MANAV RACHNA INTERNATIONAL INSTITUTE
OF
RESEARCH AND STUDIES
(Deemed to be University under section 3 of the UGC Act, 1956)

Centre for Distance and Online Education

CURRICULUM
AND
SCHEME OF EXAMINATION

B.A. (Honours) ECONOMICS

ONLINE DEGREE PROGRAMME

ACADEMIC BATCH: 2023-26

PREAMBLE

The Centre for Distance and Online Education has adopted the curriculum that has relevance to the local, national, regional and global developmental needs with well-defined Program Educational Objectives (PEOs), Program Objectives (POs) and Program Specific Objectives (PSOs) at the program level and Course Outcomes (COs) at individual course level.

The unique and vibrant curriculum of undergraduate and postgraduate programs offered by the Centre for Distance and Online Education is committed to a liberal education philosophy and promotes quality teaching as well as research on the contemporary demand. The vision of the department is to attain the standard of excellence by imparting knowledge in areas of fundamental importance and pushing frontiers of research to address emerging global challenges through holistic development of students into ethical and socially responsible competent economists. The mission of the department is to offer curriculum which prepares students for acquiring theoretical knowledge and applied skills to deal with the economic enquiries; engage students in research on economic and public-policy issues for attaining development in a sustainable manner and to impart holistic education by producing socially responsible and internationally competitive economists.

The Economics PEOs and POs aim to create globally competent economists by extending frontiers to meet the current and future needs, introduce research for addressing the economic challenges to build up a sustainably developed world. It will help inculcate national ethos and values to the ignited minds for serving community on economic or policy issues. The curriculum will enable students to apply analytical framework for economic enquiry and decision-making by appropriate consideration of social and environmental welfare at local, regional, national and global level. The curriculum is regularly reviewed for any revisions or new courses which will help address the need of the academics, industry and society. Regular feedback on the curriculum is taken from all stakeholders' i.e. students, parents, faculties and industry experts. The curriculum is benchmarked with reputed national and international institutions/Universities.

The robust curriculum aims to narrow down the gap between academics and industry to increase employment opportunities and at the same time aims at pushing frontiers of research to meet the local, regional, national and global demand for new forms of knowledge.

The course includes earning of 140 credits during the 3-year duration of the programme in 6 semesters. The total credits required to be earned are further divided as Compulsory Courses and Elective Courses. Total 102 credits are required to be earned under Compulsory Courses and at least 38 credits under Elective Courses. The choice of elective courses is open ended can be chosen from the ones offered by the parent department as well as offered by other departments of the university.

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MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH and STUDIES

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Centre for Distance and Online Education

VISION

Through online education, Manav Rachna stands tall to bring the most efficacious environment for providing higher quality academic and research-oriented education to the aspirants. Manav Rachna Online Education facilitate the goal of increasing access to enduring learning prospects to students and providing opportunities to make efficient use of scarce resources in light of the new economic realities of higher education.

MISSION

To provide an exclusive learning environment to students with flexible and meticulous online learning opportunities that will guide students to acquire the knowledge and skills as per the requirements of society at large. The aim of Manav Rachna Online Education is:

- To develop emerging skills through online learning methodologies to pursue their Academic and Professional goals.
- To impart profound knowledge and understanding of conceptual aspects of multidisciplinary learning.

ABOUT THE DEPARTMENT

The ultimate touchstone of quality education is the quality culture permeating in any education Institution. In today's world of digitization, technical education stands at the crossroads of keeping pace with the emerging needs of humankind along with fast changing trends in governance and scientific development. The global transformation, trend of learning by doing, relevance to people and nation development – Manav Rachna International Institute of Research and Studies is the right place to gear up with a world class competitive edge. We are trusted to nurture juvenile minds and prepare them to deal with challenges of their future

endeavors. Continuing the Legacy of our Founder Dr. O.P Bhalla, Manav Rachna has launched "Manav Rachna Centre for Distance and Online Education" to provide quality programmes to those students who are not able to draw benefits from conventional systems of Education. Seven programmes in different streams namely Computer Applications, Management, Commerce, Business Administration and Economics will be offered by University in online mode with specialization in different domains. In Today's opportunistic world specialized education is essential for successful professional life. Manav Rachna Centre for Distance and Online Education has collaboration with prominent industry partners to provide global career opportunities to the students and prepare the students to acquire the increased technology intensive needs of today. In addition, Manav Rachna Centre for Distance and Online Education provides a multidisciplinary approach for the students to shape their career inside and outside their domain of education and to meet the evolving needs of the society. The commitment of multidisciplinary education is to broaden the participation of students in higher education and leads to a more diverse community. In a multidisciplinary approach, students are inspired to select diverged courses from different disciplines to expand their knowledge, discover themselves through creative thinking and learn the skills of collaboration. The online programmes will help the students to achieve an academic degree along with flexibility and relaxation. These online programs hold equal academic value to as on-campus degree and help students in developing themselves into an industry ready as equivalent to a conventional degree. Students can perfectly reshape their career and future through impeccably designed online programmes. The renowned faculty, cutting –edge advanced curriculum, technology driven and a remarkable content delivery will be helpful in the successfully implementation of online programs.

PROGRAM EDUCATIONAL OBJECTIVES (**PEO'S**)

PEO-1: Create globally competent economists by extending frontiers to meet the current and future needs;

PEO-2: Introduce research for addressing the economic challenges to build up a sustainably developed world;

PEO-3: Pursue lifelong learning to holistically prepare students for a variety of careers as proficient economist;

PEO-4: Inculcate national ethos and values to the ignited minds for serving community on economic or policy issues.

PROGRAM OBJECTIVES (**PO'S**)

PO-1: Gain a firm grasp of knowledge on economics for insight into the complexities, dynamics and challenges of current economic scenarios;

PO-2: Comprehend with the empirical applications using relevant quantitative techniques to support contemporary economic arguments;

PO-3: Apply analytical framework for economic enquiry and decision-making by appropriate consideration of social and environmental welfare;

PO-4: Analyze the economic issues and articulate policy options by engage in reflective and independent thinking;

PO-5: Evaluate new economic ideas in life-long process of learning through research and development;

PO-6: Model the perspective of economic thought by aiding in disciplinary growth and policy making.

UNDERGRADUATE PROGRAM SPECIFIC OBJECTIVES (**PSO'S**)

PSO-1: Accomplish a deep understanding of core economic principles to relate wide range of real-world issues;

PSO-2: Develop analytical aptitude with modern quantitative tools necessary to understand

the economic arguments;

PSO-3: Instill lifelong learning skills for policy modelling and analysis of factual issues of the economy.

