-104	Advance Data Mining	5	1	3	20	80
	Total of Sessional & Semester Exam Marks					**400**

	Paper Name (Practical)	Pract Hours	Exam Hours	Max Marks
mtc-105	Lab-High Performance Computing & Data Mining	4	3	50
mtc-106	Lab-Ad hoc Networking	4	3	50
mtc-107	Lab-Information & Network Security	4	3	50
	Total of Practical Marks			**150**
	Total of Theory & Practical Marks			**550**

TEACHING AND EXAMINATION SCHEME
Master of Technology (Computer Science)
Semester II

	Paper Name (Theory)	Lec	Tut	Exam Hours	MAX MARKS	
					Sess-ional	Sem Exam
mtc-201	Data Science With R	5	1	3	20	80
mtc-202	Advance Java	5	1	3	20	80
mtc-203	Advance Computer Graphics	5	1	3	20	80
mtc-204	Machine Learning	5	1	3	20	80
	Total of Theory (Sessional + Semester Exam Marks)					**400**

	Paper Name (Practical)	Pract Hours	Exam Hours	Max Marks
mtc-205	Lab-Advance Java	4	3	50
mtc-206	Lab-Computer Graphics	4	3	50
mtc-207	Lab-Machine Learning, Data Science	4	3	50
	Total of Practical Marks			**150**
	Total of Theory & Practical Marks			**550**

TEACHING AND EXAMINATION SCHEME
Master of Technology (Computer Science)
Semester III

	Paper Name (Theory)	Lec	Tut	Exam Hours	MAX MARKS	
					Sess-ional	Sem Exam
mtc-301	Mobile Application Development	5	1	3	20	80
mtc-302	Advance Image Processing	5	1	3	20	80
mtc-303	Big Data Analysis	5	1	3	20	80
mtc-304	Minor Project	5	1	3	20	80
	Total of Theory (Sessional + Semester Exam Marks)					**400**

	Paper Name (Practical)	Pract Hours	Exam Hours	Max Marks
mtc-305	Lab-Mobile Application Devleopment	4	3	50
mtc-306	Lab-Image Processing	4	3	50
mtc-307	Lab-Big Data	4	3	50
	Total of Practical Marks			**150**
	Total of Theory & Practical Marks			**550**

TEACHING AND EXAMINATION SCHEME
Master of Technology (Computer Science)
Semester IV

Paper Name (Theory)		Lec	Tut	Exam Hours	MAX MARKS	
					Sess-ional	Sem Exam
mtc-401	Dissertation	36		3	90	360
mtc-402	Seminar	6	1	3	20	80
	Total of Theory (Sessional + Semester Exam Marks)					**550**

Scheme of Examination
(For M. Tech. – Computer Science)

Theory:
Attempt 5 questions out of 10 questions set by the Examiner.

Sessional:
There will be sessional (internal assessment) of 20 marks conducted by the department.

Practical:
Practical exams shall be conducted by one internal and one external examiner of a batch of 20 students in a day.
Duration of Practical exam is 3 hours.
A Laboratory Exercise File should be prepared by each student for each practical paper and should be submitted during practical examinations.
Dissertation: 6 hours per student
Seminar: 3 hours per student
One External Examiner and one Internal Examiner will evaluate the Dissertation and Seminar.
A group of three students will be assigned to one faculty for Dissertation and Seminar.
Practical of 50 marks distribution is as under:

a. 30 marks for practical examination exercise for 3 questions
b. 10 marks for Viva-voce
c. 10 marks for Laboratory Exercise File

Eligibility:
M. Sc. (CS) / M. Sc. (IT), M. Sc. (Physics, M. Sc. (Math), MCA and B.E. /B. Tech. with minimum 60%

Scheme of Examination
(For M. Tech. – Computer Science)

Reg. 17 (a)

The examination for the M. Tech. Computer Science will consist of 4 semesters. The examination shall consist of (a) Theory papers (b) Laboratory / Practical work and project work. Candidates will be required to pursue a regular, full time course of study at the University department for a period of two academic years in order to be eligible for appearing in the examination.

