Master of Computer Applications (MCA)
(Under Faculty of Science)
(Choice Based Credit System)

Part III

Semester V							
Sr. No	Subject Code	Subject Title	Internal Marks	External Marks	CP	Workload /Week	
						T	P
1	MCA51	Data Science	20	80	4	4	-
2	MCA52	Android Development with Kotlin	20	80	4	4	-
3	MCA53E	Elective-I i)Network Security ii)Big Data Analytics iii)Software Quality Assurance iv)Natural Language Processing	20	80	4	4	-
4	MCA54E	Elective-II i)E-Commerce ii)Business Intelligence iii)Start up Management iv)Entrepreneurship Development	20	80	4	4	
5	MCA56	Operation Research & Optimization Techniques	20	80	4	4	-
6	MCA5L1	LAB III (Data Science)		100	4	-	4
7	MCA5L2	LAB IV(Android Development with Kotlin)		100	4	-	4
8	MCA5IS	Industrial Seminar	50		2	2	-
		Total	150	600	30	22	08

Semester VI					
Sr. No.	Subject Code	Subject Title	Internal	External	CP
1	MCA61	Project Work	200	300	20

MCA51-Data Science

Internal Marks -20　　　　　　　External Marks-80　　　　　　　Theory-04 h/week

Course Objectives:

1) *Gain an in-depth understanding of Data Science processes, data wrangling, data exploration, data visualization, hypothesis building, and testing*
2) *Install the required Python environment and other auxiliary tools and Libraries*
3) *Gain expertise in Machine Learning using the Scikit-Learn package*
4) *Gain an in-depth understanding of supervised learning and*
5) *Use the matplotlib library of Python for data visualization*
6) *Gain an in depth understanding of Deep Learning*

Unit I　　　　　　　　　　　　　　　　　　　　　　　　　　　**(15 hours)**

Introduction to Data Science and Hadoop

Data Science, Big data Predictive Analysis, Data Mining, Soft computing Neural Network, Deep learning, Introduction to Machine learning, Hadoop Ecosystem, Installation, Components of the Hadoop ecosystem and learn to work with HBase, its architecture and data storage, learning the difference between HBase and RDBMS, MapReduce and its characteristics.

Unit II　　　　　　　　　　　　　　　　　　　　　　　　　　　**(15 hours)**

Machine Learning

Introduction to Artificial Intelligence and Machine Learning, Data Wrangling and Manipulation, Supervised Learning, Feature Engineering, Supervised Learning Classification, Unsupervised Learning,Time Series Modeling, Ensemble Learning Recommender Systems.

Unit III　　　　　　　　　　　　　　　　　　　　　　　　　　　**(15 hours)**

Data Science with Python

Data Collection Outlier Detection and Treatment Missing Value/NA Imputation Techniques Dividing Data into Training, Testing and Validation Sets. Mathematical Computing with Python (NumPy),Scientific Computing with Python (Scipy),Data Manipulation with Pandas, Machine Learning with Scikit–Learn, Data Visualization in Python using Matplotlib.

Unit IV　　　　　　　　　　　　　　　　　　　　　　　　　　　**(15 hours)**

Deep Learning

Introduction to Neural Networks Forward and backward propagation. Introduction to Deep Learning ,

Convolution Neural Network ,Recurrent Neural Network. Deep Learning with Keras /PyTorch: Setting up Project, Starting Jupyter, Importing Libraries and Creating Deep Learning Model.

Reference Books

1. Lars George, HBase: The Definitive Guide, O'Reilly.
2. Hari Shreedharan, Using Flume Flexible, Scalable, and Reliable Data Streaming, O'Reilly Media
3. Kord Davis, Ethics of Big Data: Balancing Risk and Innovation, O'Reilly.
4. Tom White, Hadoop – A Definitive Guide, O'Reilly.
5. Data Mining: Practical Machine Learning Tools and Techniques, Ian H. Witten, Eibe Frank
6. Goodfellow, I., Bengio, Y., Courville, A., & Bengio, Y. (2016). Deep learning (Vol.1). Cambridge: MIT press.
7. Deep Learning with Python, François Chollet

Semester-V

MCA52-Android Development with Kotlin

Internal Marks -20   External Marks-80   Theory-04 h/week

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Course Outcomes
1. *Comprehend Kotlin language*
2. *Understand Android Studio Environment and application structure.*
3. *Demonstrate different layouts, views, activities and intents*
4. *Design good user interface for the application.*
5. *Able to store, retrieve and load data*
6. *Demonstrate programming skills using Kotlin*

Unit I   (15 hours)
Introduction to Kotlin
Kotlin basics: Introduction to Kotlin, Benefits of using Kotlin, Use Kotlin REPL to practice basic expressions, Control flow statements in Kotlin, Null safety with Kotlin. **Functions:** Creating and calling functions with default and named arguments, Writing concise and compact functions, Passing functions as arguments to other functions, Writing simple lambdas.