Articulation Matrix (mapping is labeled as strongly with 3, moderately with 2 or low with 1)

	PO-1	**PO-2**	**PO-3**	**PO-4**	**PO-5**	**PO-6**	**PSO-1**	**PSO-2**	**PSO-3**
PEO-1	3	3	3	3	2	3	3	3	3
PEO-2	3	3	3	3	2	3	3	3	2
PEO-3	3	3	3	2	3	2	3	3	2
PEO-4	2	2	3	3	3	3	2	2	3

SEMESTER AND CHOICE BASED CREDIT SYSTEM

Economics undergraduate is a one hundred forty credits programme comprising six semesters under the credit based system of study. In this programme, students' performance is measured by the number of credits they earned/completed. Based on the course credits and grade obtained by the student, grade point average is calculated.

(a) Course credits assignment

Each course has a certain number of credits assigned to it depending upon its duration in periods for lecture, tutorial and practical/field practice in a week. A few courses/activities may have without credit(s) and are referred to as Audit Pass courses, which are mandatory to pass as a partial fulfillment of award of the degree.

(b) Earning of credits

At the end of every course, a grade shall be awarded in each course for which a student has registered. On obtaining a minimum Pass-grade, student shall accumulate the course credits as Earned Credits. A student's performance shall be measured by the number of credits that he/she has earned and by the weighted grade point average. Grades obtained in the audit courses shall not be counted for computation of grade point average, however

shall be mandatory to pass as a partial fulfillment of award of degree.

For Award of Degree of the programme Online B.A. (Honours) in Economics, he/she has to earn minimum 140 credits during the 3-year duration of the programme in 6 semesters. The total credits required to be earned have been further classified under two baskets of courses: 'Compulsory Courses' and 'Elective Courses'. The total 108 credits required to be earned under Compulsory Courses basket (including two foundation courses) and 32 credits under Elective Courses basket. All courses under the Compulsory Courses basket are required to be qualified and cleared/pass by each and every students enrolled under the programme, and the same are semester-wise listed in the study scheme along with credits assigned to each course.

Under Elective Courses Basket, there will be three types of courses:

- Semester-wise Inter-disciplinary/Generic/Discipline-specific courses offered by the department itself.
- Open/inter-disciplinary courses offered at the level of Institute/University, and notified from the office of Dean- Academics.
- Massive Open Online Courses (MOOCs) available on SWAYAM platform or any other platform as recommended by UGC/AICTE and notified from the office of Dean-Academics.

Each course shall have credits assigned to it. Student shall be required to register courses every semester for as many courses/credits specified under Elective Courses basket depending upon his/her interest, capability/pace of learning and availability of time slot (without any clash in time table) so as to earn all required total credits under the Elective Courses basket during the entire program duration. However, for registration of courses [including courses under Compulsory Courses basket, Elective Courses basket and Previous Semester Courses (wherein he/she was declared in-eligible on the basis of attendance or he/she could not clear the course within permissible given chances)], if any, the maximum limit in a semester shall be 30 credits.

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Online BA (Honours) in Economics

SEMESTER-I

Course Type	Course Code	Title of Course	Internal/ Continuous Assessment	End Semester Examination	Total	Credits
Foundation	OCH-202B	Environmental Studies	30	70	100	3 + 1*
Core	OBECO-DS-108	Mathematical Economics-I	30	70	100	6
	OBECO-DS-109	Introductory Microeconomics	30	70	100	6
	OBECO-DS-110	Statistical Methods in Economics-I	30	70	100	6
Total			**120**	**280**	**400**	**22**

*Note: * In Environmental Studies, OCH-202B, 1 credit is for field visit/project.*

SEMESTER-II

Course Type	Course Code	Title of Course	Internal/ Continuous Assessment	End Semester Examination	Total	Credits
Compulsory Courses						
Foundation	OBECO-DS-201A	Communication and Writing Skills for Economist	30	70	100	4
Core	OBECO-DS-206	Introduction to Macroeconomics	30	70	100	6
	OBECO-DS-207	Statistical Methods in Economics-II	30	70	100	6
	OBECO-DS-208	Mathematical Economics-II	30	70	100	6
Total			**120**	**280**	**400**	**22**

SEMESTER-III

Course Type	Course Code	Title of Course	Internal/ Continuous Assessment	End Semester Examination	Total	Credits
Compulsory Courses						
Core	OBECO-DS-306	Intermediate Microeconomics-I	30	70	100	6
	OBECO-DS-307	Intermediate Macroeconomics-I	30	70	100	6
	OBECO-DS-501	Basic Econometrics	30	70	100	6
Elective-I		Choose any 1 from Elective Basket-I	30	70	100	4
Total			**120**	**280**	**400**	**22**

SEMESTER-IV

Course Type	Course Code	Title of Course	Internal/ Continuous Assessment	End Semester Examination	Total	Credits
Compulsory Courses						
Core	OBECO-DS-406	Intermediate Microeconomics-II	30	70	100	6
	OBECO-DS-407	Intermediate Macroeconomics-II	30	70	100	5
	OBECO-DS-408	Development Economics-I	30	70	100	6
	OBECO-DS-409	Indian Economy-I	30	70	100	6
Elective-II		Choose any 1 from Elective Basket-II	30	70	100	4
Total			**150**	**350**	**500**	**27**

SEMESTER-V

Course Type	Course Code	Title of Course	Internal/ Continuous Assessment	End Semester Examination	Total	Credits
Compulsory Courses						
Core	OBECO-DS-653	Term Paper	30	70	100	6
	OBECO-DS-507	International Economics-I	30	70	100	6
Elective-III		Choose any 3 from Elective Basket-III	30	70	100	4
			30	70	100	4
			30	70	100	4
Total			**150**	**350**	**500**	**24**

SEMESTER-VI

Course Type	Course Code	Title of Course	Internal/ Continuous Assessment	End Semester Examination	Total	Credits
Compulsory Courses						
Core	OBECO-DS-606	Indian Economy and Policy	30	70	100	6
	OBECO-DS-551A	Dissertation	30	70	100	6
Elective-IV		Choose any 3 from Elective Basket-IV	30	70	100	4
			30	70	100	4
			30	70	100	4
Total			**150**	**350**	**500**	**24**