1. Eligibility for M. Tech. Computer Science: M.Sc (CS)/M.Sc. (IT), M. Sc. (Physics), M. Sc. (Maths), MCA and B.E. / B. Tech. with minimum 60%.
2. Examination:
    i. There shall be 23 papers (4 theory, 3 practical in the I, II and III semester and in the IV Semester 1 dissertation and 1 seminar) of 2200 marks (first to fourth semester). Theory paper shall be of 100 marks out of which 20 marks shall be considered as internal assessment based on internal test and seminars and 80 marks will be of examination of 3hours duration at the end of each semester as determined by the University. The practical examination shall be of 50 marks assessed by external examiner. The minor project work will be of 80 marks, dissertation of 360 marks and seminar of 80 marks based on presentation and viva-voce assessed by external examiner.
    ii. To pass a semester a candidate shall have to score 25% marks in each subject (theory, internal assessment, dissertation, seminar and practical) separately and also 36% marks in aggregate of all the papers prescribed for the examination.
    iii. Due paper(s) will be applicable if a candidate obtains 36% marks in aggregate and fails in not more than two (2) papers (theory). Due paper(s) of first semester will be held along with the third semester and the due paper(s) of second semester will be held along with the fourth semester. The third and fourth semester due paper(s) will be held in the first and second semester respectively of the next year. The chance of due paper(s) will be given thrice in each semester.
    iv. Wherever a candidate appears at for a due paper examination he/she will do so according to the syllabus in force.
    v. A candidate not appearing at any examination/absent in any paper of term end examination shall be deemed as fail.
3. A candidate for a pass in the examination shall be required to obtain:
    i. At least 36% marks in the aggregate of all the papers prescribed for the examination and
    ii. At least 36% marks in the practical(s), dissertation, seminar wherever prescribed at the examination, provided that if a candidate fails to secure at least 25% marks in each individual paper at the examination notwithstanding his having obtained the minimum percentage of marks required in the aggregate for that examination.

No Division will be awarded in the first, second and third semester examinations. Division shall be awarded at the end of the fourth semester Examination on the combined marks obtained at the first, second third and fourth semester taken together as noted below:

Passed with First Division	60% of the aggregate marks taken together of all the foursemester examinations
Passed with second division	48%

All the rest will be declared to have passed the examination if they secure more than 36% in aggregate.

Provided that if a candidate clears any paper after a continuous period of two years since he/she was admitted to the M. Tech. Computer Science then for the passing marks, i.e. 36% marks, shall be taken into account in the case of such course(s).

4. The grace marks shall be given up to 1% of the total aggregate marks of theory and practical of that semester in maximum one paper.
5. Candidates reappearing at an examination in a subsequent year shall be examined in accordance with the scheme and syllabi in force and shall be entitled to the award of the degree of year in which they clear the last failing/unclear paper.

Duration: 3 hours	Max Marks: 80

mtc-101Information and Network Security

Classical Encryption Techniques Symmetric Cipher Model, Cryptography, Cryptanalysis and Brute-Force Attack, Substitution Techniques, Caesar Cipher, Monoalphabetic Cipher, Playfair Cipher, Hill Cipher, Polyalphabetic Cipher, One Time Pad. Block Ciphers and the data encryption standard: Traditional block Cipher structure, stream Ciphers and block Ciphers, Motivation for the feistel Cipher structure, the feistel Cipher, The data encryption standard, DES encryption, DES decryption, nature of the DES algorithm.

Public-Key Cryptography and RSA: Principles of public-key cryptosystems, applications, requirements, cryptanalysis. The RSA algorithm, Key Management and Distribution: Symmetric key, distribution scenario, Hierarchical key control, session key lifetime, a transparent key control scheme, Decentralized key control, controlling key usage, Symmetric key distribution using asymmetric encryption, simple secret key distribution, secret key distribution with confidentiality and authentication, A hybrid scheme, distribution of public keys,

Wireless network security: Wireless security, Wireless network threats, Wireless network measures, mobile device security, security threats, mobile device security strategy

Secure Sockets Layer: SSL Architecture, SSL Protocols, Transport Layer Security, Electronic Mail Security, IP Security.

