

## **Program Name: M. Sc. Applied Statistics & Analytics**

### **PROGRAM OUTCOMES:**

1. On completion of this program, a student would build a strong foundation for theoretical and conceptual understanding of Applied Statistics as well as Analytics domain.
2. Students will be introduced to fundamental ideas and techniques of data modeling, with an emphasis on the applications.
3. Students will be able to handle big data, clean and process it
4. They will be able to use appropriate models for analysis, derive business insights from the results.
5. They will be able to apply computing theory in different software and languages.
6. They will be able to perform well in group and develop professional presentation skills.
7. They will develop leadership skills and instill a sense of ethical decision making that will be beneficial to the organization and the communities they serve.

### **PROGRAM SPECIFIC OUTCOMES:**

**We offer electives as Marketing Analytics and Quality Management. Also courses on Organizational Behaviour, Leadership skills and Project Management/ Change Management are offered as a part of the curriculum.**

1. Understand and critically apply the concepts and methods of Marketing Analytics, Quality Management
2. Identify, model and solve decision problems in different settings using machine learning techniques and data mining.
3. To understand systematic approach of dealing with the transition or transformation of an organization's goals, processes or technologies.

### **COURSE OUTCOMES**

| <b>Year</b> | <b>Semester</b> | <b>Course</b>                         | <b>Expected outcomes</b>  |
|-------------|-----------------|---------------------------------------|---|
| I           | I               | Probability Models for Data Analytics | <ol style="list-style-type: none"><li>1. To be able to quantify uncertainty about events using mathematical descriptions of probability models.</li><li>2. To be able to identify appropriate probability models for experiments/data involving univariate and multivariate random variables.</li><li>3. Should be able to understand and use different probability models.</li></ol> |
|             |                 | Modern Statistical Inference          | <ol style="list-style-type: none"><li>1. Gain knowledge of theory of modern statistical inference.</li><li>2. Develop ability to apply the results of modern statistical inference, develop theoretical as well as algorithmic understanding</li></ol>  |

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|  |   |  | <ul style="list-style-type: none"> <li>3. Students can apply Bayesian computation and re-sampling methods.</li> <li>4. Gain knowledge of multiple testing procedure and ability to apply them for real problems.</li> </ul>  |
|  | Design of Experiments                       |  | <ul style="list-style-type: none"> <li>1. Students will be able to understand planning and conducting the experiment and analysing the data collected through the experiment.</li> </ul>   |
|  | Stochastic Models for Analytics             |  | <ul style="list-style-type: none"> <li>1. State the defining properties of various stochastic process models and identify appropriate stochastic process model(s) for a given applied problem in analytics.</li> <li>2. Apply Markov chains in discrete- and continuous-time to solve inventory and queueing problems.</li> <li>3. Apply the theory to model real phenomena and answer some questions in applied sciences and analytics.</li> </ul>  |
|  | Statistical Computing I (Practical)         |  | <ul style="list-style-type: none"> <li>1. Simulate data from various univariate and bivariate distributions and study their properties empirically.</li> <li>2. Compare resampling methods and iterative algorithms for estimation of parameters of an underlying distribution.</li> <li>3. Apply various designs studied in theory to real life data sets coming from pharmaceutical, clinical or manufacturing industries.</li> <li>4. Understand the use of different stochastic processes to model insurance and stock market data.</li> </ul> |
|  | Statistical Computing II (Base SAS and SQL) |  | <ul style="list-style-type: none"> <li>1. Ability to handle data related problem using Base SAS Software along with SQL.</li> <li>2. Ability to read, write and manipulate the data.</li> <li>3. Ability to run standard procedures of SAS necessary for data preparation.</li> </ul>  |
|  | Organizational Behaviour I                  |  | <ul style="list-style-type: none"> <li>1. Awareness about basics of an organization</li> <li>2. Understanding of purpose and importance of behavioural skills in organization life</li> </ul>  |