Classes and Objects: Introduction to object-oriented programming in Kotlin, Classes and objects in Kotlin, Constructors, Visibility modifiers, Subclasses and inheritance, Interfaces, Data classes, Singleton class enums, Pairs, triples and collections in Kotlin, Extensions in Kotlin

Unit II   (15 hours)
Introduction to Android
Buildind first Android app: Installing Android Studio, Creating an Android app project, Deploying the app to an emulator or a device, Building an Android app that contains images and a click handler, Modifying views within the layout of an app, Adding libraries to module gradle file. **Layouts:** Creating layouts in Android Studio using XML and the Layout Editor, Adding interactivity to your app, Working with ConstraintLayout, Data binding basics

App Navigation: Creating Fragments, Defining NavHostFragment, navigation graphs, navigational paths, Functionality of Back and Up buttons, Defining the options menu, Creating a navigational drawer, Using the Safe Args plugin and passing of arguments, Starting an external Activity.

Unit III   (15 hours)
Android Application Architecture
Activity and Fragment Lifecycles: Understanding Activity and Fragment Lifecycles, Exploring logging options in your app, Using the Android Lifecycle library, Exploring configurationchanges

App Architecture (UI Layer): Using the recommended Android App Architecture, Using the LifeCycle, ViewModel,and ViewModelFactory classes, Adding LiveData and LiveData, observers, Adding Data Binding with ViewModel and LiveData, Adding LiveData, transformations

App Architecture (Persistence): Overview of Room Persistence Library, Introduction to coroutines, **Advanced RecyclerView use cases:** Introduction to RecyclerView Fundamentals,

Implementing data binding with RecyclerView, Using GridLayout with RecyclerView, Interacting with RecyclerView items, Adding headers in RecyclerView

Unit IV   **(15 hours)**
Connect to the Internet and App Design
Connect to the Internet: Connecting to a web service with the Retrofit library, Parsing a JSON response with the Moshi library, Using coroutines with Retrofit ,Loading and displaying images from the Internet, Filtering data from the Internet.

Repository pattern and WorkManager: Adding an offline cache and repository, Implementing WorkManager, Working with background workers and periodic WorkerRequest

App UI Design: Introduction to basic app design, Understanding Styles and Themes, Implementing Material Design, Designing for everyone

Reference Books:

1. https://developer.android.com/kotlin
2. https://developer.android.com/kotlin/getting-started-resources
3. Kotlin for Android Developers: Learn Kotlin the Easy Way While Developing an Android App by , Antonio Leiva (Free ebook)
4. Learn Android Studio 3 with Kotlin: Efficient Android App Development by, Ted Hagos, Apress publisher.
5. https:// www.shabakeh-mag.com/sites/default/files/files/attachment/1397/04/1530550032.pdf

MCA (Choice Based Credit System)

(Under Faculty of Science)

(Introduced from June 2021)

To be implemented from the academic year 2021-2022

Semester-V

MCA53E.1-Network Security

Internal Marks -20   External Marks-80   Theory-04 h/week

Course Outcomes

1. *Understand network security architecture and classical encryption techniques.*
2. *Describe the principles of cryptosystems, hash functions and digital signature.*
3. *Explore and apply layered security for TCP/IP model*
4. *Learn necessary approaches and techniques to build protection mechanisms in order to secure computer networks*

Unit I   **(15 hours)**

Block Ciphers & Cryptography

Introduction to Network Security, Security Architecture, Principles of Cryptography, Symmetric Key Cryptography, Data Encryption Standard, Block Cipher Principles, Block Cipher Modes, Advanced Encryption Standard, Public Key Cryptography, RSA Algorithm, Key management, Key Distribution and Certification,

Unit II   **(15 hours)**

Authentication Algorithms and Integrity Checks

Authentication Requirement, Authentication Functions, Types of Authentication, Message Authentication Code (MAC), Authentication Protocols, Hash function, Message Digest (MD5) Algorithm, Secure Hash Algorithm, Data Integrity, Message Integrity, Non-Repudiation, Digital Signature.

