2.6.1: Program Outcomes

Program: B.A. (Program) Operational Research/B.Sc. (Prog.) Physical Sciences/ B.Sc. (Prog.) Applied Physical Sciences/ B.Sc. (Program) Mathematical Sciences (Operational Research)

Program Specific Outcomes (PSO)

PSO1 Helps to understand the nature and basic concepts of operational research and its applications

PSO2 Encourages students to use basic operational research tools and techniques whenever necessary

PSO3 Equips students with necessary mathematical and statistical tools and techniques

PSO4 Helps students in formulating simple real life problems as operational research problems and solving them using various tools and techniques

PSO5 Encourages the use of relevant softwares viz. LINDO/ LINGO/ MATLAB/ SPSS/ Mathematica/ TORA etc.

Course Outcomes (CO)

Core Courses

COs of the course "Introduction to Operational Research and Linear Programming"

CO1 Provides a good understanding of operational research techniques, methodologies and tools

CO2 Helps students make better organizational and operational decisions

CO3 Introduces the concepts of linear programming modeling and its solution techniques

CO4 Explores the mathematical properties of general linear programming problems

CO5 Helps students solve and analyze real-world business problems

COs of the course "Inventory and Marketing Management"

CO1 Provides students with analytical skills that are necessary for the understanding of inventory and warehousing management knowledge and principles

CO2 Equips the students with latest advancements in the subject area

CO3 Enhances employability opportunities as many private and public sector companies involved in manufacturing, logistics and supply Chain require skilled inventory planners

CO4 Offers specialized insight into marketing principles, practices and strategy

CO5 Puts students at the cutting edge of industry innovations and developments

CO6 Aims to develop well-rounded, professional marketers

CO7 Enables students to undertake a number of critical marketing tasks

COs of the course "Optimization Techniques"

CO1 Introduces students to the principles, techniques and tools for modeling and solving decision making problems

CO2 Discusses quadratic programming problems, separable programming problems and their applications

CO3 Introduces the concept of dynamic programming

CO4 Introduces multi-objective optimization and goal programming

COs of the course "Network Models and Scheduling Techniques"

CO1 Familiarizes students with the concepts and techniques of project management
CO2 Trains students on organizing and presenting a project through a diagram
CO3 CPM is used for projects consisting of well-defined activities
CO4 PERT is used for managing uncertain activities of a project
CO6 Covers various real life problems like finding the shortest path, spanning tree, travelling salesman problem etc.

Discipline Specific Elective (DSE) Courses

COs of the course "Queueing and Reliability Theory"

CO1 Mathematical study of waiting lines or queues and has its base as statistical models and methods which provide competitive advantage to improve customer satisfaction
CO2 Provides knowledge of optimization techniques to help design optimal systems in the presence of limited resources
CO3 Equips students to conduct studies using mathematical models and formulas to determine the best way of serving the greatest number of customers, given their staffing resources
CO4 Imparts knowledge of all stages of modern engineering processes including design manufacture, testing, maintenance and repair

COs of the course "Quality Management"

CO1 Students can work as a Quality Manager (QM) who can devise and establish the company's quality procedures, standards and specifications, review the customer requirements and making sure they are met
CO2 Trains students for setting standards for quality as well as health and safety, making sure that manufacturing or production processes meet international and national standards and looking at ways to reduce waste and increase efficiency of the production process
CO3 Assists students in defining quality procedures in conjunction with operating staff, setting up and maintaining controls and documentation procedures and monitoring performance by gathering relevant data and producing statistical reports

COs of the course "Integer Programming and Theory of Games"

CO1 Introduces integer programming problems and solution methods
CO2 Discusses applications of integer programming in allocation/selection, scheduling and sequencing
CO3 Introduces game theory and discusses various concepts related to games
CO4 Discusses the game theory problem as a linear programming problem

COs of the course "Logistics and Supply Chain Management (Theory and Tutorials)"

CO1 Helps in streamlining the flow of goods and services across various organizations with the aim of fulfilling customer requirements
CO2 Helps firms in achieving alacrity and efficiency
CO3 Opens a world of job opportunities in this field spanning from specialised positions such as procurement manager, plant/facility manager, logistics and distribution manager to generalized ones such as accounts manager and human resource manager

Skill Enhancement Course (SEC)

COs of the course "Operational Research Applications"

CO1 Provides a good understanding in operational research techniques
CO2 Includes the most up-to-date practices, methodologies and tools
CO3 Helps students make better organizational and operational decisions

COs of the course "Project Management"

CO1 Familiarizes students with the concepts and techniques of project management
CO2 Imparts operational research skills needed to improve business performance