Elective Basket-I						
Course Code	**Title of Course**	**Internal/ Continuous Assessment**	**End Semester Examination**	**Total**	**Duration of Exam**	**Credits**
OBECO-DC- 901	Research Methodology	30	70	100	3hrs.	4
OBECO-DC-003	Money-Banking & Finance	30	70	100	3hrs.	4
OBECO-ID-003	Vedic Mathematics & Quantitative Reasoning	30	70	100	3hrs.	4
Elective Basket-II						
Course Code	**Title of Course**	**Internal/ Continuous Assessment**	**End Semester Examination**	**Total**	**Duration of Exam**	**Credits**
OBECO-DS-053A	Data Analysis through Computer	30	70	100	3hrs.	4
OBECO-ID-005	Government & Politics in India	30	70	100	3hrs.	4
OBECO-GE-001	Financial Accounting in India	30	70	100	3hrs.	4
Elective Basket-III						
Course Code	**Title of Course**	**Internal/ Continuous Assessment**	**End Semester Examination**	**Total**	**Duration of Exam**	**Credits**
OBECO-DC-055	Data Analysis through - Statistical Software - STATA	30	70	100	3hrs.	4
OBECO-DC-903	Development Economics II	30	70	100	3hrs	4
OBECO-DC-005	Environment & Resource Economics	30	70	100	3hrs.	4
OBECO-GE-002	Qualitative Data Analysis	30	70	100	3hrs.	4
OBECO-DS-902	Understanding Sustainable Development Goals	30	70	100	3hrs.	4
OBECO-DC-906	Labour Economics	30	70	100	3hrs.	4
OBECO-DC-908	Economics for Education	30	70	100	3hrs.	4
OBECO-ID-004	Public Budget & Fiscal Policy in India	30	70	100	3hrs.	4
OBECO-DS-652	Field Study	30	70	100	3hrs.	4
OBECO-DS-401	Public Economics	30	70	100	3hrs.	4

Elective Basket-IV						
Course Code	**Title of Course**	**Internal/ Continuous Assessment**	**End Semester Examination**	**Total**	**Duration of Exam**	**Credits**
OBECO-DC-056	Data Analysis through - Statistical Software - R	30	70	100	3hrs.	4
OBECO-DC-904	International Economics - II	30	70	100	3hrs.	4
OBECO-GE-004	Capital Market & Corporate Finance	30	70	100	3hrs.	4
OBECO-GE-005	International Development Institutions	30	70	100	3hrs.	4
OBECO-DC-006	Behavioural Economics	30	70	100	3hrs.	4
OBECO-DC-905	Health Economics	30	70	100	3hrs.	4
OBECO-DC-907	Infrastructure Economics	30	70	100	3hrs.	4
OBECO-DC-909	Gender Economics	30	70	100	3hrs.	4

Online BA (Honours) in Economics

SEMESTER-I

Course Type	Course Code	Title of Course	Credits
Foundation	OCH-202B	Environmental Studies	4
Core	OBECO-DS-108	Mathematical Economics-I	6
	OBECO-DS-109	Introductory Microeconomics	6
	OBECO-DS-110	Statistical Methods in Economics-I	6
Total			**22**

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OCH-202B: ENVIRONMENTAL STUDIES

Credits
3+1
Duration of Examination: 3 Hrs

Max. Marks : 100
Continuous Evaluation: 30
End Semester Examination: 70

Pre-Requisite: The learners should have the knowledge of environment, biodiversity, atmospheric pollution and importance of environmental studies. They should have the knowledge of causes and effects of disasters and various environmental problems.

Course Type: Ability Enhancement Foundation Course

Course Outcomes

After completion of this course, the students will be able to:
OCH202B.1 Understand significant environmental issues
OCH202B.2 Practice environment friendly practices
OCH202B.3 Analyze the different factors behind several environmental problems
OCH202B.4 Evaluate significant environmental concerns
OCH202B.5 Provide innovative solutions to resolve environmental issues.

Part-A

Unit 1: The Multidisciplinary nature of environmental studies

1.1 Definition; Scope and importance, Need for public awareness.
1.2 Natural Resources: Forest Resources, Water Resources, Land Resources, Energy Resources and Mineral Resources

Unit 2: **Concept of an ecosystem.**

2.1 Structure and function of an ecosystem. - Producers, consumers and decomposers. - Energy flow in the ecosystem.
2.2 Ecological succession. - Food chains, food webs and ecological pyramids.
2.3 Introduction, types, characteristic features, structure and function of the following ecosystem: - a. Forest ecosystem b. Grassland ecosystem c. Desert ecosystem d. Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries).

Unit 3: Biodiversity and its Conservation

3.1 Introduction-Definition: genetic, species and ecosystem diversity.
3.2 Biogeographical classification of India.
3.3 Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values.
3.4 Biodiversity at global, National and local levels, India as a mega-diversity nation, Hot- spots of biodiversity, Threats to biodiversity: habital loss, poaching of wildlife, man-wildlife conflicts.
3.5 Endangered and endemic species of India.
3.6 Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.

PART B

Unit 4: Environmental Pollution

4.1 Definition - Causes, effects and control measures of: - a. Air pollution b. Water pollution c. Soil pollution d. Marine pollution e. Noise pollution f. Thermal pollution g. Nuclear hazards.
4.2 Solid waste Management: Causes, effects and control measures of urban and industrial wastes.
4.3 Role of an individual in prevention of pollution. - Pollution case studies. - Disaster management: floods, earthquake, cyclone and landslides.

Unit 5: Social Issues and the Environment
5.1 From Unsustainable to Sustainable development. - Urban problems related to energy. - Water conservation, rain water harvesting, watershed management. - Resettlement and rehabilitation of people; its problems and concerns.
5.2 Case studies. - Environmental ethics: Issues and possible solutions. - Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Case studies. - Wasteland reclamation. - Consumerism and waste products.
5.3 Environment Protection Act. - Air (Prevention and Control of Pollution) Act. - Water (Prevention and Control of Pollution) Act. - Wildlife Protection Act. - Forest Conservation Act. - Issues involved in enforcement of environmental legislation. - Public awareness.

Unit 6: Human Population and the Environment
6.1 Population growth, variation among nations. - Population explosion-Family welfare Programme.
6.2 Environment and human health. - Human Rights. - Value Education. - HIV/AIDS.
6.3 Women and Child Welfare. - Role of information Technology

Text Books/ Reference Books:
1. Carson, R. 2002. *Silent Spring*. Houghton Mifflin Harcourt.
2. Gadgil, M., & Guha, R. 1993. *This Fissured Land: An Ecological History of India*. Univ. of California Press.
3. Gleeson, B. and Low, N. (eds.) 1999. *Global Ethics and Environment*, London, Routledge.
4. Gleick, P. H. 1993*. Water in Crisis*. Pacific Institute for Studies in Dev., Environment & Security. Stockholm Env. Institute, Oxford Univ. Press.
5. Groom, Martha J., Gary K. Meffe, and Carl Ronald Carroll. 2006. *Principles of Conservation Biology*. Sunderland: Sinauer Associates.
6. Grumbine, R. Edward, and Pandit, M.K. 2013. *Threats from India's Himalaya dams*. Science, 339: 36-37.