Unit III   **(15 hours)**

Security Practice & System Security

Authentication Applications, Kerberos, X.509, Authentication Services, Internet Firewalls, Types of Firewalls, Firewall Designs, Secure Electronic Transaction (SET) Protocol, Intrusion Detection System, Virus and related Threats – Countermeasures, Firewalls Design Principles, Trusted systems, Security Policies

Unit IV   **(15 hours)**

Electronic Mail, IP & Web Security

Electronic Mail Security, Attacks and Countermeasures, Pretty Good Privacy, S/MIME, Securing TCP Connections, Secure Sockets Layer, Network Layer Security, IP Security, IP and IPv6 Authentication Header, Encapsulation Security Payload (ESP), Internet Key Exchange, Web Security, SSL/TLS Basic Protocol, Securing Wireless LANs

Reference Books:

1. Williams Stallings, Cryptography and Network Security - Principles and Practices, Prentice Hall Publication, 4th Edition, 2005
2. James F. Kurose and K. W. Ross, Computer Networking: A Top Down Approach, Pearson, 5th Edition 2013
3. Michael E Whitman and Herbert J Mattord, Principles of Information Security, Vikas Publishing House, 4th Edition, 2003
4. Tanenbaum, A.S., Computer Networks, Prentice Hall of India Pvt. Ltd, 4th Edition, 2005
5. Douglas E. Comer, Computer Network and Internets with Internet Applications, Pearson Education Inc., 4th Edition, 2004
6. Kaufman C., Perlman R. and Speciner, M., Network Security, Private Communication in a public world, Prentice Hall PTR., 2nd Edition, 2002.

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Semester-V

MCA53E.2-Big Data Analytics

Internal Marks -20   External Marks-80   Theory-04 h/week

Course Outcomes:

1. *Understanding of Big Data for Business Intelligence*
2. *Understanding different tools for Big Data Analytics.*
3. *To study issues relating Big Data Security.*
4. *Learn end to end skills of Big data Analytics*

Unit I   **(15 hours)**

Introduction to Big Data.
Definition of Big Data, Sources of Big Data, Characteristics of Big Data, Harnessing Big Data, Real time data processing, Structure of Big Data, Need of Big Data Management, Big Data life Cycle and processing, Concepts in Data Warehousing and its Relevance for Big Data. Applications of Big Data, Benefits of Big Data Management.

Unit II   **(15 hours)**

NoSQL Databases for Big Data: Introduction to NoSQL, aggregate data models, aggregates, key-value and document data models, relationships, graph databases, schema less databases, materialized views, distribution models, sharing, master-slave replication , peer-peer replication , sharding and replication . Introduction to HBase, MongoDB, Executing queries with MongoDB.

Unit III   **(15 hours)**

Big Data Analytics Tools.Introduction to HDFS, HDFS operations. Features, Architecture, Components of Hadoop, Hadoop daemons. Cluster capacity planning, Hadoop cluster setup and administration.MapReduce - Map-Reduce Architecture, Writing Map-Reduce program, Examples of Map-Reduce.Pig - architecture, Pig data types, Defining schema, Reading and storing data through Pig ,Hive-Introduction, Hive Vs RDBMS, Data Base Operations in Hive.

Unit IV   **(15 hours)**

Big Data Security, Security concerns with Hadoop, Hadoop Security Challenges and threats, Hadoop security best practices, Hadoop Kerberos Security Implementation & Configuration, Securing Sensitive Data in Hadoop Setting up audit logging in Hadoop cluster, Data encryption in Hadoop Ranger- Provide authentication, authorization and data protection.

Reference Books:

1. Boris lublinsky, Kevin t. Smith, Alexey Yakubovich, "Professional Hadoop Solutions", Wiley, ISBN: 9788126551071, 2015.

2. Tom White, Hadoop: The Definitive Guide, O'Reilly, 3rd edition Dirk Deroos, Hadoop for Dummies, wiley

3. Alex Holmes, Hadoop in Practice, manning 1 st edition.

4. Alan Gates, Programming Pig, O'Reilly

6. Chris Eaton, Dirk deroos et al. , "Understanding Big data ", McGraw Hill, 2012.

7. Tom White, "HADOOP: The definitive Guide" , O Reilly 2012. 6 IT2015 SRM(E&T)

8. VigneshPrajapati, "Big Data Analytics with R and Haoop", Packet Publishing 2013.

9. Tom Plunkett, Brian Macdonald et al, "Oracle Big Data Handbook", Oracle Press, 2014.

10. http://www.bigdatauniversity.com/ 7. JyLiebowitz, "Big Data and Business analytics",CRC press, 2013.

