# SNDT Women's University, Mumbai

## Master of Computer Application in Management
## (MCA - M)

*as per NEP-2020*

# Syllabus

## (2023-25)

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|---|---|---|
| Programme<br><br>Degree<br><br>e.g.<br><br>M.A./M.Com./M.Sc./ M.M.S., etc. | | Master of Computer Applications in Management<br><br>MCA in Management |
| Parenthesis if any (Specialization)<br><br>e.g. History, Human Development, English, etc. | | |
| Preamble (Brief Introduction to the programme) | | The name of the programme - Masters of Computer Applications in Management (MCA – M)<br><br>▪ The revised MCA – M Curriculum 2020 builds on the implementation of the Choice Based Credit System (CBCS) and Grading System in alignment with NEP 2020. The curriculum takes the MCA –M programme to the next level in terms of implementing Outcome Based Education along with the Choice Based Credit System (CBCS) and Grading System.<br>▪ The programme will be of 88 credits, i.e., 22 credits per semester for four semesters.<br>The objective of the programme is to provide student with opportunities to pursue a career in industry or entrepreneurship acquiring knowledge, skills and attitudes that give a strong foundation for holding competent and responsible executive positions. The curriculum has been designed to enable the student to develop a thorough knowledge of the basic concepts and techniques for understanding computer applications and devising effective IT, Technology, Management strategies. Further, it aims to enable the student to develop analytical, decision-making and Techno managerial skills required for the industry and be ready to contribute and manage the various IT/Managerial functions ranging from Office management-business, Techno base distribution management, and strategic planning in the current hypercompetitive world.<br><br>• At the end of each semester, appearing for various certifications is possible for each student enabling them to make their resume rich. |

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| Programme Outcomes (POs)<br><br>*Action Verbs demonstrating (Major) discipline-related knowledge acquisition, mastery over cognitive and professional, vocational skills are to be used*<br><br>*E.g. demonstrate sound understanding of.., analyse, compare, create, design, etc…*<br><br>*(minimum 5)* | | After completing this programme, Learner will |
| | 1. | Ability to apply computing fundamentals, specialization, mathematics, and domain knowledge to abstract and conceptualize models, solve complex problems, and use research-based methods. |
| | 2. | Develop and adapt methodologies, resources, and modern tools for complex computing activities, considering public health, safety, cultural, sociological, and environmental factors in designing solutions. |
| | 3. | Understand and commit to professional ethics and cyber regulations, responsibilities, and norms of professional computing practice. |
| | 4 | Develop independent study skills for career advancement in computing; effectively communicate complex tasks to the community and the public through reports, documentation, persuasive presentations and clear instructions. |
| | 5. | Function effectively as an individual and as a member or leader in diverse teams and in multidisciplinary environments. |
| | 6. | Identify a timely opportunity and using innovation to pursue that opportunity to create value and wealth for the betterment of the individual and society at large. |
| | 7. | Understand and assess societal, environmental, health, safety, legal, and cultural issues within local and global contexts, and the consequential responsibilities relevant to professional computing practice. |
| Eligibility Criteria for Programme | | Applicant/Candidate must be a female.<br><br>Appeared for MH-CET/SNDTWU'S JDBIMSR ENTRANCE EXAM. |
| Intake (For SNDT WU Departments and Conducted Colleges) | | |

**MCA – in Management**

**As per NEP (AY-2023-25)**

| SEMESTER | | | | 1Credit = 25Marks<br>Total Credits = 88<br>Total Marks = 88*25<br>= 2200 |
|---|---|---|---|---|
| I | II | III | IV | |
| 22 | 22 | 22 | 22 | |

**SEMESTER-I**

| Code | Subject | Type of Course | L | Pr. | Cr. | Int. Exam. | Ext. Exam. | Total Marks |
|---|---|---|---|---|---|---|---|---|
| **116411** | **Operating Systems** | Major (Core) | 4 | - | 4 | 50 | 50 | 100 |
| **116412** | **Data Communication and Networking** | Major(Core) | 4 | - | 4 | 50 | 50 | 100 |
| **116413** | **Data Structures and analysis of Algorithm** | Major(Core) | 2 | - | 2 | 0 | 50 | 50 |
| **116424** | **Data Structures and Analysis of Algorithm-Lab** | Major (Core) | - | 2 | 2 | 25 | 25 | 50 |
| **116425** | **Operating Systems-Lab** | Major (Core) | - | 2 | 2 | 25 | 25 | 50 |
| | **Open Course-I- Management Subjects** | Major (Open Course) | 4 | - | 4 | 50 | 50 | 100 |
| **136411** | **Research Methodology** | Minor Stream (RM) | 4 | - | 4 | 50 | 50 | 100 |
| | **Total** | | | | **22** | **250** | **300** | **550** |