Evaluation Tools:
Assignment/Tutorials | Sessional tests | Surprise questions during lectures/Class Performance | End Semester Examination

Instructions for paper setting:
Seven questions are to be set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each Part A and Part B (one from each unit). Student needs to attempt two questions out of three from each part. Each question will be of 14 marks.

Evaluation Policy:
The evaluation will include two types of assessments:
(i) Continuous or formative assessments (in the form of end semester examination or term examination. Weightage of assessments are as follows:
For continuous or Formative assessment (in semester): Maximum 30 percent. The categorization is:

MCQs	30%
Subjective (Short/Long)	40%
Discussion/Presentation	15%

Projects/Group Activities etc 15%

(ii) For Summative assessment (End Semester Examination or End-Term Examination):
Minimum: 70 percent. Categorization for the same is:
Objective Type Questions: 30%
Short/Long Questions: 70%

Course Articulation Matrix

CO Statements	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PSO-1	PSO-2	PSO-3	PSO-4
OCH-202-B.1	3	3	2	2	3	3	2	3	2	2
OCH-202-B.2	3	3	3	3	2	1	2	3	3	3
OCH-202-B.3	3	2	3	3	1	2	3	3	2	3
OCH-202-B.4	2	3	2	3	3	3	3	3	2	3
OCH-202-B.5	2	3	3	3	2	1	3	3	3	3

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OBECO-DS-108: Mathematical Economics -I

Credits
6
Duration of examination: 3 Hrs
Pre-requisites: NIL
Course Type: Core

Maximum marks: 100
Continuous Evaluation: 30
End Semester Examination: 70

Course Outcomes

After completion of this course, the students will be able to:
OBECO-DS-108.1 Develop an understanding of the basic tools of Mathematics.
OBECO-DS-108.2 Understand the graphical interpretation of formulas and functions
OBECO-DS-108.3 Analyze the application of mathematics in Economics problems
OBECO-DS-108.4 Understand concepts for developing foundation of Maths in Economics

Part-A

Unit-1: Preliminaries

1.1 Sets and set operations
1.2 Relations; functions and their properties;
1.3 Types of functions: linear, quadratic, polynomial, power, exponential, logarithmic; along with graphical interpretation
1.4 Sequences and series: convergence, algebraic properties and applications;

Unit 2 Applications of Differential Calculus

2.1 Derivative as rate of change/slope of curve
2.2 Differentiation properties: constant rule, power rule, sum rule, product rule, quotient rule, chain rule, inverse rule.
2.3 Second and higher order derivative; properties and applications in Economics.

Unit 3 Partial and Total Derivatives

3.1 Meaning and techniques of partial differentiation
3.2 Second order partial derivative
3.3 Derivative of implicit functions.
3.4 Meaning and rules of total differentials, Applications in Economics

Part B

Unit 4 Basics of Integral Calculus

4.1 Nature of integral and area under curve;
4.2 Integration: constant rule, power rule, sum rule, exponential rule, logarithm rule, substitution rule

4.3 Definite and indefinite integral. Applications in Economics

Unit-5: Differential and Difference Equations

5.1 First-order differential equation: homogeneous and non-homogeneous cases
5.2 Phase diagrams and stability
5.3 First order difference equation
5.4 Equilibrium and its stability. Applications in Economics.

Unit-6: Linear Algebra

6.1 Vector spaces: algebraic and geometric properties, scalar products, norms, orthogonality
6.2 Matrices with properties and operations. Types of matrices.
6.3 Inverse of a matrix; Cramer's Rule.
6.4 Linear transformations: properties; systems of linear equations and economic applications: properties of their solution sets;
6.5 Determinants: characterization, properties and applications. Applications in Economics.

List of Suggested Text Books/Reference Books

1. Chiang, A.C. and Wainwright, K. (2016) *Fundamental methods of mathematical economics*. Atlanta, GA: AMAC Accessibility Solutions.
2. Sydsæter, K. and Hammond, P.J. (2009) *Mathematics for Economic Analysis*. New Delhi: Pearson.
3. R G D, A. (1962) *Mathematical Analysis for Economists. 1962 ed*. London: Macmillan.

Evaluation Tools:

Assignment/Tutorials | Sessional tests | Surprise questions during lectures/Class Performance | End Semester Examination

Instructions for paper setting:

Seven questions are to be set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each Part A and Part B (one from each unit). Student needs to attempt two questions out of three from each part. Each question will be of 14 marks.

Evaluation Policy:

The evaluation will include two types of assessments:

(iii) Continuous or formative assessments (in the form of end semester examination or term examination. Weightage of assessments are as follows:
For continuous or Formative assessment (in semester): Maximum 30 percent. The categorization is:

MCQs	30%
Subjective (Short/Long)	40%
Discussion/Presentation	15%
Projects/Group Activities etc	15%

(iv) For Summative assessment (End Semester Examination or End-Term Examination):
Minimum: 70 percent. Categorization for the same is:

Objective Type Questions:	30%
Short/Long Questions:	70%

Course Articulation Matrix

CO Statements	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PSO-1	PSO-2	PSO-3
OBECO-DS-108.1	3	2	2		1			3	
OBECO-DS-108.2	3	2	2						
OBECO-DS-108.3	3	3	2	1	1	2		3	
OBECO-DS-108.4	3	2	2	1		2		2	

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OBECO-DS-109: Introductory Microeconomics

Credits 6
Maximum marks: 100
Continuous Evaluation: 30
Duration of examination: 3 Hrs
End Semester Examination:70
Pre-requisites: NIL
Course Type: Core

Course Outcomes

After completion of this course, the students will be able to:
OBECO-DS-109.1 Understand how scarcity, opportunity costs and cost/benefit analysis impact economic behavior
OBECO-DS-109. 2 Interpret detailed theory of consumer behavior
OBECO-DS-109. 3 Infer behavior of firm in theory of production, cost and revenue
OBECO-DS-109.4 Understand the impact of monopolies versus competitive equilibrium on economic outcomes

Part-A

Unit-1: Introduction

1.1 Principles of Economics
1.2 Economic problem :- Scarcity and Choice
1.3 Central Problems of the economy, Positive and Normative Analysis
1.4 Production Possibility Curve:- Definition, Properties , Rotation and shifts of PPC