11. GazzangforHadoop http://www.cloudera.com/content/cloudera/en/solutions/enterprisesolutions /security-for-hadoop.html

12. Eric Sammer, "Hadoop Operations", O'Reilley, 2012.

13. HADOOP SECURITY :TODAY AND TOMORROW http://www.cloudera.com/content/cloudera/en/solutions/enterprisesolutions /security-for-hadoop.html

MCA53E.3-Software Quality Assurance

Internal Marks -20	External Marks-80	Theory-04 h/week

Course Outcome:
1. *To understand quality management processes.*
2. *To understand Distinguish between the various activities of quality assurance, quality planning and quality control.*
3. *To understand the importance of standards in the quality management process and their impact on the final product.*
4. *To understand SQA processes from planning until execution*

Unit I (15 hours)

Software Projects: Understanding Software Projects, Software Project management, Software Development Life cycle, Typical Software roles and responsibilities, Components, Review of Models for Software Development **Project Planning:** Planning process, definition, estimation, testing strategy, team members, organization structure, database, capability baseline, quality objectives, Project Management Plan.**Software Quality & Metrics:** Understanding quality, definitions, attributes of measures, metrics for Software Quality, integrating metrics within software process, metrics for small organization, establishing metric program, estimation observation, planning process, scope and feasibility, resources, project estimation, decomposition technique, Metrics for different types of projects.

Unit II (15 hours)
Project Monitoring & Control: Project Control, effort data, Monitoring and Control, Quantitative techniques, Monitoring Process, Tools and techniques, Example of Monitoring, Data collection, Piloting **Configuration Management:** Introduction, Process, Audit **Software Project Audit:** Introduction, Quality, Quality Principles, Quality Attributes IT, Quality Assurance, Process Definition Life Cycle, Quality Audits, Quality Assurance vs Quality Control

Unit III (15 hours)
Risk management and management Process, Enterprise Risk database, Reactive vs. Proactive risk strategies, software risk, risk identification risk refinement, risk mitigation. **Acquiring Software Projects:** Outsourcing a project, processes involved in award of a project contract, best practices in writing a proposal, RFP, RFI, SOW **Benchmarking:** Introduction, Types of benchmarking, **CMMI and SPM:** Introduction, CMMI framework, Process area, levels of CMMI, Standard CMMI method for appraisal, CMMI adoption, CMMI vs CMM

Unit IV   **(15 hours)**

Project Management in Maintenance Projects: Introduction, Software Project Maintenance Life Cycle, Process, estimation, Configuration management, Metrics, Defect prevention, Issues.

Software Testing and Maintenance : Foundations of Testing, Software techniques, Levels of software testing, Software testing Development Life Cycle Test Planning, Test Design and Implementation, Testing Network Management Systems, Web Based Testing, Testing Object-Oriented systems, Test Execution and Measurement, Management Issues for Software Quality, Software Testing Types: Unit, Integration, & System, Benchmarking and Certification, Control flow & loop testing, Data-flow testing, Transaction flow testing, Domain testing, Coverage vs. usage based testing, Software Reuse, Software Aging, Product Enhancement, Reverse Engineering, Reengineering Method, Architectural Simplification. **Software Testing Tools:** Test case Generation Methodology, Study of various Testing Tools (Win Runner, Load Runner), Automatic Testing Tool

Reference Books:

1. Software Project Management, Sanjay Mohapatra, Cengage Learning
2. Software Project Management in Practice, Pankaj Jalote, Pearson
3. Project Management – Core text Book, Mantel "et al"., Wiley
4. Software Engineering: A practical Approach, Roger S. Pressman, McGraw-Hill
5. Software Testing Concepts and Tools, Nageswara RaoP usuluri, DreamTech

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(Introduced from June 2021)

To be implemented from the academic year 2021-2022

Semester-V

MCA53E.4 –Natural Language Processing

Internal Marks -20	External Marks-80	Theory-04 h/week

Course Outcomes

1. *Understand Vocabulary Matching and ultra-fast tokenization modules with Spacy.*
2. *Develop pattern matching modules using Stemming and Lemmatization*
3. *Apply POS tagging and NER for finding patterns.*
4. *Apply SciKit-Learn for Text Classification*
5. *Analyze Sentiment with NLTK and understand semantics.*

Unit I (15 hours)

Natural Language Processing (NLP) Basics: Introduction, NLP Phases, Corpus, regular expression, Spacy – Setup, Overview, Spacy Basics, Tokenization, Stemming, Lemmatization, stop words, phrase matching and vocabulary, project to extract most common words from a story.

Unit II (15 hours)

Part of Speech (POS) Tagging and Named Entity Recognition (NER): Introduction to POS and NER, part of speech tagging- Rule-Based and Stochastic, Named Entity Recognition, Sentence Segmentation, A project on Finding patterns in speeches.

Unit III (15 hours)

Text Classification: Introduction to Text Classification, Machine Learning Overview, Classification Metrics, Confusion Matrix, Scikit-Learn Primer, Text Feature Extraction, Text Classification. Simple projects like creating word clouds, email Spam Detection.

Unit IV (15 hours)

Semantics and Sentiment Analysis: Introduction to Semantics and Sentiment Analysis, Elements of Semantic Analysis, Semantics and Word Vectors, Semantics and Word Vectors with Spacy, Sentiment, Analysis, Sentiment Analysis with NLTK, Movie Review Project using Sentiment Analysis Code.