**SEMESTER-II**

| Code | Subject | Type of Course | L | Pr. | Cr. | Int.Exam. | Ext.Exam. | Total Marks |
|---|---|---|---|---|---|---|---|---|
| **216411** | **Advanced JAVA** | Major (Core) | 4 | - | 4 | 50 | 50 | 100 |
| **216412** | **DatabaseManagementSystems** | Major (Core) | 4 | - | 4 | 50 | 50 | 100 |
| **216413** | **WebTechnology** | Major (Core) | 2 | - | 2 | 50 | 0 | 50 |
| **216424** | **Advanced JAVA-Lab** | Major (Core) | - | 2 | 2 | 25 | 25 | 50 |
| **216425** | **Database Management Systems-Lab** | Major (Core) | - | 2 | 2 | 25 | 25 | 50 |
| | **Open Course-II- Management Subjects** | Major (Open Course) | 4 | - | 4 | 50 | 50 | 100 |
| **256431/246441** | **RP/OJT** | RP/OJT | | 4 | 4 | 50 | 50 | 100 |
| | **Total** | | | | **22** | **300** | **250** | **550** |

**SEMESTER-III**

| Code | Subject | Type of Course | L | Pr. | Cr. | Int.Exam. | Ext.Exam. | TotalMarks |
|---|---|---|---|---|---|---|---|---|
| **316411** | **Applied Statistical Methods** | Major (Core) | 4 | - | 4 | 50 | 50 | 100 |
| **316412** | **Big Data Analytics** | Major (Core) | 4 | - | 4 | 50 | 50 | 100 |
| **316413** | **Programming with Python** | Major (Core) | 4 | - | 4 | 50 | 50 | 100 |
| **316424** | **Applied Statistical Methods-Lab- Using R** | Major (Core) | 0 | 2 | 2 | 25 | 25 | 50 |
| **316425** | **Data science and Analytics lab - Using Python)** | Major (Core) | 0 | 2 | 2 | 25 | 25 | 50 |
| | **Open Course-III-Management Subjects** | Major (Open Course) | 2 | - | 2 | 50 | 00 | 50 |
| **356431** | **RP** | RP | 4 | - | 4 | 50 | 50 | 100 |
| | **Total** | | | | **22** | **300** | **250** | **550** |

**SEMESTER-IV**

| Code | Subject | Type of Course | L | Pr. | Cr. | Int. | Ext. | Total |
|---|---|---|---|---|---|---|---|---|
| **416411** | Block Chain Technology | Major (Core) | 4 | - | 4 | 50 | 50 | 100 |
| **416412** | Managerial Economics | Major (Core) | 4 | - | 4 | 50 | 50 | 100 |
| **416413** | Software Engineering | Major (Core) | 4 | - | 4 | 50 | 50 | 100 |
| **416424** | **Software Testing and Quality Assurance Lab** | Major (Core) | - | 2 | 2 | 50 | 0 | 50 |
| | **Open course-IV- Management / CS & IT Subjects** | Major (Open Course) | 2 | | 2 | 50 | 0 | 50 |
| **446441** | **OJT** | OJT/R | 6 | | 6 | 100 | 50 | 150 |
| | **Total** | | | | **22** | 350 | 200 | **550** |

| | **Open Course-I-Management Subjects** | | **Open Course-II- Management Subjects** |
|---|---|---|---|
| 126411 | Principles & Practices of Management | 226411 | Digital Business |
| 126412 | Fundamentals of Organization Behavior | 226412 | Entrepreneurship Development |

| | **Open Course-III- Management Subjects** | | **Open course-IV** |
|---|---|---|---|
| 326411 | Enterprise Performance Management | 426411 | Artificial Intelligence |
| 326412 | Strategic Management | 426412 | Project Management |

| SN | Courses, Modules and Outcomes | Course Contents | Cr |
|---|---|---|---|
| | **Semester III** | | |
| **316411** | **Applied Statistical Methods - Major (Core) Theory** | | **4** |
| | **Course Outcomes: Learners will be able to:**<br>• Students will grasp fundamental statistical concepts and their diverse applications.<br>• Students will master descriptive and inferential statistical techniques for data analysis.<br>• Students will proficiently utilize statistical software for analysis and visualization tasks.<br>• Students will develop critical thinking skills to apply statistical methods to real-world problems. | | |
| **Module 1** | **Introduction to Statistics** | | 1 |
| | **LOs:** Learners will be able to<br>• Understand the fundamental concepts of statistics and their applications in various fields.<br>• Apply descriptive statistics techniques to summarize and interpret data.<br>• Demonstrate knowledge of basic probability theory and its relevance to statistical analysis.<br>• Explain different sampling techniques and their implications for statistical inference.<br>• Utilize statistical software to perform basic data analysis and visualization tasks. | **Modules content:**<br>**Introduction**: Overview of statistical methods and their applications<br>Descriptive statistics: measures of central tendency and dispersion<br>Probability theory: basic concepts, probability distributions (discrete and continuous), and properties<br>Sampling techniques and sampling distributions<br>Statistical software introduction (e.g., R, Python, SPSS) | |