Unit-2: The Market Forces of Demand and Supply

2.1 Demand: - Individual Demand, Market demand, factors affecting Individual/Market Demand, Law of Demand, change in Demand and change in Quantity demanded
2.2 Supply: - Individual Supply, Market Supply, factors affecting Individual/Market Supply, Law of supply, change in supply and change in Quantity Supplied
2.3 Elasticity of Demand and Elasticity of supply: - Degrees of elasticity, Types of elasticity, Factors affecting elasticity
2.4 Application of Supply, Demand and Elasticity

Unit-3: Consumer's Behavior

3.1 Consumer's equilibrium – Cardinal Approach (meaning of utility, law of diminishing marginal utility, conditions of consumer's equilibrium using marginal utility analysis.)
3.2 Consumer's equilibrium – Ordinal Approach (Indifference Curve and its properties, Budget Line, conditions of consumer's equilibrium).
3.3 Derivation of Demand Curve through Cardinal and Ordinal Preferences.
3.4 Price effect:- Substitution and Income effect

Part-B

Unit-4: Production and Cost

4.1 Production function in traditional theory
4.2 Law of variable proportions: derivation of short run total/average/marginal products

4.3 Short run cost:- Total fixed cost, Total variable cost, Total cost, average fixed cost, Average variable cost, Average total cost, and Marginal cost
4.4 Costs of production as derived functions
4.5 Relationship between Average and Marginal Costs

Unit-5: Producer's Equilibrium
5.1 Total and average/marginal revenues in competitive and imperfectly competitive markets
5.2 Relation between average and marginal revenues (with mathematical proof).
5.2 Producer's equilibrium-meaning and its conditions in terms of marginal revenue marginal cost.
5.4 Producer's equilibrium-meaning and its conditions in terms of Total revenue Total cost.

Unit-6: Market Structure
6.1 Market structure and classifications :- Perfect Competition, Monopoly, Monopolistic Competition, Oligopoly
6.2 Effects of shift in Demand and Supply
6.3 Price-Output determination under Perfect Competition
6.4 Price-Output determination under Monopoly

List of Suggested Text Books/Reference Books

1. Mankiw, N.G. (2015) *Principles of microeconomics*. Stamford, CT: Cengage Learning.
2. Varian, H.R. (2020) *Intermediate microeconomics: A modern approach*. New York: W.W. Norton and Company.
3. Pindyck, R.S. and Rubinfeld, D.L. (2005) *Microeconomics*. Upper Saddle River, NJ: Pearson Prentice Hall.
4. Frank, R.H. (2020) *Microeconomics and behaviour*. New York, NY: McGraw-Hill Education.

Evaluation Tools:
Assignment/Tutorials | Sessional tests | Surprise questions during lectures/Class Performance | End Semester Examination

Instructions for paper setting:
Seven questions are to be set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each Part A and Part B (one from each unit). Student needs to attempt two questions out of three from each part. Each question will be of 14 marks.

Evaluation Policy:
The evaluation will include two types of assessments:

(i) Continuous or formative assessments (in the form of end semester examination or term examination. Weightage of assessments are as follows:
For continuous or Formative assessment (in semester): Maximum 30 percent. The categorization is:

MCQs	30%
Subjective (Short/Long)	40%
Discussion/Presentation	15%
Projects/Group Activities etc	15%

(ii) For Summative assessment (End Semester Examination or End-Term Examination):
Minimum: 70 percent. Categorization for the same is:

Objective Type Questions:	30%
Short/Long Questions:	70%

Course Articulation Matrix

CO Statements	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PSO-1	PSO-2	PSO-3
OBECO-DS-109.1	3			2			3	3	
OBECO-DS-109.2	3	2	2	1	1	3	3	2	1
OBECO-DS-109.3	3	2	2	1	1		3	2	1
OBECO-DS-109.4	3		2	1	1	2	3	2	1

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH AND STUDIES (**MRIIRS**)

(Deemed to be University under Section 3 of the UGC Act 1956)

OBECO-DS-110: Statistical Methods in Economics-I

Credits: 6
Maximum marks: 100
Continuous Evaluation: 30
Duration of examination: 3 Hrs
End Semester Examination:70
Pre-requisites: NIL
Course Type: Core

Course Outcomes

After completion of this course, the students will be able to:
OBECO-DS-110.1 Apply statistical concepts, techniques, and methodologies to real-world data sets,
OBECO-DS-110.2 Enhance critical thinking and problem-solving abilities through the application of statistical techniques
OBECO-DS-110.3 Develop effective communication skills, to present statistical findings and interpretations
OBECO-DS-110.4 Development of a curious and analytical mindset for further studies or professional applications in fields requiring statistical analysis.

Part-A

Unit 1: Central Tendency

1.1 Introduction to data distribution and its properties; emphasis on central tendency as the first property
1.2 Characteristics of a good measure of central tendency
1.3 Averages: arithmetic, geometric, and harmonic means and their relationships
1.4 Relationship between mean, median, and mode
1.5 Positional averages: quartiles, deciles, and percentiles.

Unit 2: Dispersion

2.1 Measures of dispersion: range, interquartile range, variance, standard deviation, mean deviation, and quartile deviation
2.2 Range-based measures of dispersion: mean deviation, coefficient of variation, and interquartile range
2.3 Empirical Rule and its application in estimating data proportions using the normal distribution
2.4 Chebyshev's Theorem and its usefulness in estimating data proportions within a certain range.

Unit 3: Moments, Skewness, and Kurtosis

3.1 Moment generating function: understanding moments about arbitrary origin, raw moments, and central moments
3.2 Skewness: measurement using absolute and relative measures
3.3 Kurtosis: understanding its measurement and implications

Part-B

Unit 4: Bivariate Analysis

4.1 Overview of correlation and regression
4.2 Analysis of bivariate data: scatter diagram and graphical representation
4.3 Exploring correlation: Karl Pearson correlation, coefficient of correlation, and probable error

4.4 Understanding the coefficient of determination, Spearman's rank correlation, and basics of partial and total correlations.

Unit 5: Index Number

5.1 Importance of constructing index numbers: Price index versus Value index
5.2 Comparative analysis of index number construction methods: Fisher, Laspeyres, and Paasche methods
5.3 Consistency tests for index numbers: time reversal, factor reversal, and circular tests
5.4 Addressing problems associated with index numbers, including a comparison with implicit price deflators.

Unit 6: Regression Analysis

6.1 Introduction to regression equations and their properties
6.2 Relationship between correlation and regression coefficients
6.3 Numerical examples to illustrate regression analysis.