COs of the course "Portfolio Optimization"

CO1 Introduces basics concepts of investment and investment market
CO2 Familiarizes students with quantitative optimization methods to optimize investment decisions

COs of the course "Business Data Analysis"

CO1 Familiarizes students with decision methods and modeling of data analysis
CO2 Provides understanding and knowledge to turn data into new insights and intelligence

Program: B.A (Honors), B.Com (Honors) & B.Sc. (Honors)

Program Specific Outcomes (PSO)

PSO1 Helps to understand the nature and basic concepts of Operational Research and its applications

PSO2 Encourages students to use basic Operational Research tools and techniques whenever necessary

PSO3 Equips students with necessary mathematical and statistical tools and techniques

PSO4 Helps students in formulating simple real life problems as Operational Research problems and solving them using various tools and techniques

PSO5 Encourages the use of relevant softwares viz. LINDO/ LINGO/ MATLAB/ SPSS/ Mathematica/ TORA etc.

Course Outcomes (CO)

Generic Elective: Course (GE)

COs of the course "Introduction to Operational Research and Linear Programming"

CO1 Provides a good understanding of operational research techniques, methodologies and tools

CO2 Helps students make better organizational and operational decisions

CO3 Introduces the concepts of linear programming modeling and its solution techniques

CO4 Explores the mathematical properties of general linear programming problems

CO5 Helps students solve and analyze real-world business problems

COs of the course "Inventory Management"

CO1 Vital for the continuous and uninterrupted operations of most of the organizations

CO2 Maintaining optimal stock levels can increase revenue, reduce costs, and improve cash flows

CO3 Equips the students with latest advancements in the subject area

CO4 Enhances employability opportunities

CO5 Many private and public sector companies involved in manufacturing, logistics and supply chain require skilled inventory planners

CO6 Fast growth of organized retail industry has created many more opportunities for the inventory professionals

COs of the course "Queueing and Reliability Theory"

CO1 Mathematical study of waiting lines or queues and has its base as statistical models and methods which provide competitive advantage to improve customer satisfaction

CO2 Provides knowledge of optimization techniques to help design optimal systems in the presence of limited resources

CO3 Equips students to conduct studies using mathematical models and formulas to determine the best way of serving the greatest number of customers, given their staffing resources

CO4 Imparts knowledge of all stages of modern engineering processes including design

manufacture, testing, maintenance and repair

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Course Outcomes (CO)

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COs of the course "Business Data Analysis"

CO1 Familiarizes students with decision methods and modeling of data analysis
CO2 Provides understanding and knowledge to turn data into new insights and intelligence

Program: M.Sc. Operational Research

Program Specific Outcomes (PSO)

PSO1 Helps students meet the challenges of the information-driven, process-oriented competitive business environment

PSO2 Trains students to fulfill the challenging educational and research needs of business in the functional areas of operational and the allied disciplines

PSO3 Ensures students accomplish great results in diverse sectors such as analytics, research, marketing, manufacturing and services, leading to higher productivity and growth in society

PSO4 Develops and upgrades the skills and proficiency of the students in a balanced manner keeping focus on operational research tools in conjunction with required inputs of mathematics, statistics and computer science

PSO5 Encourages the use of relevant softwares viz. LINDO/ LINGO/ MATLAB/ SPSS/ Mathematica/ TORA etc.

Course Outcomes (CO)

COs of the course "Mathematical Programming-I"

CO1 Introduces the concepts of linear programming modeling
CO2 Explores the mathematical properties of general linear programming problems
CO3 Studies the theory of the simplex algorithm as a solution technique
CO4 Provides understanding of linear programming modelling and its solution technique
CO5 Helps students solve and analyze real-world business problems
CO6 Discusses applications of transportation and assignment problems
CO7 Studies duality and post optimality analysis
CO7 Trains students to formulate a real life problem as a linear programming problem
CO8 Makes students capable enough to work in the area of manufacturing, transportation, agriculture etc

COs of the course "Inventory Management-I"

CO1 Vital for the continuous and uninterrupted operations of most of the organizations
CO2 Maintaining optimal stock levels can increase revenue, reduce costs, and improve cash flows
CO3 Equips the students with latest advancements in the subject area
CO4 Enhances employability opportunities
CO5 Many private and public sector companies involved in Manufacturing, Logistics and Supply Chain require skilled Inventory Planners
CO6 Fast growth of organized retail industry has created many more opportunities for the inventory professionals

COs of the course "Queueing System-I"