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| **Module 2** | **Statistical Inference** | | **1** |
| | **LOs:** Learners will be able to<br><br>• Estimate population parameters and construct confidence intervals for population characteristics.<br>• Perform hypothesis tests to make inferences about population parameters.<br>• Differentiate between parametric and non-parametric statistical tests and apply them appropriately.<br>• Interpret the results of hypothesis tests and make informed decisions based on statistical evidence.<br>• Conduct basic analysis of variance (ANOVA) to compare means across multiple groups. | **Modules content:**<br><br>Estimation: point estimation, confidence intervals<br>Hypothesis testing: principles, types of errors, p-values<br>Parametric tests: t-tests, z-tests, chi-square tests<br>Non-parametric tests: Mann-Whitney U test, Wilcoxon signed-rank test<br>Introduction to ANOVA (Analysis of Variance) | |
| **Module 3** | **Regression Analysis** | | 1 |
| | **LOs:** Learners will be able to<br><br>• Understand the principles of regression analysis and its applications in modeling relationships between variables.<br>• Build and interpret simple linear regression models to make predictions and assess relationships.<br>• Develop multiple linear regression models and evaluate their goodness-of-fit and predictive performance.<br>• Apply logistic regression models to analyze categorical outcome variables.<br>• Assess the assumptions of regression models and diagnose potential issues using appropriate techniques. | **Module Contents:**<br><br>Simple linear regression: modeling, interpretation, inference<br>Multiple linear regression: model building, diagnostics, interpretation<br>Logistic regression: binary and multinomial logistic regression models<br>Model evaluation and selection techniques: residual analysis, goodness-of-fit tests, AIC, BIC | |

| Module 4 | Advanced Topics in Applied Statistics | | 1 |
|---|---|---|---|
| | **LOs:** Learners will be able to<br><br>• Design experiments and observational studies using principles of experimental design.<br>• Analyze time series data to identify trends, seasonality, and autocorrelation patterns.<br>• Apply survival analysis techniques to model time-to-event data.<br>• Understand the basics of Bayesian statistics and its advantages over classical methods.<br>• Critically evaluate real-world applications of statistical methods in various domains. | **Module Contents:**<br><br>Experimental design principles: randomized controlled trials, factorial designs<br><br>Time series analysis: modeling trends, seasonality, and autocorrelation<br><br>Survival analysis: Kaplan-Meier estimator, Cox proportional hazards model<br><br>Bayesian statistics: introduction to Bayesian inference, Bayesian regression<br><br>Case studies and real-world applications in various fields (e.g., healthcare, finance, social sciences) | |
| **Assignments/ Activities towards CCE** | | | |
| | Weekly quizzes or assignments covering theoretical concepts and computational exercises<br>Final project: Students will select a real-world dataset and apply various statistical methods learned throughout the course, including data analysis, interpretation, and presentation of results. | | |

**References:**

**Books:**


1) Montgomery, D. C., Runger, G. C., & Hubele, N. F. (2006). *Engineering statistics* (5th ed.). John Wiley & Sons.
2) Gelman, A., Carlin, J. B., Stern, H. S., Dunson, D. B., Vehtari, A., & Rubin, D. B. (2013). *Bayesian data analysis* (3rd ed.). Chapman and Hall/CRC.


**Journals:**


- ✓ Journal of Applied Statistics. (n.d.). Retrieved from https://www.tandfonline.com/toc/cjas20/current
- ✓ Journal of Statistical Software. (n.d.). Retrieved from https://www.jstatsoft.org/


**Websites:**


- ✓ StatsDirect. (n.d.). Retrieved from https://www.statsdirect.com/
  National Institute of Statistical Sciences. (n.d.). Retrieved from https://www.niss.org/

**MOOCs:**

- ✓ Coursera. (n.d.). Statistics and Data Science Specialization. Retrieved from https://www.coursera.org/specializations/statistics
- ✓ edX. (n.d.). Data Science MicroMasters Program. Retrieved from https://www.edx.org/micromasters/data-science

| SN | Courses, Modules and Outcomes | Course Contents | Cr |
|---|---|---|---|
| | **Semester III** | | |
| **316412** | **Big Data Analytics - Major (Core) Theory** | | **4** |
| | **Course Outcomes: Learners will be able to:**<br>• Describe big data and use cases from selected business domains.<br>• Explain NoSQL big data management.<br>• Install, configure, and run Hadoop and HDFS.<br>• Perform map-reduce analytics using Hadoop.<br>• Use Hadoop related tools such as HBase, Cassandra, Pig, and Hive for big data analytics. | | |
| **Module 1** | **Introduction** | | 1 |
| | **LOs:** Learners will be able to<br>• Define big data and its relevance in modern decision-making.<br>• Analyze industry applications of big data, focusing on marketing and risk management.<br>• Evaluate big data technologies like Hadoop and cloud computing for scalable data solutions.<br>• Explore emerging trends such as crowd-sourcing analytics and their impact on big data utilization. | **Modules content:**<br>**Introduction**: What is big data, why big data, 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 analytic. | |