List of Suggested Text Books/Reference Books

1. Merchant, R. *et al.* (1998) *Applied Statistics for business and economics,, third edition, Allen L. Webster*. Boston: Irwin/McGraw-Hill.
2. Spiegel, M.R., Schiller, J.J. and Srinivasan, R.A. (2013) *Probability and statistics*. New York: Schaum.
3. Paul, H. *et al.* (2016) *Statistics for Economics: Compiled from statistics for Business and Economics, Eighth Edition, Global edition, Paul Newbold, William L. Carlson and Betty M. Thorne*. Harlow: Pearson.
4. Keller, G. (2023) *Statistics for Management and Economics*. Boston, MA: Cengage.
5. Levine, D., Szabat, K. and Stephan, D. (2020) *Business statistics: A first course*. Hoboken, NJ: Pearson.
6. Agresti, A., Franklin, C.A. and Klingenberg, B. (2023) *Statistics: The art and science of learning from Data*. Harlow: Pearson.
7. Lind, D.A., Marchal, W.G. and Wathen, S.A. (2024) *Statistical Techniques in Business & Economics*. New York, NY: McGraw Hill.
8. Evans, J.R. (2021) *Business analytics: Methods, models, and decisions*. Harlow, Essex: Pearson Education Limited.
9. Kleinbaum, D.G. *et al.* (2014) *Applied regression analysis and other multivariable methods*. Australia: Cengage Learning.

Evaluation Tools:

Assignment/Tutorials | Sessional tests | Surprise questions during lectures/Class Performance | End Semester Examination

Instructions for paper setting:

Seven questions are to be set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each Part A and Part B (one from each unit). Student needs to attempt two questions out of three from each part. Each question will be of 14 marks.

Evaluation Policy:

The evaluation will include two types of assessments:

(i) Continuous or formative assessments (in the form of end semester examination or term examination. Weightage of assessments are as follows:

For continuous or Formative assessment (in semester): Maximum 30 percent. The categorization is:

MCQs	30%

Subjective (Short/Long) 40%
Discussion/Presentation 15%
Projects/Group Activities etc 15%

(ii) For Summative assessment (End Semester Examination or End-Term Examination):
Minimum: 70 percent. Categorization for the same is:
Objective Type Questions: 30%
Short/Long Questions: 70%

Course Articulation Matrix

CO Statements	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PSO-1	PSO-2	PSO-3
OBECO-DS-110.1	3					2	3		
OBECO-DS-110.2	2	1	3		2	2	3	3	3
OBECO-DS-110.3	3		3	2				2	
OBECO-DS-110.4		2			2	2	3		2

Online BA (Honours) in Economics

SEMESTER-II

Course Type	Course Code	Title of Course	Credits
Foundation	OBECO-DS-201A	Communication and Writing Skills for Economist	4
Core	OBECO-DS-206	Introduction to Macroeconomics	6
	OBECO-DS-207	Statistical Methods in Economics-II	6
	OBECO-DS-208	Mathematical Economics-II	6
Total			**22**

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH AND STUDIES

(MRIIRS)

(Deemed to be University under Section 3 of the UGC Act 1956)

OBECO-DS- 201A: Communication and Writing Skills For Economist

Credits
4
Duration of Examination: 3 Hrs
Pre-Requisite: NA
Course Type: Foundation

Max. Marks : 100
Continuous Evaluation : 30
End Semester Examination: 70

Course Outcomes

After completion of this course, the students will be able to:
OBECO-DS-201A.1 Familiarize students with the basic concepts and patterns of scholarly communication and writing
OBECO-DS-201A.2 Enable the application of concepts in various everyday scenarios
OBECO-DS-201A.3 Develop adequate comprehension skills for verbal and written communication
OBECO-DS-201A.4 Aid in organisation and expression of opinion and argument

PART-A

Unit-1 Introduction to English Writing and Communication

1.1. Introduction to Linguistic and Phonetics.
1.2. Importance of communication tools
1.3. Basics of English grammar and speech, vocabulary skills, sentence structuring and word choice for academic writing

Unit-2: Effective Writing Skills

2.1. Introduction to effective writing skills (Structure, Cohesion)
2.2. 7C's of Communication.
2.3. Format's and Styles- Articles resume and CV, minutes, notices, etc.

Unit-3: Types and Purposes of Academic Writing

3.1. Importance of writing and communication in academics
3.2. Academic styles – assignments, projects, reports, academic papers, dissertation/ thesis
3.3. Process of Communication

PART-B

Unit-4: Writing Formats for Scholarly Communication

4.1. Building Relationship and Cross cultural communication
4.2. Business Etiquettes
4.3. Academic Writing (Plagiarism, citations, Referencing Styles; drafts editing)

Unit 5: Oral Communication

5.1. Presentations in seminars, conferences and workshops
5.2 Basic forms of public speaking – debates, JAM sessions, declamations and elocutions

5.3. Group and panel discussions – participation and moderation; personal interviews

Unit-6: Reading, Comprehension and Communication of Texts

6.1 Academic reading of written texts and audiovisual texts such as books, newspaper articles, research articles, cinema, digital- texts, etc.

6.2 Understanding and usage in different written and oral communication styles learnt through the course.

List of Suggested Text Books/Reference Books

1. Zemach, D.E. and Rumisek, L.A. (2010) *College writing: From paragraph to essay*. Oxford: Macmillan Education.

2. Jordan, R.R. (2010) *Academic writing course: Study skills in English*. Harlow: Longman.

3. Hinkel, E. (2020) *Teaching academic L2 writing: Practical techniques in vocabulary and grammar*. New York; London: Routledge, Taylor et Francis Group.

4. Anderson, J.R. and Bellezza, J.V. (1993) *Rules of the mind*. Hillsdale, NJ: Laurence Erlbaum Associates, Publishers.

5. Richards, J.C. and Miller, S.K. (2009) *Doing academic writing in education: Connecting the personal and the professional*. New York: Routledge.

Evaluation Tools:

Assignment/Tutorials | Sessional tests | Surprise questions during lectures/Class Performance | End Semester Examination

Instructions for paper setting:

Seven questions are to be set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each Part A and Part B (one from each unit). Student needs to attempt two questions out of three from each part. Each question will be of 14 marks.