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|    |                                    |  | <p>3. Application through assignments and/or class-room participation of key skills to improve the students' skills of operating in a group.</p>   |
| II | Generalized Linear Models          |  | <ol style="list-style-type: none"> <li>1. To carry out multiple linear regression analysis and give an account of the idea of generalizing of linear modelling.</li> <li>2. To apply different methods for the estimation and variable selection and find the right link function.</li> <li>3. To apply inference to general linear models.</li> <li>4. To be able to interpret the results in practical examples.</li> </ol>  |
|    | Financial Econometrics             |  | <ol style="list-style-type: none"> <li>1. Use the standard asset pricing models.</li> <li>2. Investigate market interdependence</li> <li>3. Estimate using linear time series and volatility models.</li> <li>4. Forecast financial data using high-level econometric techniques and measure their effectiveness.</li> <li>5. Use CAPM models and connect individual returns to market return.</li> <li>6. Do portfolio analysis.</li> <li>7. Do high frequency data analysis from financial markets.</li> </ol> |
|    | Applied Multivariate Data Analysis |  | <ol style="list-style-type: none"> <li>1. A student will be able to understand and explain what multivariate statistical analysis is and when its application is appropriate.</li> <li>2. He will be introduced to several useful multivariate techniques, making strong use of illustrative examples. The student will have knowledge about how to build high end unsupervised learning model.</li> </ol>   |
|    | Survival Analysis                  |  | <ol style="list-style-type: none"> <li>1. Understand the basic theoretic and applied principles of survival analysis.</li> <li>2. Analyze survival data using appropriate statistical software.</li> </ol>   |
|    | Statistical Computing III          |  | <ol style="list-style-type: none"> <li>1. Apply various regression techniques to analyze different data sets.</li> <li>2. Dimension reduction by using multivariate techniques.</li> <li>3. Applications of survival analysis to model lifetime data, financial data</li> </ol>  |

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|    |     |   | <p>etc.</p> <p>4. Understand the use of different univariate and multivariate time series models to model insurance, stock market data and forecasting.</p>   |
|    |     | Statistical Computing IV (Python)           | <ol style="list-style-type: none"> <li>Ability to handle a statistical analysis situation from the software perspective.</li> <li>Ability to read, write and manipulate the data.</li> <li>Ability to run statistical analysis.</li> </ol>  |
|    |     | Organizational Behaviour II                 | <ol style="list-style-type: none"> <li>The student develops awareness about basics of leadership in organizations and understanding of basic leadership behavioural skills in organization life.</li> </ol>   |
| II | III | Introduction to Machine Learning Techniques | <ol style="list-style-type: none"> <li>The student is well versed with several fundamental concepts and methods for machine learning techniques and is familiar with some basic &amp; industry specific learning algorithms and their applications in day to day real life.</li> <li>Students will be able to understand advantage of machine learning techniques over traditional predictive modelling.</li> </ol> |
|    |     | High Performance Data Mining                | <ol style="list-style-type: none"> <li>At end of the course the students will develop understanding of high-end machine learning algorithm that is widely accepted across any industry.</li> <li>The student will be well conversant with high performance data mining approach that is mostly applicable in Data Science / Big Data industry.</li> </ol>   |
|    |     | Financial Analytics                         | <ol style="list-style-type: none"> <li>On successful completion of the course, students will be able to analyse economic and financial data using statistical models. Emphasis will be placed on model fitting and interpretation.</li> </ol>   |
|    |     | Marketing Analytics                         | <ol style="list-style-type: none"> <li>To develop ability to handle a marketing problem with data insights and provide effective course of analysis.</li> <li>The student will be able to perform</li> </ol>  |

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|    |                       |                                   | descriptive analysis, segmentation, survival analysis, customer lifetime value calculations, RFM analysis sentiment analysis and social network analysis.   |
|    |                       | Computational Biology             | 1. The student will develop ability to apply sequence analysis methods and to perform – profile searches, RNA structure analysis and Phylogenetic inference.  |
|    |                       | Quality Management                | 1. Students should be able to use a set of quality management methods, mainly empirical, statistical methods to improve the process management of a project.  |
|    |                       | Statistical Computing V           | 1. After doing this course, the students will be able to apply various machine learning techniques to solve real life problems faced by various industries/ sectors.  |
|    |                       | Statistical Computing VI (HADOOP) | 1. Students will get practical introduction to Big Data Management - Tools and Techniques.<br>2. Students will be able to select tools and put architecture in place for solving specific Big Data processing problems.   |
|    |                       | Project Management                | 1. To understand project management design, development, and deployment<br>2. Learn to align critical resources for effective project implementation<br>3. To understand the implications, challenges, and opportunities of organizational dynamics in project management.    |
| IV | Internship (Industry) |                                   | 1. Gain work experience and bridge the gap between academia and industry.<br>2. Improve the students' employability prospects.<br>3. Students will develop skills and advance their professional portfolios while also contributing to the goals and outcomes of the company. |