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| **Module 2** | **Introduction to NoSQL** | | **1** |
| | **LOs:** Learners will be able to<br><br>• Understand NoSQL databases and various data models like key-value and document models.<br>• Explore distribution and replication models such as sharding and master-slave replication.<br>• Ensure consistency in distributed databases while optimizing performance.<br>• Implement Map-Reduce for distributed computing and partitioning strategies for efficient data handling. | **Modules content:**<br><br>Introduction to NoSQL, aggregate data models, aggregates, key-value and document data models, relationships, graph databases, schema less databases, materialized views, distribution models, sharding, master-slave replication, peer peer replication, sharding and replication, consistency, relaxing consistency, version stamps, map-reduce, partitioning and combining, composing map-reduce calculations. | |
| **Module 3** | | | 1 |
| | **LOs:** Learners will be able to<br><br>• Understanding data formats and analyzing data using Hadoop, including scaling out with Hadoop streaming and pipes.<br>• Exploring the design of Hadoop Distributed File System (HDFS) and its core concepts, along with Hadoop I/O and data integrity mechanisms.<br>• Implementing MapReduce workflows, unit testing with MRUnit, and understanding job scheduling, shuffle, and sort operations.<br>• Investigating classic MapReduce and YARN frameworks, handling failures, and optimizing task execution for efficient data processing. | **Modules content:**<br><br>Data format, analyzing data with Hadoop, scaling out, Hadoop streaming, Hadoop pipes, design of Hadoop distributed file system (HDFS), HDFS concepts, Java interface, data flow, Hadoop I/O, data integrity, compression, serialization, Avro, file-based data structures.<br>MapReduce workflows, unit tests with MRUnit, test data and local tests, anatomy of MapReduce job run, classic Map-reduce, YARN, failures in classic Map-reduce and YARN, job scheduling, shuffle and sort, task execution, MapReduce types, input formats, output format. | |
| **Module 4** | | | |
| | **LOs:** Learners will be able to<br><br>• Understand HBase's data model and client interactions, with practical examples.<br>• Explore Cassandra's data | **Module Contents:**<br><br>HBase, data model and implementations, HBase clients, HBase examples, praxis. Cassandra, Cassandra data model, Cassandra examples, Cassandra clients, Hadoop | |

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| | model, clients, and Hadoop integration.<br>• Learn Pig's data model, scripting with Pig Latin, and testing using Grunt.<br>• Utilize Hive for data analysis, including HiveQL queries and manipulation. | integration.Pig, Grunt, pig data model, Pig Latin, developing and testing Pig Latin scripts. Hive, data types and file formats, HiveQL data definition, HiveQL data manipulation, HiveQL queries. | |
| **Assignments/ Activities towards CCE** | | | |
| | • Analyze marketing strategies using web analytics, assessing challenges and outcomes.<br>• Develop a machine learning-based fraud detection algorithm for financial transactions, evaluating its effectiveness.<br>• Analyze healthcare datasets to propose data-driven strategies for improvement, presenting findings.<br>• Implement a MapReduce algorithm for data processing, evaluating its correctness and efficiency. | | |

**References:**

**Books:**


1) Zikopoulos, P., Eaton, C., Zikopoulos, P. C., & Eaton, C. (2011). *Understanding Big Data: Analytics for Enterprise Class Hadoop and Streaming Data* (1st ed.). McGraw-Hill.
2) Marz, N., & Warren, J. (2015). *Big Data: Principles and Best Practices of Scalable Realtime Data Systems* (1st ed.). Manning Publications.


**Journals:**


✓ Chen, M., Mao, S., & Liu, Y. (2014). Big Data: A Survey. *Mobile Networks and Applications*, 19(2), 171–209. https://doi.org/10.1007/s11036-013-0489-0
✓ Gandomi, A., & Haider, M. (2015). Beyond the hype: Big data concepts, methods, and analytics. *International Journal of Information Management*, 35(2), 137–144. https://doi.org/10.1016/j.ijinfomgt.2014.10.007


**Websites:**


✓ IBM Big Data & Analytics Hub. (n.d.). Retrieved from https://www.ibm.com/analytics/hub/
✓ Google Cloud Big Data & Machine Learning Blog. (n.d.). Retrieved from https://cloud.google.com/blog/topics/big-data


**MOOCs:**


✓ Coursera. (n.d.). Big Data Specialization. Retrieved from https://www.coursera.org/specializations/big-data
✓ edX. (n.d.). Big Data Courses. Retrieved from https://www.edx.org/learn/big-data

| SN | Courses, Modules and Outcomes | Course Contents | Cr |
|---|---|---|---|
| | **Semester III** | | |
| **316413** | **Programming with Python - Major (Core) Theory** | | **4** |
| | **Course Outcomes: Learners will be able to:**<br>• Understand why Python is a useful scripting language for developers.<br>• Learn how to design and program Python applications.<br>• Learn how to use lists, tuples, and dictionaries in Python program.<br>• Learn how to identify Python object types. | | |
| **Module 1** | **Introduction** | | 1 |
| | **LOs:** Learners will be able to<br><br>• Understand Python's history, features, and limitations.<br>• Identify major applications of Python.<br>• Execute Python programs, utilize interactive help, and set up environments.<br>• Demonstrate proficiency in Python syntax, variables, data types, flow control, and string manipulation. | **Modules content:**<br><br>Programming Language, History and Origin of Python Language, Features of Python, Limitations, Major Applications of Python, First Python Program, Python Interactive Help Feature, Python differences from other languages, Installing and setting Python environment in Windows and Linux, basics of Python interpreter, Execution of python program, Editor for Python code, syntax, variable, Data types. Flow control: if, if else, for, while, functions, continue, pass, break. Strings: Sequence operations, String Methods, Pattern Matching. | |