Reference Books:

1. Natural Language Processing with Python– Analyzing Text with the Natural Language Toolkit, Steven Bird, Ewan Klein, and Edward Loper.
2. Hands-On Natural Language Processing with Python: A Practical Guide to Applying Deep Learning Architectures to Your NLP Applications, Rajalingappaa Shanmugamani and Rajesh Arumugam
3. Speech and Language Processing, Daniel Jurafsky and James H. Martin
4. Handbook of Natural Language Processing, Frederick J. Damerau, NitinIndurkhya

MCA54E.1-E-Commerce

Internal Marks -20   External Marks-80   Theory-04 h/week

Course Outcomes

1. *Understand architecture and business models of E-commerce*
2. *Discuss types and working of E-Payment system*
3. *Understand E-commerce security techniques*
4. *Discuss working of web based marketing and issues in E-commerce*

Unit I   **(15 hours)**

Introduction to Electronic Commerce, Meaning, nature and scope; channels of e-commerce, Business applications of e-commerce, Traditional commerce vs. E-commerce, Business model of ecommerce: B2B, B2C, C2C, B2G and other models of ecommerce

Anatomy of E-Commerce Applications – E-Commerce Consumer & Organization Applications- E- Commerce and World Wide Web, Internet Service Providers – Architectural Framework for Electronic Commerce, WWW as the Architecture- Hypertext publishing.

Unit II   **(15 hours)**

Electronic Payment Systems – Types of Electronic Payment System, e-cash and currency servers, Digital Token Based Electronic Payment System – e- cheques, credit card, and electronic purses debit cards Smart Cards – Credit Cards, Risk in Electronic Payment Systems, Designing Electronic Payment Systems, Electronic Data Interchange, Traditional EDI system ,Data transfer and standards, EDI system and the Internet, Impact of EDI-Internet application on the accounting profession, EDI Applications in Business, EDI implementation, MIME, and value added networks Work flow automation and Coordination, Customization and Internal Commerce, Supply Chain Management (SCM).

Unit III   **(15 hours)**

Security issues in e-commerce: Security risk of e-commerce, type and sources of threats; protecting the electronic commerce assets and intellectual property; client server network security; data and message security; digital identification and electronic signature, Secure Socket Layer (SSL), PCI, SET.

Threats in Computer Systems: Virus, Cyber Crime Network Security, encryption approach to e commerce security, Key management, additional authentication methods, additional non-repudiation techniques, Protecting Web server with a Firewall, Firewall and the Security Policy, Network Firewalls and Application Firewalls, Proxy Server.

Unit IV   **(15 hours)**

Corporate Digital Library – Document Library, Digital Document Types, Corporate Data Warehouse, Advertising and Marketing – Information based Marketing, Advertising on Internet, On-Line Marketing Process, and Market Research. Web-Based marketing -On-line advertising mechanisms, Web Site design issues, Intelligent agents and their impact on marketing techniques.

Understanding Ethical, Social and Political issues in E-Commerce: A model for Organizing the issues, Basic Ethical Concepts, Analysing Ethical Dilemmas, Candidate Ethical principles Privacy and Information Rights: Information collected at E-Commerce Websites, The Concept of Privacy, Legal protections Intellectual Property Rights: Types of Intellectual Property protection, E-Governance.

Reference Books:

1. Supply Chain Management - Strategy, Planning & Operation by Sunil Chopra, Peter Meindl, D. V. Kalra, Pearson Education.
2. Management Information Systems by Jaiswal and Mittal, Oxford University Press
3. e-Commerce A Manager's Guide to e-Business by ParagDiwan& Sunil Sharma
4. Elias. M. Awad, "Electronic Commerce", Prentice-Hall of India Pvt Ltd.
5. Ravi Kalakota, Andrew B. Whinston, "Electronic Commerce-A Manager's guide", Addison-Wesley.
6. Efraim Turban, Jae Lee, David King, H.Michael Chung, "Electronic Commerce–A Managerial Perspective", Addison-Wesley.
7. Elias M Award, "Electronic Commerce from Vision to Fulfilment", 3rd Edition, PHI, Judy Strauss, Adel El-Ansary, Raymond Frost, "E-Marketing", 3RDEdition, Pearson Education.
8. Electronic commerce By Greenstein and Feinman - Tata McGraw-Hill
9. E-commerce   By   BhushanDewan   -   S.   Chand
   16. Introduction to Computers - Peter Norton's – TMH (4th Ed.)
10. E-Business: A beginners Guide ByElsenpeter - Tata McGraw-Hill
11. E-Commerce: The cutting Edge of Business by Bajaj & Nag - Tata McGraw-Hill
12. E-Commerce by Deepak Goel - S. Chand
13. E-Commerce, Business on the Net by KamleshAgarwal, McMillan.