CO1 Mathematical study of waiting lines, or queues
CO2 Results often used when making business decisions about the resources needed to provide a

service
CO3 Enhances employability opportunities
CO4 Knowledge of Queuing Theory provides competitive advantage to improve customer satisfaction
CO5 Equips students to conduct studies using mathematical models and formulas to determine the best way of serving the greatest number of customers, given their staffing resources
CO6 Helps design and implement robust Queuing Models to create this competitive advantage

COs of the course "Statistics-I"

CO1 Science of decision making in the face of uncertainty
CO2 Enables the use of statistical tools in uncertain situations
CO3 Knowledge aids in the study of Reliability Theory, Queuing Theory, Decision Theory, Software Reliability, Quality Management, Time Series and Forecasting, Econometrics etc
CO4 Increases job potential in almost all public and private sectors because of its rich data analytic tools

COs of the course "C++ & Unix"

CO1 Highly portable language
CO2 Considered as the language of choice for multi-device, multi-platform app development
CO3 Curriculum meets the need of programming in present day industries
CO4 Gives an extra edge to students to work in multi-national companies as it is a powerful, efficient and fast language

COs of the course "Mathematical Programming-ll"

CO1 Introduces students about nonlinear and convex problems
CO2 Helps students to know how to model nonlinear optimization problems
CO3 Provides solution techniques to solve such problems
CO4 Helps students solve and analyze many business problems which are nonlinear in nature
CO5 Discusses integer programming and its applications in allocation/selection, scheduling and sequencing
CO6 Discusses quadratic programming problems, separable programming problems and their applications
CO7 Introduces the concept of dynamic programming

COs of the course "Scheduling Techniques"

CO1 Focuses majorly on Project management
CO2 PERT/CPM are the project management techniques which are taught
CO3 Trains students on organizing and presenting a project through a diagram
CO4 CPM is used for projects consisting of well-defined activities
CO5 PERT is used for managing uncertain activities of a project
CO6 Covers various real life problems like finding the shortest path, travelling salesman problem etc

COs of the course "Marketing Management"

CO1 Offers specialized insight into marketing principles, practices and strategy
CO2 Puts students at the cutting edge of industry innovations and developments
CO3 Aims to develop well-rounded, professional marketers
CO4 Enables students to undertake a number of critical marketing tasks

COs of the course "Reliability & Maintenance Theory"

CO1 Has its base as physics based principles, statistical models and methods
CO2 Provides knowledge of optimization techniques to help design optimal systems in the presence of limited resources
CO3 Has employability potential in various manufacturing industries, some of which have a separate unit - Quality Systems and Reliability in their respective Engineering Research Centres
CO4 Imparts knowledge of all stages of modern engineering processes including design, manufacture, testing, maintenance and repair

COs of the course "Mathematical Programming-III"

CO1 Introduces multi-objective optimization and goal programming
CO2 Covers some basic concepts as well as some solution methods of multi-objective optimization
CO3 Helps students model and solve many decision and planning problems which involve multiple conflicting objectives that should be considered simultaneously
CO4 Discusses linear fractional programming and its applications
CO5 Familiarizes students with many solution methods to solve non-linear programming problems and its special cases

COs of the course "Statistics-II"

CO1 Regression analysis and time series analysis are two major components of this course
CO2 Techniques are widely used for prediction and forecasting
CO3 Regression helps the managers to understand the relationships among economic variables
CO4 Time series analysis is the study of some variable over a period of time
CO5 Helps students study the factors influencing purchase decision
CO6 Aids in observing customer trend over a period of time etc.
CO7 Encourages students to deal with real life problems involving Regression and time series
CO8 Increases chances of exposure in industries like Banking, Insurance etc.

COs of the course "Software Reliability"

CO1 One of the most in-demand and fastest growing occupational fields
CO2 Allows entry-level candidates to earn positions because of its popularity
CO3 Helps to locate and identify glitches in the software and fix those issues
CO4 Students are taught to develop mathematical models in order to quantify the number of faults

present in the software

COs of the course "Database Management System & Visual Programming"

CO1 Course is divided into two parts: Database management system (DBMS) and Visual programming (VP)
CO2 Imparts knowledge about how to control internal operations of the organization
CO3 Uses graphical elements and figures to develop a program
CO4 MS SQL server and MS Visual Basic are used to provide practical knowledge

COs of the course "Financial Management"

CO1 Provides domain knowledge to the students
CO2 Provides the data analytics and optimization skills required for a successful career in finance and other business organizations
CO3 Broadens the employment opportunities in job market for Operational Research Professionals

COs of the course "Logistics & Supply Chain Management"