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| **Module 2** | | | **1** |
| | **LOs:** Learners will be able to<br><br>• Perform essential operations on lists and understand basic dictionary operations.<br>• Utilize tuples, files, and functions proficiently.<br>• Master the basics of modules, including importing and executing them, handling compiled files, and working with standard modules.<br>• Understand package importation using different methods. | **Modules content:**<br><br>Lists: Basic Operations, Iteration, Indexing, Slicing and Matrixes; Dictionaries: Basic dictionary operations; Tuples and Files; Functions: Definition, Call, Arguments, Scope rules and Name resolution; Modules: Module Coding Basics, Importing Programs as Modules, Executing Modules as Scripts, Compiled Python files(.pyc), Standard Modules: OS and SYS, The dir() Function, Packages, Different ways to import Packages. | |
| **Module 3** | **Business intelligence applications, Logistic and production models, Data envelopment analysis** | | 1 |
| | **LOs:** Learners will be able to<br><br>• Understand OOP concepts in Python, including class design, object creation, attribute access, and manipulation, as well as garbage collection for object destruction.<br>• Master exception handling within classes, identifying and managing different types of exceptions.<br>• Perform file management operations, including opening, reading, writing, renaming, and deleting files, as well as navigating directories.<br>• Apply these concepts effectively in Python programming. | **Modules content:**<br><br>Classes and Objects: The concept of OOPS in Python, designing classes, creating objects, accessing attributes, editing class attributes, Built-in class attributes, Garbage collection, Destroying objects.<br>Exception Handling and Classes: Exception Handling-Introduction, Exceptions, and its types, how to handle exceptions.<br>File Management in Python: Operations on files (opening, modes, attributes, encoding, closing), read () & write () methods, tell () & seek () methods, renaming & deleting files in Python, directories in Python. | |
| **Module 4** | | | 1 |

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| | **LOs:** Learners will be able to<br><br>• Master Python's database interaction with MySQL and SQLite.<br>• Understand Python's role in hacking and cyber forensics, focusing on debugging and code injection.<br>• Proficiently use PyDBG and Immunity Debugger for debugging.<br>• Apply Python for practical database management and cyber security tasks. | **Module Contents:**<br><br>Python and Databases: ODBC and Python, Working withDatabases inMySQL, Working with Tables in MySQL, managing users in MySQL, Accessing MySQL data from Python, Working with SQLite Database.<br>Role of Python in Hacking and Cyber Forensics, Debugging in python: Introduction to PyDBG and immunity debugger; Hooking: Soft Hooking with PyDBG, Hard Hooking with Immunity Debugger, DLL, and code injection: Remote Thread Creation, DLL Injection, Code Injection. | |
| **Assignments/ Activities towards CCE** | | | |
| | • Execute a basic Python program and explore the interactive help feature.<br>• Work with tuples, files, and standard modules like OS and SYS.<br>• Explore built-in class attributes and understand garbage collection.<br>• Investigate debugging techniques using PyDBG and Immunity Debugger.<br>• Create a cyber-security project showcasing Python's role in hacking and code injection methods. | | |

**References:**

**Books:**


1) Lutz, M. (2013). *Learning Python* (5th ed.). O'Reilly Media.
2) Downey, A. (2015). *Think Python: How to Think Like a Computer Scientist* (2nd ed.). O'Reilly Media.


**Journals:**


✓ Python Software Foundation. (n.d.). Retrieved from https://www.python.org/
✓ Journal of Python Programming. (n.d.). Retrieved from [Insert URL if available]


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✓ Real Python. (n.d.). Retrieved from https://realpython.com/
✓ Python.org. (n.d.). Retrieved from https://www.python.org/


**MOOCs:**


✓ Coursera. (n.d.). Python for Everybody Specialization. Retrieved from https://www.coursera.org/specializations/python
✓ edX. (n.d.). Introduction to Python: Absolute Beginner. Retrieved from https://www.edx.org/learn/python

| SN | Courses, Modules and Outcomes | Course Contents | Cr |
|---|---|---|---|
| | **Semester III** | | |
| **316424** | **Applied Statistical Methods- Lab- Using R Major (Core) Practical** | | **2** |
| | **Course Outcomes: Learners will be able to:**<br>• Enhance proficiency in utilizing R software for statistical analysis and data visualization.<br>• Apply theoretical statistical concepts to real-world datasets, improving analytical skills.<br>• Develop competency in conducting statistical tests and hypothesis testing using R.<br>• Communicate statistical findings effectively through graphical representations and written reports. | | |
| **Module 1** | **Introduction to R and Basic Statistical Analysis** | | |
| | **LOs:** Learners will be able to<br>• Gain proficiency in using R for data manipulation and basic statistical analysis.<br>• Understand fundamental concepts of descriptive statistics and data visualization in R.<br>• Develop skills in importing and exporting data in various formats using R. | **Module Contents:**<br>• Overview of R programming language and environment<br>• Data import/export in R<br>• Descriptive statistics: mean, median, variance, and standard deviation<br>• Data visualization techniques: histograms, boxplots, scatter plots. | |