Semester-V

MCA54E.2-Business Intelligence

Internal Marks -20　　　　　　　External Marks-80　　　　　　Theory-04 h/week

Course Outcome:

1. *Understand various concepts and tools behind data warehousing and mining data for business intelligence*
2. *Discuss ETL tools & techniques for business data modelling.*
3. *Understand data analytics and reporting tools used for business intelligence.*
4. *Demonstrate BI tools and applications.*

Unit I　　　　　　　　　　　　　　　　　　　　　　　　　　　**(15 hours)**

Concept of Data, Information, and Knowledge, Design and implementation aspect of OLTP, Introduction to Business Intelligence and Business Models, BI Definitions & Concepts, Business Applications of BI, BI system components, Effective and timely decisions, The role of mathematical models, Business intelligence architectures, Ethics and business intelligence. Types of BI Users. Design and implementation aspect of OLAP, Difference between OLAP and OLTP, Components of Data Warehouse Architectures, Role of DW in BI.Difference between business intelligence & data analytics.

Unit II　　　　　　　　　　　　　　　　　　　　　　　　　　　**(15 hours)**

Data Quality, Data profiling, Data enrichment, data duplication, ETL Architecture and what is ETL, Extraction concept and Change data capture, Transformation concept, lookups, time lag, formats, consistency, Loading concept, Initial and Incremental loading, late arriving facts, What is Staging, Data marts, Cubes, Scheduling and dependency matrix. Data preparation, Prediction methods-Mathematical method, Distance methods, Logic method, heuristic method-local optimization technique,Star schema, Snow flake schema, and Fact Constellation schema, Dimensions - Slowly Changing Dimensions (SCD) types, conformed dimensions), Clickstream Source Data (Google Analytics as a Clickstream Data Source), Facts (additive, semi-additive, non-additive), Hierarchy in dimensions, parent child relationships, Many-Many Dimensional relationship, Multi Valued Dimensions and Dimension Attributes.

Unit III　　　　　　　　　　　　　　　　　　　　　　　　　　　**(15 hours)**

Data visualization-Concept, methods, Exploratory and statistical techniques:- Cluster analysis, Analytics concepts and use in Business Intelligence, Predictive analysis :- Regression, Time series, Data Mining :- Hierarchical clustering, Decision tree Text analytics :- Text mining, In-Memory Analytics and In-DB Analytics, Web mining, Case study: Google Analytics.

Metadata Layer, Presentation Layer, Data Layer, Use of different layers and overall Reporting architecture, Various report elements such as Charts, Tables, prompts Data aggregation: Table based, Materialized views, Query rewrite, OLAP, MOLAP, Dashboards, Ad-hoc reports, interactivity in analysis (drill down, drill up), Security: report level, data level (row, column),Scheduling.

Unit IV　　　　　　　　　　　　　　　　　　　　　　　　　　　**(15 hours)**

BI Tools- Introduction of Tableau, Installation, Connect To data, Data Visualization using Tableau- Chart,

graphs, advanced functionalities-Filters, Drill Down &Up, Forecasting, Trend Lines, Clustering, Creating Dashboard using Tableau, story, End Notes. Big data like HIVE, PIG and DW appliances like Netezza Teradata, and Smart Change data capture using log based techniques, Real time BI, Operational BI, Embedded BI, Agile BI, BI on cloud, Trend in BI. Advantages and limitations of BI, Application of BI.

Reference Books:

1. William Inmon, "Building the Data Warehouse", Wiley publication 4th edition.
2. Efrem G. Mallach, "Decision Support and Data Warehouse Systems", 1st Edition Publisher: Tata McGraw-Hill Education, ISBN-10: 0072899816.
3. 3. Efraim Turban, Ramesh Sharda, DursunDelen, David King, "Business Intelligence", ISBN-10: 013610066X Publisher: Prentice Hall.ISBN-13: 9780136100669.
4. Dorian Pyle, "Business Modeling and Data Mining", Elsevier Publication MK.
5. Ralph Kimball, Margy Ross, "The Data Warehouse Toolkit", 3rd edition, Publisher: Wiley
6. Business Intelligence data mining and optimization for decision making- by Carlo Vercellis ,wiley publication.
7. Adaptive business Intelligence by ZbigniewMichlewicz, martin Schmidt, matthewmichalewicz, constantinChiriac
8. Data Mining concepts and techniques second edition by Jiawei Han and MichelineKamber.
9. Data Mining: Introductory and Advanced topics, Pearson Education, by M.Dunham
10. Data warehousing Fundamentals by PaulrajPonnian, John Willey
11. Data mining for Business intelligence: concepts, techniques and applications in Microsoft Excel by G. Shumeli, N R Patel, P.C Bruce, Wiley
12. Learning Tableau- Joshua N.Milligan
13. Tableau 10 for Bigginer- ChandraishSinha, OHIO Computer Academy
14. Tableau 10 Busines Intelligence Cookbook, Donabel Santos