Duration: 3 hours	Max Marks: 80

mtc-102High Performance Computing

Introduction to Grid Architecture Characteristic, standard bodies, Grid types, Topologies, Components and Layers, Comparison with other approaches System Infrastructure, traditional paradigms for distributed computing, web services,

Grid standards: OGSA & WSRF, Semantic Grid & Autonomic Computing Metadata & Ontology in semantic web, Semantic Web Services, Layered Structure of Semantic Grid, Semantic Grid Activities, Autonomic Computing, computational grids, Data grids, architecture of Grid systems, Grid security infrastructure.

Grid Scheduling & Resource Management, scheduling paradigms, how scheduling works, review of Condor.

Introduction to Cloud Computing, Definition, Characteristics, Components, Cloud provider, SAAS, PAAS, IAAS / HAAS, and Others, Organizational scenarios of clouds, Administering & Monitoring cloud services, benefits and limitations

Virtualization&Cloud, virtualization characteristics, managing virtualization, virtualization in cloud, Virtualization desktop and managing desktops in the cloud and security issues Cloud Storage and Data Security Storage basics, Storage as a service providers, security, aspects of data security, data security mitigation, provider data and its security.

Duration: 3 hours	Max Marks: 80

mtc-103Wireless Ad hoc Network

Overview of Third Generation (3G) in wireless
Universal Mobile Telecommunication Service (UMTS), UMTS Service and Air interface, 3GPP network architecture, CDMA2000, TD-CDMA and TDSCDMA Technologies.

Evolution of 2.5G
Enhancement over 2G, GPRS and EDGE network services and architectures, traffic dimensioning, CDMA2000 (1XRTT), WAP and SMS, migration path from 2G to 2.5G to 3G

UMTS
UMTS basics, WCDMA interface, UTRAN architecture, establishment of UMTS speech cells, UMTS packet data (R99), high speech packet data handover and UMTS core network evolution

CDMA2000
Radio components, network structure packet data transport flow, radio network (IS-2000, 1XRTT), EVDO

TD-SCDMA
Architecture and code network, radio network, interface migration technique RAN Traffic planning.

TD-CDMA
Generic TD-CDMA architecture, code networks, radio network, interface migration technique RAN traffic planning

VoIP Technology
Basis of IP transport, VoIP challenge, H-323, session invitation protocol, distributed architecture and media gateway control, VoIP and SS7 VoIP quality of service.

Duration: 3 hours	Max Marks: 80

mtc-104Advance Data Mining

Introduction to data mining, DM techniques, issues and challenges in Dm, Applications, association rules, Prior, Partition, Pincer-Search, Dynamic Itemset counting, FP-tree growth, Incremental, Boder Algorithm

Clustering Techniques, portioning, k-Medoid algorithm, Hierarchical, categorical clustering algorithm, Decision tree, best split, splitting indices and criteria, decision tree construction algorithm, CART, ID3, C4.5, CHAID, Decision tree construction with presorting, rain Forest, approximate methods, Boat, Pruning Technique

Data mining using NN, web mining, temporal and spatial data mining.

Duration: 3 hours	Max Marks: 80

mtc-201Data Science with R

Introduction- Basic elements of R, data input and output, objects, attributes, number , vectors , array, matrix, lists,

Reading data from files , controls statements, loops , functions, R scripts, data science overviews, data visualisation using graphics in R, GGplot 2, File format of graphics output, introduction to hypotheses, types of hypothesis, data sampling, confidence and significance level, hypothesis tests, parametric test, non-parametric test,

Introduction to Regression Analysis, types of regression analysis, nonlinear regression, cross validation, principal component analysis, factor analysis, classification its types, linear, logistics , regression, support vector machine, k-nearest neighbour, Naïve Bayes classification, decision tree classification, random forest classification, evaluating classifier model, introduction clustering, clustering methods, association rules, Appriori algorithm

Duration: 3 hours	Max Marks: 80

mtc-202Advance Java

Servlet Structure, Servlet packaging, HTML building utilities, Lifecycle, Single Thread model interface, Handling Client Request: Form Data, Handling Client Request: HTTP Request Headers. Generating server Response: HTTP Status codes, Generating server Response: HTTP Response Headers, Handling Cookies, Session Tracking.