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| **Module 2** | **Inferential Statistics and Hypothesis Testing** | | |
| | **LOs:** Learners will be able to<br><br>• Learn inferential statistical techniques and their applications in hypothesis testing.<br>• Understand the principles of sampling distributions and the Central Limit Theorem.<br>• Acquire knowledge of parametric and non-parametric hypothesis tests and their implementation in R. | **Module Contents:**<br><br>Introduction to inferential statistics<br>Sampling distributions and Central Limit Theorem<br>Parametric and non-parametric hypothesis testing<br>One-sample and two-sample t-tests, chi-square test, ANOVA | |
| **Module 3** | **Regression Analysis and Model Building** | | |
| | **LOs:** Learners will be able to<br><br>• Master the concepts and techniques of regression analysis in R.<br>• Develop the ability to build and interpret simple and multiple linear regression models.<br>• Gain insights into logistic regression and its applications for categorical data analysis. | **Module Contents:**<br><br>Simple linear regression: model fitting, interpretation, and diagnostics<br>Multiple linear regression: variable selection, model diagnostics<br>Logistic regression: binary and multinomial models<br>Model validation techniques: cross-validation, ROC curves | |
| **Module 4** | **Advanced Topics in Statistical Modeling** | | |
| | **LOs:** Learners will be able to<br><br>• Explore advanced statistical modeling techniques using R.<br>• Learn time series analysis methods and their applications in forecasting.<br>• Understand survival analysis techniques and their implementation in R.<br>• Gain exposure to generalized linear models (GLMs) and Bayesian statistics for complex data analysis. | **Module Contents:**<br><br>Time series analysis: ARIMA models, forecasting techniques<br>Survival analysis: Kaplan-Meier estimator, Cox proportional hazards model<br>Generalized linear models (GLM): Poisson regression, logistic regression extensions<br>Bayesian statistics: introduction and applications in statistical modeling | |
| **Assignments/ Activities towards CCE** | | | |
| | • Conduct a comprehensive data analysis using R on a chosen dataset, demonstrating proficiency in statistical techniques and interpretation of results.<br>• Collaboratively develop an R package addressing a specific statistical problem, showcasing programming skills, documentation, and | | |

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| | usability testing.<br>• Analyze a real-world case study using R, applying appropriate statistical methods and providing actionable insights and recommendations.<br>• Act as statistical consultants, conducting data analysis for hypothetical client, and delivering a comprehensive report with findings and recommendations. | |

**References:**

**Books:**


1) Kabacoff, R. (2015). *R in Action: Data Analysis and Graphics with R* (2nd ed.). Manning Publications.
2) Crawley, M. J. (2015). *Statistics: An Introduction Using R* (2nd ed.). Wiley.


**Journals:**


✓ Journal of Statistical Software. (n.d.). Retrieved from https://www.jstatsoft.org/
✓ R Journal. (n.d.). Retrieved from https://journal.r-project.org/


**Websites:**


✓ R Project. (n.d.). Retrieved from https://www.r-project.org/
✓ RStudio. (n.d.). Retrieved from https://www.rstudio.com/


**MOOCs:**


✓ Coursera. (n.d.). Data Science and Machine Learning Bootcamp with R. Retrieved from https://www.coursera.org/specializations/data-science-machine-learning-r
✓ edX. (n.d.). Data Analysis for Life Sciences: Statistics Using R. Retrieved from https://www.edx.org/professional-certificate/harvardx-data-analysis-for-life-sciences-2


| SN | Courses, Modules and Outcomes | Course Contents | Cr |
|---|---|---|---|
| | **Semester III** | | |
| **316425** | **Data science and Analytics lab – (Using Python) Major (Core) Practical** | | **2** |
| | **Course Outcomes:**<br>**Learners will be able to:**<br>1. Use Pandas Data Frames, Numpy multi-dimensional arrays, and SciPy libraries to work with a various dataset.<br>2. We will introduce you to pandas, an open-source library, and we will use it to load, manipulate, analyze, and visualize cool datasets. | | |
| **Module 1** | | | |
| | **LOs:** Learners will be able to<br>• Grasp domain understanding and dataset | **Module Contents:**<br>Learning Objectives, Understanding the Domain, Understanding the | |