Evaluation Policy:

The evaluation will include two types of assessments:

(i) Continuous or formative assessments (in the form of end semester examination or term examination. Weightage of assessments are as follows:

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MCQs	30%
Subjective (Short/Long)	40%
Discussion/Presentation	15%
Projects/Group Activities etc	15%

(ii) For Summative assessment (End Semester Examination or End-Term Examination): Minimum: 70 percent. Categorization for the same is:

Objective Type Questions:	30%
Short/Long Questions:	70%

Course Articulation Matrix

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PSO 1	PSO 2	PSO 3
OBECO-DS-201A.1	3	2		2	2	2	2		3
OBECO-DS-201A.2		3		2	2	2	2	2	
OBECO-DS-201A.3		2		2		3	3	2	
OBECO-DS-201A.4		2		3	3	2	2	3	

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH AND STUDIES (**MRIIRS**)

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OBECO-DS-206: Introduction to Macroeconomics

Credits: 6
Maximum marks: 100
Continuous Evaluation: 30
End Semester Examination: 70
Duration of examination: 3 Hrs
Pre-requisites: NIL
Course Type: Core

Course Outcomes

After completion of this course, the students will be able to:
OBECO-DS-206.1 Describe the concept of macroeconomic models
OBECO-DS-206.2 Analyze theories of consumption, saving and investment
OBECO-DS-206.3 Illustrate the functions of money and product markets in economy
OBECO-DS-206.4 Familiarize with theories of output, unemployment and labour market

Part-A

Unit-1: Macroeconomic Foundation

1.1 Development of macroeconomics: basic ideas of modern macroeconomics (introduction to Classical-Keynesian synthesis) and its new development (overview of New Keynesian/New Classical/Monetarism).,
1.2 Concept of markets in macroeconomics: commodity, money & labor markets; concept of aggregate demand-supply & macro-equilibrium
1.3 Basics of economic growth, business cycles (recovery, prosperity, recession, depression); concept of ex-ante versus ex-post, potential versus actual, nominal versus real outputs
1.4 Policy instruments: fiscal policy versus monetary policy; basics of open economy macroeconomics and exchange rate; inflation and deflation, supply shock; unemployment

Unit-2: Theories of Consumption

2.1 Micro-foundation of aggregate consumption expenditure; subjective versus objective factors of consumption
2.2 The consumption function: relationship between consumption and income: Marginal propensity to consume (MPC) and marginal propensity to save (MPS)
2.3 Keynesian Law of consumption

Unit-3: Saving and Investment

3.1 Derivation of saving function from consumption (equation with diagram, propensity to save); concept of capital (classical definition, stock versus flow concept, properties of capital)
3.2 Basics of the theory of investment (Neo-classical view to determine level of investment); stock market and Tobin's q
3.3 Keynesian theory: investment demand and marginal efficiency of capital (including mathematical derivation on present value criterion, marginal efficiency of capital versus marginal efficiency of investment)

Part-B

Unit-4: Money Supply and Demand

4.1 Money and its functions: commodity versus fiat money
4.2 Liquidity preference: transactional and speculative/precautionary demand
4.3 Money supply determination and monetary aggregates.

Unit-5: Theory of Inflation

5.1 Inflation and its significance in macroeconomics; Types of inflation: demand-pull and cost-push inflation
5.2 Measurement of inflation: Consumer Price Index (CPI), Producer Price Index (PPI), and GDP deflator
5.3 Deflation and its costs; concepts of structural inflation, disinflation/stagflation/ hyperinflation; seigniorage.

Unit-6: Output and Unemployment

6.1 Composition of aggregate output; full employment level of output
6.2 Definition of unemployment: types and measurement including natural rate of unemployment, cyclical and frictional unemployment
6.3 Real-wage rigidity and structural unemployment; causes of unemployment

List of Suggested Text Books/Reference Books

1. Lipsey, R.G. and Chrystal, K.A. (2007) *Economics*. Oxford: Oxford University Press.
2. Samuelson, P.A. *et al.* (2020) *Economics*. Boston, MA: McGraw-Hill.
3. Mankiw, N.G. (2003) *Macroeconomics*. New York: Worth Publishers.
4. Branson, W.H. (1972) *Macroeconomic theory and policy*. New York: Harper and Row.
5. Dornbusch, R. and Fischer, S. (1981) *Macroeconomics*. Tokyo: McGraw-Hill.

Evaluation Tools:

Assignment/Tutorials | Sessional tests | Surprise questions during lectures/Class Performance | End Semester Examination

Instructions for paper setting:

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Objective Type Questions:	30%
Short/Long Questions:	70%

CO Statements	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PSO-1	PSO-2	PSO-3
OBECO-DS-206.1	3						3		
OBECO-DS-206.2	3	2	2	1	1		3	2	1
OBECO-DS-206.3	3						3	2	
OBECO-DS-206.4	3	2	2	1	1		3	2	1

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH AND STUDIES

(**MRIIRS**)

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OBECO-DS-207: Statistical Methods in Economics-II

Credits: 6
Maximum marks: 100
Continuous Evaluation: 30
End Semester Examination: 70
Duration of examination: 3 Hrs
Pre-requisites: NIL
Course Type: Core

Course Outcomes

After completion of this course, the students will be able to:

OBECO-DS-207.1 Apply statistical concepts, techniques, and methodologies to real-world data sets,

OBECO-DS-207.2 Enhance critical thinking and problem-solving abilities through the application of statistical techniques

OBECO-DS-207.3 Develop effective communication skills, to present statistical findings and interpretations

OBECO-DS-207.4 Development of a curious and analytical mind-set for further studies or professional applications in fields requiring statistical analysis.

Part-A

Unit 1: Introduction to Statistics and Probability

1.1 Basic concepts of statistics: data, variables, populations, and samples.
1.2 Types of data: qualitative and quantitative.
1.3 Introduction to probability: events, outcomes, sample spaces.
1.4 Probability rules: addition rule, multiplication rule, complement rule.
1.5 Conditional probability and Bayes' theorem.
1.6 Counting principles: permutations and combinations.

Unit 2: Probability Distributions

2.1 Discrete probability distributions: Bernoulli, binomial, and Poisson distributions.
2.2 Continuous probability distributions: uniform, normal, exponential, and gamma distributions.
2.3 Properties of probability distributions: mean, variance, and moment generating functions.
2.4 Central Limit Theorem and its significance.

Unit 3: Sampling and Estimation

3.1 Sampling techniques: random sampling, stratified sampling, and cluster sampling.
3.2 Sampling distributions: sampling distribution of sample means and sample proportion.
3.3 Point estimation: unbiasedness, efficiency, and consistency.
3.4 Confidence intervals: construction and interpretation.
3.5 Sample size determination for estimation.

Unit 4: Hypothesis Testing

4.1 Introduction to hypothesis testing: null and alternative hypotheses.
4.2 Test statistics and p-values.
4.3 Type I and Type II errors, significance level, and power of a test.