Overview of JSP Technology, Need of JSP, Benefits of JSP, Advantages of JSP, Basic syntax, invoking Java code with JSP scripting elements, creating Template Text, Invoking java code from JSP, Limiting java code in JSP, using JSP expressions, comparing servlets and JSP, writing scriptlets. Using Scriptlets to make parts of JSP conditional, using declarations, declaration example. Controlling the Structure of generated servlets: the JSP page directive, import attribute, session attribute, isElignore attribute, buffer and auto flush attributes, info attribute ,errorPage and is errorPage attributes, is Thread safe Attribute, extends attribute, language attribute, Including files and applets in JSP Pages, using java beans components in JSP documents

Java Beans & Annotations: Creating Packages, Interfaces, JAR files and Annotations. The core java API package, New Java Lang Sub package, Built-in Annotations.Working with Java Beans. Introspection, Customizers, creating java bean, manifest file, Bean Jar file, new bean, adding controls, Bean properties, Simple properties, Design Pattern events, creating bound properties, Bean Methods, Bean an Icon, Bean info class, Persistence ,Java Beans API.

JDBC: Talking to Database, Immediate Solutions, Essential JDBC program, using prepared Statement Object, Interactive SQL tool. JDBC in Action Result sets, Batch updates, Mapping, Basic JDBC data types, Advanced JDBC data types, immediate solutions.

Introduction to EJB, the Problem domain, Breakup responsibilities, CodeSmart, the Enterprise Java bean specification, components types, server side component types, session beans, message driven beans, entity beans, the Java Persistence Model, container services. Dependency injection, concurrency, instance pooling and caching, transactions, security, timers, naming and object stores, interoperability, Life Cycle callbacks, interceptors, platform integration. Definitions, naming conventions, coding the EJB, the contract, the bean Implementation class, out of Container Testing, Integration Testing.

Duration: 3 hours	Max Marks: 80

mtc-203Advance Computer Graphics

Three-Dimensional Object Representations:Polyhedra, OpenGL Polyhedron Functions, Curved Surfaces, Quadric Surfaces, Super quadrics, OpenGL Quadric-Surface and Cubic-Surface Functions, Blobby Objects, Spline Representations, Cubic-Spline Interpolation Methods, Bezier Spline Curves, Bazier Surfaces B-Spline Curves, B-Spline Surfaces,

Visible-Surface Detection Methods:Classification Of Visible –Surface Detection Algorithms, Back-Face Method, Depth-Buffer Method, A-Buffer Method, Scan-Line Method, BSP-Tree Method, Area-Subdivision Method, Octree Methods, Ray-Casting Method, Comparison of Visibility –Detection Methods, Curved Surfaces, Wire-Frame Visibility –Detection Functions.

Illumination Models and Surface- Rendering Methods:Light Sources, Surface Lighting Effects, Basic Illumination Models, Transparent Surfaces, Atmospheric Effects, Shadows, Camera parameters, Displaying light intensities, Halftone patterns and dithering techniques, polygon rendering methods, ray-tracing methods, Radiosity lighting model, Environment mapping, Photon mapping, Adding surface details, Modeling surface details with polygons, Texture mapping, Bump mapping,

Color models, color applications and Computer animation:Properties of light, Color models, Standard primaries and the chromaticity diagram, The RGB color model, The YIQ and related color models, The CMY and CMYK color models, The HSV color model, The HLS color model, Color Selection and applications.

Hierarchical modeling and Graphics file formats:Basic modeling concepts, Modeling packages, General hierarchical modeling methods

Duration: 3 hours	Max Marks: 80

mtc-204Machine Learning

Introduction: Well posed learning problems, Designing a Learning system, Perspective and Issues in Machine Learning.

Concept Learning: Concept learning task, Concept learning as search, Find-S algorithm, Version space, Candidate Elimination algorithm, Inductive Bias.

Decision Tree Learning: Decision tree representation, Appropriate problems for decision tree learning, Basic decision tree learning algorithm, hypothesis space search

Artificial Neural Networks: Introduction, Neural Network representation, Appropriate problems, Perceptions, Backpropagation algorithm.