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| | comprehension for effective data analysis.<br>• Acquire proficiency in utilizing Python packages for importing, exporting data, and deriving basic insights from datasets**.** | Dataset, Python package for data science, Importing and Exporting Data in Python, Basic Insights from Datasets. | |
| **Module 2** | | | |
| | **LOs:** Learners will be able to<br>• Learn methods to identify and manage missing values, as well as techniques for data formatting and normalization.<br>• Gain proficiency in data preprocessing techniques such as binning and creating indicator variables for effective analysis. | **Module Contents:**<br>Identify and Handle Missing Values, Data Formatting, Data Normalization Sets, Binning, Indicator variables | |
| **Module 3** | | | |
| | **LOs:** Learners will be able to<br>• Understand descriptive statistics and basic grouping techniques.<br>• Gain proficiency in ANOVA and correlation analysis, including advanced topics in correlation. | **Module Contents:**<br>Descriptive Statistics, Basic of Grouping, ANOVA,<br>Correlation More on Correlation. | |
| **Module 4** | | | |
| | **LOs:** Learners will be able to<br>• Learn simple and multiple linear regression, polynomial regression, and model evaluation methods like R-squared and MSE.<br>• Master model evaluation techniques to recognize over-fitting, under-fitting, and refine models for better prediction and decision-making. | **Module Contents:**<br>Simple and Multiple Linear Regression, Model<br>Evaluation Using Visualization, Polynomial Regression and Pipelines, R-squared and MSE for In-Sample<br>Evaluation, Prediction and Decision Making.<br>Model Evaluation, Over-fitting, Under-fitting and Model, Regression Grid, Search Model Refinement. | |
| **Assignments/ Activities towards CCE** | | | |
| | • Data analysis projects focusing on real-world datasets and domain-specific challenges.<br>• Case studies involving regression analysis, model evaluation, and refinement techniques.<br>• Hands-on exercises utilizing Python packages for data preprocessing, regression analysis, and model evaluation. | | |

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| | • Group presentations and discussions on data analysis methodologies, findings, and implications for decision-making. | |

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| SN | Courses, Modules and Outcomes | Course Contents | Cr |
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| | **Semester III** | | |
| **326411** | **Enterprise Performance Management - Major (Open Course) Theory** | | **2** |
| | **Course Outcomes: Learners will be able to:**<br>• To acquaint the students with a perspective of different facets of management of an enterprise.<br>• To provide inputs with reference to the Investment Decisions along with the techniques for those decisions.<br>• To inculcate the evaluation parameters of enterprise in terms of expenses, control systems and pricing.<br>• To develop the knowledge of the concept of auditing and its applicability as performance management tool. | | |
| **Module 1** | **Performance management system** | | |
| | **LOs:** Learners will be able to<br>• Grasp performance management importance and its link to strategic planning.<br>• Evaluate financial performance using responsibility accounting and metrics like ROI, ROA, MVA, EVA.<br>• Analyze non-financial measures like Balanced Scorecard.<br>• Assess SBU performance and understand transfer pricing methods. | **Module Contents:**<br>1.1 Performance Management: Concept, Need, Linkages with Strategic Planning, Management Control and Operational Control.<br>1.2 Performance Evaluation Parameters: Financial – Responsibility Accounting –Concept of Responsibility Centers, Revenue Centre, Expense Centre - Engineered and Discretionary costs – Committed costs, Profit Centre, Investment Centers. ROI, ROA, MVA, EVA – DuPont analysis. (Numericals Not expected – Interpretation only) Limitations of Financial Measures.<br>1.3 Performance Evaluation Parameters: Non-Financial Performance measures – Balanced Scorecard, Malcolm Baldrige Framework.<br>1.4 Measuring SBU Level Performance: Concept, Need, Linkages with Enterprise Performance Management – Goal Congruence. Transfer Pricing – Objective, Concept, Methods – Cost based, Market price based & Negotiated, Applicability of Transfer Pricing. | |

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| **Module 2** | **Capital Expenditure Control And Performance Evaluation Parameters for Banks.** | | |
| | **LOs:** Learners will be able to<br>• Grasp capital expenditure control and budgeting process.<br>• Identify tools for expenditure control like performance indices.<br>• Evaluate bank performance using metrics like NPAs and RoI.<br>• Analyze retail performance using methods like ABC analysis. | **Module Contents:**<br>2.1 Capital Expenditure Control: Concept, Need, Process of Capital Budgeting, Types of capital expenditure decisions – pre-sanction, operational and post-sanction control of capital expenditure.<br>2.2Tools & Techniques of Capital Expenditure Control: Performance Index, Technical Performance Measurement, Post completion audit.<br>2.3 Performance Evaluation Parameters for Banks: Customer Base, NPAs, Deposits, RoI, Financial Inclusion, Spread, Credit Appraisal, Investments.<br>2.4 Performance Evaluation Parameters for Retail: ABC analysis, Multiple Attribute Method, Gross Margin Return on Investment (GMROI), GMROI as Gross Margin/Average Inventory at Cost. | |
| **Module 3** | **Performance Evaluation Parameters for Projects** | | |
| | **LOs:** Learners will be able to<br>• Grasp project performance evaluation methods, including variance analysis.<br>• Understand nonprofit organization features and evaluation techniques.<br>• Analyze fund accounting, governance, and strategic planning in nonprofits.<br>• Evaluate the role of social audits in nonprofit performance assessment. | **Module Contents:**<br>3.1 Performance Evaluation Parameters for Projects: Project Control Process: Setting base line plan, Measuring progress and performance, comparing plan against action, Taking action, Schedule variance (time overruns), Project Cost Variance (cost overruns).<br>3.2 Performance Evaluation Parameters for Non-Profit: Features of Nonprofit organizations, fund accounting, governance, product pricing, strategic planning & budget preparations, social audit. | |