CO1 Helps in streamlining the flow of goods and services across various organizations with the aim of fulfilling customer requirements
CO2 Helps firms in achieving alacrity and efficiency
CO3 Opens a world of job opportunities in this field spanning from specialised positions such as procurement manager, plant/facility manager, logistics and distribution manager to generalized ones such as accounts manager and human resource manager

COs of the course "Marketing Research"

CO1 Focuses on the development of professional skills
CO2 Key skills taught include traditional intellectual knowledge, motivation, self-reliance, communication, personality development, critical evaluation and logical argument
CO3 Inculcates vocational skills to forge a successful career in the modern marketing environment

COs of the course "Queueing System-II"

CO1 Enhances employability opportunities
CO2 Provides deeper knowledge of various Queuing Models
CO3 Provides knowledge of more complex Queueing Problems and Queueing Networks to mimic real-life problems better

COs of the course "Multicriteria Decision Models"

CO1 Introduces students to the principles, techniques and tools for modelling and solving decision making problems
CO2 Introduces the major modern techniques and methodologies used at international level, namely analytical hierarchy process and data envelopment analysis methods

CO3 Provides insight into methods of quantitative and qualitative analysis for the effective handling of "real world" decision problems

CO4 Explains the principles of the theory of multicriteria analysis and its role in the Decision Support process

CO5 Enables in understanding the process of modelling a problem and the process of making a decision based on one or more criteria considering both qualitative and quantitative aspects

COs of the course "Decision Theory"

CO1 Teaches skills of decision making under the conditions of risk and uncertainty

CO2 Provides systematic and quantitative approach to addressing and evaluating important choices confronted by organizations in the private and public sector

CO3 Provides job opportunities in business (planning, marketing, negotiation), health care, management, and energy, exploration, litigation and dispute resolution, etc.

COs of the course "Portfolio Management"

CO1 Introduces basics concepts of investment and investment market

CO2 Familiarizes students with quantitative optimization methods to optimize investment decisions in real world situations

CO3 Provides students with real market exposure which will help them to better understand the investment problems, importance of data and subjective influence in financial decisions

CO4 Helps students model and solve real investment decision problems through acquired knowledge about the financial decision making and solution approaches

COs of the course "Quality Management"

CO1 Students can work as a Quality Manager (QM) who can devise and establish the company's quality procedures, standards and specifications, review the customer requirements and making sure they are met

CO2 Trains students for setting standards for quality as well as health and safety, making sure that manufacturing or production processes meet international and national standards and looking at ways to reduce waste and increase efficiency of the production process

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COs of the course "Data Warehousing and Data Mining"

CO1 Helps students develop their skills in the use and application of various technologies, architectures, techniques, tools and methods in the area of Data Science

CO2 Provides an opportunity to specialize as a Data Scientist, one of the most in demand roles across all sectors including health, retail, and energy

<u>COs of the course "Project Work"</u>

CO1 Provides real world exposure of business decision problems

CO2 Each student has to work on a real world business problem (as an Industrial project) and has to understand, model and analyze the problem and also needs to provide its solution based on the knowledge acquired on OR tools through other courses taught in curriculum

Program: M.A./M.Sc. Applied Operational Research

Program Specific Outcomes (PSO)

PSO1 Helps students meet the challenges of the information-driven, process-oriented competitive business environment

PSO2 Trains students to fulfill the challenging educational and research needs of business in the functional areas of operational and the allied disciplines

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PSO5 Encourages the use of relevant softwares viz. LINDO/LINGO/MATLAB/SPSS/Mathematica etc.

PSO6 Trains students in understanding and handling real life problems through case studies

Course Outcomes (CO)

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COs of the course "Data Warehousing and Data Mining"

CO1 Helps students develop their skills in the use and application of various technologies, architectures, techniques, tools and methods in the area of Data Science

CO2 Provides an opportunity to specialize as a Data Scientist, one of the most in demand roles across all sectors including health, retail, and energy

COs of the course "Project Work"

CO1 Provides real world exposure of business decision problems

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Program: M.Phil. Operational Research

Program Specific Outcomes (PSO)

PSO1 Provides advanced courses in Operational Research
PSO2 Strengthens student's basic foundations for doing research in Operational Research
PSO3 Teaches students to write research papers, dissertations, thesis etc
PSO4 Trains students in giving presentations in seminars, conferences etc

Course Outcomes (CO)

COs of the course "Research Methodology"

CO1 Introduces research methodology concepts and research methods
CO2 Provides an overview on basic statistical analysis and interpretation tools for research
CO3 Assists in research writing and introduces IPR and plagiarism tools

COs of the course "Mathematical Programming"