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Semester-V

MCA54E.3 –Startup Management

Internal Marks -20   External Marks-80   Theory-04 h/week

Course Outcomes
1. *Understand Startup opportunities*
2. *Apply Legal and other requirements for new ventures*
3. *Analyze Financial Issues of start-ups*
4. *Develop Sustainability and growth of start-ups*
5. *Understand Exit strategies*

Unit I   **(15 hours)**

Entrepreneurship and Startup opportunities: Characteristics of an Entrepreneur, Distinction Between an Entrepreneur and a Manager, Functions of an Entrepreneur, Types of Entrepreneurs, Concept of Entrepreneurship, Entrepreneurial Process, Growth of Entrepreneurship in India, The New Industrial Revolution, Generate Startup Ideas with Brainstorming, The Rise of The startup Economy, Government Initiatives.

Unit II   **(15 hours)**

Small Enterprises: Definition, Characteristics, Relationship with Large Units, Scope of Small Enterprises, Opportunities for an Entrepreneurial Career, Role of Small Enterprises in Economic Development, Their Problems, Project Identification and Selection, Project Formulation, Project Appraisal, Ownership Structures.

Unit III   **(15 hours)**

Starting up Financial Issues: Feasibility Analysis, The cost and process of raising capital, Unique funding issues of a high-tech ventures, Funding with Equity, Financing with Debt, Funding startups with bootstrapping, crowd funding, strategic alliances.

Unit IV   **(15 hours)**

Startup Survival and Growth: Stages of growth in a new venture, Growing with the market, Growing within the industry, Venture life patterns, Reasons for new venture failures, Scaling Ventures, preparing for change, Leadership succession, Support for growth and sustainability of the venture.

Reference Books:

1. Kathleen R Allen, Launching New Ventures, An Entrepreneurial Approach, Cengage Learning, 2016.
2. AnjanRaichaudhuri, Managing New Ventures Concepts and Cases, Prentice Hall International, 2010.
3. S.R. Bhowmik and M. Bhowmik, Entrepreneurship, New Age International, 2007.
4. Steven Fisher, Ja-nae Duane, The Startup Equation -A Visual Guidebook for Building Your Startup, Indian Edition, McGraw Hill Education India Pvt. Ltd, 2016.
5. Donald F Kuratko, Jeffrey S. Hornsby, New Venture Management: The Entrepreneurs Road Map, 2e, Routledge, 2017.
6. Vijay Sathe, Corporate Entrepreneurship, 1e, Cambride, 2009.
7. Bruce R. Barringer, R.Duane Ireland, Entrepreneurship successfully, launching new ventures.Pearson,2019

MCA54E.4 –Entrepreneurship Development

Internal Marks -20   External Marks-80   Theory-04 h/week

Course Outcomes
1. *To understand basic concepts in area of entrepreneurship.*
2. *To understand the necessary knowledge and skills required for organizing and carrying out*
1. *Entrepreneurial activities.*
2. *To understand the key steps in elaboration of business idea.*
3. *To understand the stages of entrepreneurial process and the resources needed for successful*
4. *development of entrepreneurial ventures.*

Unit I   **(15 hours)**

Introduction to Entrepreneur and Entrepreneurship Development

The Entrepreneur: Definition and Concept, Entrepreneurial Traits Characteristics and Skill, Classification of Entrepreneurs, Entrepreneur vs Professional Managers, Women Entrepreneurs, Growth of Entrepreneur, Nature and Importance of Entrepreneurs, The Entrepreneurial Culture,
The Concept of Entrepreneurship, Theories of Entrepreneurship, Entrepreneurship Environment, Entrepreneurship Development, Entrepreneurship Training.

Unit II   **(15 hours)**

Creating and Starting the Venture

Generating business idea – sources of new ideas, methods of generating ideas, opportunity recognition. Feasibility study – market feasibility, technical/operational feasibility, financial feasibility,environmental scanning, competitor and industry analysis. Drawing business plan - preparing project report, presenting business plan to investors.

Unit III   **(15 hours)**

Micro, Small and Medium Enterprises

Concept, role and importance of MSME, Policies governing SMEs   -   Steps in setting up a small unit. SME funding - Requirements of capital (fixed and working), Factors determining capital requirements, Importance of fixed and working capital, Sources of finance for SME'S.