| Module 4 | Audit Function as a Performance Measurement Tool | | |
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| | **LOs:** Learners will be able to<br>• Recognize audits as performance measurement tools.<br>• Understand principles and objectives of financial, internal, cost, and management audits.<br>• Analyze audit reports for performance insights.<br>• Evaluate audit effectiveness in measuring organizational performance. | **Module Contents:**<br>4.1 Audit Function as a Performance Measurement Tool: Financial Audit, Internal Audit, Cost Audit, Management Audit – Principles and Objectives (Audit Reports / Formats are expected to be discussed in the class from a performance measurement perspective). | |
| **Assignments/ Activities towards CCE** | | | |
| | • Analyze performance management concepts and its link with strategic planning.<br>• Evaluate financial performance using responsibility accounting measures.<br>• Examine non-financial measures like Balanced Scorecard.<br>• Assess SBU performance and transfer pricing methods.<br>• Explore capital expenditure control and budgeting processes.<br>• Evaluate bank performance metrics including NPAs and RoI.<br>• Analyze retail performance metrics like ABC analysis.<br>• Understand project performance evaluation and variance analysis.<br>• Discuss nonprofit organization features and social audit.<br>• Examine audit functions in performance measurement. | | |

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2) Neely, A., Adams, C., & Kennerley, M. (2002). *The Performance Prism: The Scorecard for Measuring and Managing Business Success*. Financial Times Prentice Hall.

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- ✓ edX. (n.d.). Performance Measurement for Effective Management of Nonprofit Organizations. https://www.edx.org/professional-certificate/management-nonprofit-organizations

| SN | Courses, Modules and Outcomes | Course Contents | Cr |
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| | **Semester III** | | |
| **326412** | **Strategic Management - Major (Open Course) Theory** | | **2** |
| | **Course Outcomes: Learners will be able to:**<br>• Comprehend strategy concept, evolution, and characteristics.<br>• Apply strategic decision-making and management processes.<br>• Analyze business environments and internal capabilities.<br>• Develop and implement strategic plans effectively. | | |
| **Module 1** | **Introduction to Strategic Management** | | |
| | **LOs:** Learners will be able to<br>• Understand the concept and historical evolution of strategy.<br>• Identify characteristics and dimensions of strategic management.<br>• Evaluate various approaches to strategic decision-making.<br>• Analyze the strategic management process, including the role of policies and top management, and its implications for social and ethical issues. | **Module Contents:**<br>Strategy - Concept and its evolution Strategic Management Characteristics, dimensions and Approaches to strategic Decision Making Strategic Management Process Components of Strategic Management Model – Policies, Role of Top Management Strategic implications of Social and Ethical Issues. | |
| **Module 2** | **Strategy Formulation, Strategic Analysis and Strategic Planning** | | |
| | **LOs:** Learners will be able to<br>• Differentiate organizational goals, mission, and social responsibility.<br>• Analyze the business environment for strategic insights.<br>• Conduct internal analysis for strategic advantage.<br>• Master strategic planning concepts and design effective plans. | **Module Contents:**<br>Organizational Goals, Mission and Social Responsibility Analysis of Business Environment Internal analysis for Strategic Advantage –<br>Strategic Planning – meaning, steps, alternatives, advantages and Disadvantages. Designing an effective Strategic Plan | |

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| **Module 3** | **Strategic Choices and Strategy Implementation** | | |
| | **LOs:** Learners will be able to<br>• Create strategic alternatives for stability, growth, and sustainability.<br>• Assess strategic options for product portfolio development and corporate strategy.<br>• Address implementation challenges and allocate resources effectively.<br>• Understand factors influencing organizational structure for strategic alignment. | **Module Contents:**<br>Generating Strategic Alternatives for Stability, Growth and Sustainable Strategies Evaluation of Strategic Alternatives for developing Product portfolio Models and selection of Suitable Corporate Strategy Implementation issues Planning and allocation of resources Organizational Structures – factors affecting the choice, Degree of Flexibility and Autonomy | |
| **Module 4** | **Functional Strategy and Strategic Review** | | |
| | **LOs:** Learners will be able to<br>• Formulate functional strategies for various areas like marketing, CSR, HR, finance, and logistics.<br>• Assess strategic performance and recognize common evaluation criteria and challenges.<br>• Understand corporate restructuring, business process reengineering, and benchmarking, TQM, and Six Sigma concepts.<br>• Apply strategic principles to practical situations through case study analysis, like Chankyaniti. | **Module Contents:**<br>Knowledge and Formulation of Functional Strategy for Marketing Environment Sustainability CSR ( Corporate Social Responsibility) Human Resource Finance Logistics Evaluation of Strategic Performance – Criteria and Problems Concept of Corporate Restructuring, Business Process Reengineering, Benchmarking, TQM and Six Sigma Chankyaniti - A Case study approach | |
| **Assignments/ Activities towards CCE** | | | |
| | • Analyze strategy evolution, characteristics, and decision-making approaches.<br>• Evaluate strategic management components, including policies and top management roles.<br>• Assess organizational goals, mission, and social responsibility. | | |

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| | • Generate and evaluate strategic alternatives for stability and growth.<br>• Formulate functional strategies and evaluate strategic performance.<br>• Explore corporate restructuring concepts through case studies. | |

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