CO1 Introduces advanced concepts of mathematical programming modelling
CO2 Explores the properties of goal programming problems, linear complimentarity problems etc
CO3 Studies the theory of generalized convexity
CO4 Introduces the basic concepts of bi-level programming and logic based programming

COs of the course "Inventory and Production Management"

CO1 Introduces advanced concepts of inventory management
CO2 Discusses interaction of inventory and trade credit policies and other problem extensions
CO3 Discusses interaction of inventory, queues and reliability
CO4 Studies advanced deterministic and variable models

COs of the course "Queueing Systems"

CO1 Studies advanced queueing systems
CO2 Discusses design and control of queues, priority queues and queues with infinite servers
CO3 Studies functional relations of steady state solution through various methods

COs of the course "Theory of Reliability"

CO1 Provides knowledge of optimization techniques to help design advanced and more complex optimal systems in the presence of limited resources
CO2 Discusses system reliability with redundancy and "cost", reliability functions, replacement policies etc

COs of the course "Marketing Management"

CO1 Discusses marketing management models related to various real-life scenario
CO2 Discusses methodology for understanding actual present and futuristic problems, formulating appropriate models and solving them

COs of the course "Software Reliability"

CO1 Provides an overview of software reliability and basic SRGMs
CO2 Discusses various software reliability models with respect to the type and number of errors and their debugging
CO3 Studies release time problems and related models

COs of the course "Queueing Networks"

CO1 Discusses applications and case studies of queueing networks
CO2 Studies product-form and non product-form queueing networks and various optimization methods

COs of the course "Financial Engineering"

CO1 Introduces the concepts of financial engineering
CO2 Provides an overview of portfolio analysis and optimization and discusses relevant models
CO3 Discusses various programming problems in financial decision making

COs of the course "Supply Chain Management"

CO1 Discusses advanced concepts of supply chain management
CO2 Studies concepts of supply chain inventory management and mathematical programming models for supply chain planning, design, optimization and integration

COs of the course "Network Analysis"

CO1 Introduces network theory and various network problems and their solution methods
CO2 Discusses sensitivity analysis, various types of network flows, facility layout and location problems and decomposition algorithm for shortest path in a network

COs of the course "Game and Decision Theory"

CO1 Introduces game theory and discusses various concepts related to games
CO2 Discusses different types of equilibria and general technique for solving statistical games
CO3 Studies concepts of decision theory

Program: Ph.D. Operational Research

Program Specific Outcomes (PSO)

PSO1 Provides advanced courses in Operational Research
PSO2 Teaches students to write research papers, thesis etc
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Course Outcomes (CO)

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CO2 Discusses interaction of inventory and trade credit policies and other problem extensions
CO3 Discusses interaction of inventory, queues and reliability
CO4 Studies advanced deterministic and variable models

COs of the course "Queueing Systems"

CO1 Studies advanced queueing systems
CO2 Discusses design and control of queues, priority queues and queues with infinite servers
CO3 Studies functional relations of steady state solution through various methods

COs of the course "Theory of Reliability"

CO1 Provides knowledge of optimization techniques to help design advanced and more complex optimal systems in the presence of limited resources
CO2 Discusses system reliability with redundancy and "cost", reliability functions, replacement policies etc

COs of the course "Marketing Management"

CO1 Discusses marketing management models related to various real-life scenario

CO2 Discusses methodology for understanding actual present and futuristic problems, formulating appropriate models and solving them

COs of the course "Software Reliability"

CO1 Provides an overview of software reliability and basic SRGMs
CO2 Discusses various software reliability models with respect to the type and number of errors and their debugging
CO3 Studies release time problems and related models

COs of the course "Queueing Networks"

CO1 Discusses applications and case studies of queueing networks
CO2 Studies product-form and non product-form queueing networks and various optimization methods

COs of the course "Financial Engineering"

CO1 Introduces the concepts of financial engineering
CO2 Provides an overview of portfolio analysis and optimization and discusses relevant models
CO3 Discusses various programming problems in financial decision making

COs of the course "Supply Chain Management"

CO1 Discusses advanced concepts of supply chain management
CO2 Studies concepts of supply chain inventory management and mathematical programming models for supply chain planning, design, optimization and integration

COs of the course "Network Analysis"

CO1 Introduces network theory and various network problems and their solution methods
CO2 Discusses sensitivity analysis, various types of network flows, facility layout and location problems and decomposition algorithm for shortest path in a network

COs of the course "Game and Decision Theory"

CO1 Introduces game theory and discusses various concepts related to games
CO2 Discusses different types of equilibria and general technique for solving statistical games
CO3 Studies concepts of decision theory