Unit IV   **(15 hours)**

Entrepreneur Development and Government

Role of Central Government and State Government in promoting Entrepreneurship – Introduction to various incentives, subsidies and grants.Role of following agencies in the Entrepreneurship Development - District Industries Centers (DIC),Small Industries Service Institute (SISI), NABARD, National Small Industries corporation and other relevant institutions / organizations.

Reference Books:

1. Dynamics of Entrepreneurship Development - Vasant Desai
2. Entrepreneurship: New Venture Creation - David H. Holt
3. Entrepreneurship - Hisrich Peters
4. The Culture of Entrepreneurship - Brigitte Berger
5. Entrepreneurship Development - Dr. P.C.Shejwalkar
6. Thought Leaders - ShrinivasPandit
7. Entrepreneurship - Steven Brandt
8. Business Gurus Speak - S. N. Chary
9. The Entrepreneurial Connection – Gurmit Narula

MCA56 - Operation Research & Optimization Techniques

Internal Marks -20   External Marks-80   Theory-04 h/week

Course Outcomes

1. *To formulate a real-world problem as a mathematical programming model.*
2. *To learn effective project management and planning of resources and to make optimal*
1. *utilization of resources.*
2. *To solve specialized linear programming problems like the transportation, assignment,*
3. *game problems.*

Unit I   **(15 hours)**

Operation Research

Overview of Operation Research: Introduction, Origin and Development of Operation Research, Operation Research and Decision Making, Methodology of Operation Research, Applications Operation Research

Unit II   **(15 hours)**

Linear Programming Problems (LPP)

Introduction to LPP: Concept and Definitions of some terms, Mathematical Formulation of LPP and Duality in LPP, Graphical Solution to LPP, Simplex Method and Big-M method, Illustrative Examples

Unit III   **(15 hours)**

Transportation Problem

Transportation Problem (TP) – Introduction, Mathematical Formulation of TP, Solution of TP: North-west corner rule, Least cost method, Vogel's Approximation Method (VAM), Transportation Algorithm (MODI – Method), Illustrative Examples

Unit IV   **(15 hours)**

Assignment Problem and Game Theory

Assignment Problem (AP) – Introduction, Mathematical Formulation of AP,Solution of AP: Hungarian Assignment Method,Game Theory: Introduction, Two-Person zero-sum Games and Minimax-Maximin Principle, Illustrative Examples

Reference Books:

1. Hadley G.(1969): Linear Programming, Addison Wesley
2. Taha H. A. (1971): Operation Research: An Introduction, Macmillan N.Y.
3. KantiSwaroop& Gupta M. M.(1985): Operations Research, Sultan Chand & Co. ltd.
4. P.Gupta&D.S.Hira(2010): Operation Research, Sultan Chand & Co. ltd.
5. J. K. Sharma. (2003): Operation Research: Theory and Applications. Macmillan.

MCA (Choice Based Credit System)

(Under Faculty of Science)

(Introduced from June 2021)

To be implemented from the academic year 2021-2022

Semester-V

MCA5L1 – Data Science

External Marks-100   Theory-04 h/week

Programs based on the syllabus MCA51- Data Science.

MCA (Choice Based Credit System)

(Under Faculty of Science)

(Introduced from June 2021)

To be implemented from the academic year 2021-2022

Semester-V

MCA5L2 – Android Development with Kotlin

External Marks-100   Theory-04 h/week

Programs based on the syllabus MCA52- Android Development with Kotlin.

MCA (Choice Based Credit System)

(Under Faculty of Science)

(Introduced from June 2021)

To be implemented from the academic year 2021-2022

Semester-V

MCA51S – **Industrial Seminar**

Internal Marks-50   Theory-02 h/week

Seminar based on latest trends of computer science.

MCA61- Project Work

Project Work: At the end of the sixth semester of study, a student will be examined in the course "Project Work".

1. Project work may be done individually or in groups in case of bigger projects. However if project is done in groups, each student must be given a responsibility for a distinct module and care should be taken to see the progress of individual modules is independent of others.
2. Students should take guidance from an internal guide and prepare a Project Report on "Project Work" in 2 copies.
3. The Project Report should contain an Introduction to Project, which should clearly explain the project scope in detail. Also, Data Dictionary, DFDs, ERDs, File designs and a list of output reports should be included.
4. The project report will be duly accessed by the internal guide of the subject and internal marks will be given by internal guide.
5. The project report should be prepared in a format prescribed by the University, which also specifies the contents and methods of presentation.
6. The major project work carries 200 marks for internal assessment and 300 marks for external viva. The external viva shall be conducted by a panel of minimum of two examiners out of which one will be external and other will be internal.
7. Project work can be carried out in the Institute or outside with prior permission of the Institute.
8. Project viva-voce by the University panel will be conducted at the end of the semester