Bayesian Learning: Introduction, Bayes theorem, Bayes theorem and concept learning, ML and LS error hypothesis, ML for predicting probabilities, , Naive Bayes classifier, Bayesian belief networks

Evaluating Hypothesis: Motivation, Estimating hypothesis accuracy, Basics of sampling theorem, General approach for deriving confidence intervals, Difference in error of two hypothesis, Comparing learning algorithms.

Instance Based Learning: Introduction, k-nearest neighbor learning, locally weighted regression, radial basis function, cased-based reasoning,

Duration: 3 hours	Max Marks: 80

mtc-301Mobile Application Development

Introduction to mobile communication and computing**:**, Introduction to mobile computing, Novel applications,limitations and GSM architecture, Mobile services, System architecture, Radio interface, protocols, Handover and security. Smart phone operating systems and smart phones applications

Fundamentals of Android Development: Introduction to Android., The Android SDK, Understanding the Android Software Stack, Installing the Android SDK, Creating Android Virtual Devices, Creating the First Android Project, Using the Text View Control, Using the Android Emulator, The Android Debug Bridge (ADB), Basic Widgets Understanding the Role of Android Application Components, Event Handling , Displaying Messages Through Toast, Creating and Starting an Activity, Using the Edit ext Control.

The Android Debug Bridge (ADB), basic widgets understanding the role of Android Application Components, event handling, displaying messages through toast, creating and starting an activity, using the Edit ext Control Building Blocks for Android Application Design, Laying Out Controls in Containers, utilizing resources and media

Using Selection Widgets and Debugging Displaying and Fetching Information Using Dialogs and Fragments Advanced, Android Programming: Internet, Entertainment, and Services, Implementing drawing and animations,displaying web pages and maps, communicating with SMS and emails, creating and using content providers: creating and consuming services, publishing android applications.

Duration: 3 hours	Max Marks: 80

mtc-302Advance Image Processing

Elements of Visual Perception, A Simple Image Formation Model, Basic Concepts in Sampling and Quantization, Representing Digital Images, Spatial and Gray-level Resolution, Zooming and Shrinking Digital Images,Some Basic Relationships Between Pixels, Linear and Nonlinear Operations.

Image Enhancement in the Spatial Domain: Some Basic Gray Level Transformations, Histogram Processing,Enhancement Using Arithmetic/Logic Operations, Basics of Spatial Filtering, Smoothing Spatial Filters, Sharpening Spatial Filters, Combining Spatial Enhancement Methods.

Image Enhancement in the Frequency Domain: Introduction to the Fourier Transform and the Frequency Domain,

Image Restoration: A Model of the Image degradation/Restoration process, Noise Models, Restoration in the Presence of Noise Only–Spatial Filtering, Periodic Noise Reduction by Frequency Domain Filtering, Inverse Filtering ,

Color Fundamentals: Color Models, Pseudocolor Image Processing, Basics of Full-Color Image Processing, Color Transformations, Smoothing and Sharpening, Color Segmentation, Noise in Color Images, Color Image Compression.

Wavelets and Multi-resolution Processing: Image Pyramids, Subband coding, The Haar Transform, Multi-resolution Expansions, Wavelet Transforms in one Dimension, Fast Wavelet Transform

Duration: 3 hours	Max Marks: 80

mtc-303Big Data Analysis

What is big data, why big data, data, data storage and analysis, comparison with other systems, rational database management system, grid computing, volunteer computing, convergence of key trends, unstructured data, industry examples of big data, web analytics, big data and marketing, fraud and big data, risk and big data, credit risk management, big data and algorithmic trading, big data and healthcare, big data in medicine, advertising and big data, big data technologies

Introduction to HADOOP – open source technologies, cloud and big data, mobile business intelligence, crowd sourcing analytics, inter and trans-firewall analytics.

Introduction to NoSQL, aggregate data models, aggregates, key-value and document data models, relationships, graph databases, schema less databases, materialized views, distribution models, shading, version, map reduce, partitioning and combining, composing map-reduce calculations.