4.4 One-sample tests for means and proportions.
4.5 Two-sample tests for means and proportions.
4.6 Goodness-of-fit tests and tests for independence.

Unit 5: Analysis of Variance (ANOVA)
5.1 Introduction to ANOVA: one-way and two-way ANOVA.
5.2 ANOVA assumptions: normality, equal variances, and independence.
5.3 One-way ANOVA: sum of squares, mean squares, F-test, and post-hoc tests.
5.4 Two-way ANOVA: main effects and interaction effects.

Unit 6: Nonparametric Methods
6.1 Introduction to nonparametric methods.
6.2 Sign test, Wilcoxon signed-rank test, and Mann-Whitney U test.
6.3 Kruskal-Wallis test and Friedman test.
6.4 Chi-square test for independence.
6.5 Introduction to categorical data analysis: logistic regression.

List of Suggested Text Books/Reference Books

1. Walpole, R.E. *et al.* (2017) *Probability & Statistics for Engineers & Scientists*. Singapore: Pearson Education South Asia Pte Ltd.
2. Wackerly, D.D., Mendenhall, W. and Scheaffer, R.L. (2012) *Mathematical statistics with applications*. Belmont, Califiornia: Brooks/Cole.
3. Ross, S.M. (2021) *Introduction to probability and statistics for engineers and scientists*. London, United Kingdom: Academic Press.
4. Casella, G. and Berger, R.L. (2021) *Statistical inference*. Belmont: Brooks/Cole Cengage Learning.
5. Hogg, R.V., Tanis, E.A. and Zimmerman, D.L. (2015) *Probability and statistical inference*. Harlow: Pearson Education Limited.
6. Rice, J.A. (2021) *Mathematical Statistics and data analysis*. New Delhi: Cengage Learning.
Moore, D.S., McCabe, G.P. and Craig, B.A. (2021) *Introduction to the practice of Statistics*. New York: Macmillan international higher education.

Evaluation Tools:

Assignment/Tutorials | Sessional tests | Surprise questions during lectures/Class Performance | End Semester Examination

Instructions for paper setting:

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Subjective (Short/Long) 40%
Discussion/Presentation 15%
Projects/Group Activities etc 15%

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Objective Type Questions: 30%
Short/Long Questions: 70%

Course Articulation Matrix

CO Statements	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PSO-1	PSO-2	PSO-3
OBECO-DS-207.1	3					2	3		
OBECO-DS-207.2	2	1	3		2	2	3	3	3
OBECO-DS-207.3	3		3	2				2	
OBECO-DS-207.4		2			2	2	3		2

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH AND STUDIES (**MRIIRS**)

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OBECO-DS-208: Mathematical Economics-II

Credits 6
Maximum marks: 100
Continuous Evaluation: 30
Duration of examination: 3 Hrs
End Semester Examination:70
Pre-requisites: NIL
Course Type: Core

Course Outcomes

After completion of this course, the students will be able to:

OBECO-DS-208.1 Familiarize students with the meaning and types of optimization techniques
OBECO-DS-208.2 Analyze optimization problem and its economic applications
OBECO-DS-208.3 Introduce students to comparative statics and its uses in economic theory
OBECO-DS-208.4 Illustrate the concepts of input-output and linear programming modeling

PART A

Unit-1: Introduction to Optimization Problem

1.1 Overview: optimization problem and extreme values, local versus global optima
1.2 Single variable optimization. Geometric properties of functions: convex functions, their characterizations and applications; local and global optima: geometric and calculus-based characterizations, and applications
1.3 Bivariate function: convex/concave, maxima/minima and inflection point (including numerical examples for first- derivative test and second-order test)

Unit-2: Multivariable Optimization

2.1. Multivariable function: convex/concave, maxima/minima and saddle point (including numerical examples for Hessian matrix)
2.2 Geometric properties of convex functions, their characteristics, properties and applications
2.3 Quasiconvex functions, their characteristics, properties and applications
2.4 Unconstrained optimization: geometric characteristics, characteristics using calculus and applications

Unit-3: Economic Applications of Optimization

3.1 Constrained optimization: Lagrangian function and its second order test of bordered Hessian. Applications
3.2 Proof of utility maximization with budget constraint
3.3 Numerical examples of constrained optimization

PART B

Unit-4: Comparative Statics

4.1 Introduction to comparative statics in Economics
4.2 Implicit differentiation and Implicit function theorem with their applications to comparative statics
4.3 Homogeneous and homothetic functions: characteristics and applications

4.4 Properties of value function: Envelope theorem and applications. Basics of system equation

Unit-5: Linear Programming
5.1 Formulation of LPP with constraints; graphical solution
5.2 Simplex method for finding extreme values
5.3 Matrix formulation, duality and economic interpretation

Unit-6: Input-Output Model
6.1 Structure of Leontief input-output model
6.2 Static input-output analysis: open and closed model
6.3 Hawkins-Simon condition

List of Suggested Text Books/Reference Books

1 . Chiang, A.C. and Wainwright, K. (2016) *Fundamental methods of mathematical economics*. Atlanta, GA: AMAC Accessibility Solutions.
2. Sydsæter, K. and Hammond, P.J. (2009) *Mathematics for Economic Analysis*. New Delhi: Pearson.
3. R G D, A. (1962) *Mathematical Analysis for Economists. 1962 ed*. London: Macmillan.
4. Rosser, M.J. (2016) *Basic mathematics for economists*. Lonodon: Routledge, Taylor & Francis Group.
5. Dorfman, R., Samuelson, P.A. and Solow, R.M. (1987) *Linear Programming and economic analysis*. New York: Dover Publications.

Evaluation Tools:

Assignment/Tutorials | Sessional tests | Surprise questions during lectures/Class Performance | End Semester Examination

Instructions for paper setting:

Seven questions are to be set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each Part A and Part B (one from each unit). Student needs to attempt two questions out of three from each part. Each question will be of 14 marks.

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MCQs	30%
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Projects/Group Activities etc	15%

(ii) For Summative assessment (End Semester Examination or End-Term Examination):
Minimum: 70 percent. Categorization for the same is:

Objective Type Questions:	30%
Short/Long Questions:	70%

Course Articulation Matrix

CO Statements	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PSO-1	PSO-2	PSO-3
OBECO-DS-208.1	3				1		3	1	
OBECO-DS-208.2	3	2	3		2	3	3	3	
OBECO-DS-208.3	3	2	2		2	2	3	3	
OBECO-DS-208.4	3	2	3		2	3	3	3	