UNIVERSITY OF JAMMU

(NAAC ACCREDITED 'A' GRADE' UNIVERSITY)
(Baba Sahib Ambedkar Road, Jammu-180006 (J&K)

Academic Section
Email: academicsectionju14@gmail.com

NOTIFICATION
(23/November/Adp./95)

It is hereby notified for the information of all concerned that the Vice-Chancellor, in anticipation of the approval of the Academic Council, is pleased to authorize the adoption of the Syllabi and Courses of Studies in the subject of **Statistics** of Semester **Vth, VIth, VIIth and VIIIth** for **Four Year Under Graduate Programme (FYUGP)** under the **Choice Based Credit System** as per **NEP-2020 (as given in the annexure)** for the examinations to be held in the years as per the details given below:

Subject	Semester	For the examinations to be held in the year
Statistics	Semester-V	December 2024, 2025 and 2026
	Semester-VI	May 2025, 2026 and 2027
	Semester-VII	December 2025, 2026 and 2027
	Semester-VIII	May 2026, 2027 and 2028

The Syllabi of the courses is also available on the University website: www.jammuuniversity.ac.in.

Sd/-
DEAN ACADEMIC AFFAIRS

No. F. Acd/II/23/11749-11764
Dated: 13-11-2023.

Copy for information and necessary action to:

1. Dean Faculty of Mathematical Science
2. HOD/Convener, Board of Studies **Statistics**
3. Sr. P.A.to the Controller of Examinations
4. All members of the Board of Studies
5. Confidential Assistant to the Controller of Examinations
6. Director, Computer Centre, University of Jammu
7. Deputy Registrar/Asst. Registrar (Conf. /Exams. UG)
8. Incharge University Website for necessary action please

Sumita Sharma 10/11
Deputy Registrar (Academic)

10/11/23 10/11/2023 15/11/23

FYUP SEMESTER-WISE TIMELINE/ SCHEME

SEMESTER	COURSES	COURSE CODE	TITLE	CREDITS Theory + Practical
I	MAJOR	UMJSTT101	DESCRIPTIVE STATISTICS	3+1
	MINOR	UMISTT102	DESCRIPTIVE STATISTICS	3+1
	SEC	USESTT103	COMPUTATIONAL STATISTICS USING EXCEL	0+2
	MDC	UMDSTT104	STATISTICS FOR RESEARCHERS	3+0
II	MAJOR	UMJSTT201	PROBABILITY THEORY	3+1
	MINOR	UMISTT202	PROBABILITY THEORY	3+1
	SEC	USESTT203	DATA ANALYSIS USING R	0+2
	MDC	UMDSTT204	STATISTICAL TECHNIQUES FOR RESEARCHERS	3+0
III	MAJOR	UMJSTT301	PROBABILITY DISTRIBUTIONS	3+1
		UMJSTT302	STATISTICAL INFERENCE	3+1
	MINOR	UMISTT303	PROBABILITY DISTRIBUTIONS	3+1
	SEC	USESTT304	ADVANCE ANALYTICS IN R FOR DATA SCIENCE	0+2
	MDC	UMDSTT305	ADVANCED STATISTICS FOR RESEARCHERS	3+0
IV	MAJOR	UMJSTT401	THEORY OF SAMPLE SURVEYS	3+1
		UMJSTT402	DEMOGRAPHY AND VITAL STATISTICS	3+1
		UMJSTT403	SAMPLING DISTRIBUTIONS	3+1
		UMJSTT404	OPERATIONS RESEARCH	3+1
	MINOR	UMISTT405	STATISTICAL INFERENCE	4+0
V	MAJOR	UMJSTT501	DESIGN OF EXPERIMENTS	3+1
		UMJSTT502	STATISTICAL QUALITY CONTROL	3+1
		UMJSTT503	OFFICIAL STATISTICS	4+0
		UMJSTT504	ACTURIAL STATISTICS	2+0
	MINOR	UMISTT505	DESIGN OF EXPERIMENTS	3+1
	SEC	USEST1506	PYTHON FOR DATA SCIENCE **(Summer Internship)**	0+2

VI		MAJOR	UMJSTT601	APPLIED STATISTICS	3+1
			UMJSTT602	STATISTICAL COMPUTING USING C++PROGRAMMING	3+1
			UMJSTT603	ECONOMETRICS	3+1
			UMJSTT604	STATISTICS FOR ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING	3+1
		MINOR	UMISTT605	APPLIED STATISTICS	3+1
VII		MAJOR	UMJSTT701	ADVANCED PROBABILITY THEORY	4+0
			UMJSTT702	MULTIVARIATE ANALYSIS	3+1
			UMJSTT703	ADVANCED RESEARCH METHODS AND TECHNIQUES	3+1
			UMJSTT704	FINANCIAL STATISTICS	3+1
		MINOR	UMISTT705	ADVANCED PROBABILITY THEORY	4+0
VIII	**4 YRS UG** Honors	MAJOR	UMJSTT801	ADVANCED LINEAR MODELS	3+1
			UMJSTT802	ADVANCED STATISTICAL INFERENCE	4+0
			UMJSTT803	SURVIVAL ANALYSIS AND BIOSTATISTICS	4+0
			UMJSTT804	ADVANCE PYTHON FOR DATA HANDLING	3+1
		MINOR	UMISTT805	SURVIVAL ANALYSIS AND BIOSTATISTICS	4+0
	4 YRS UG Honors with Research	MAJOR	UMJSTT806	LINEAR MODELS	3+1
		MINOR	UMISTT807	LINEAR MODELS	3+1
		SEC	USESTT808	RESEARCH PROJECT/ DISSERTATION	0+12

Abbreviations Used:
SEC: Skill Enhancement Course
MDC: Multidisciplinary Course

ANNEXURE-A

Semester 5

UMJSTT501 DESIGN OF EXPERIMENTS

UMJSTT502 STATISTICAL QUALITY CONTROL

UMJSTT503 OFFICIAL STATISTICS

UMJSTT504 ACTURIAL STATISTICS

UMISTT505 DESIGN OF EXPERIMENTS (Minor)

USESTI506 PYTHON FOR DATA SCIENCE (**Summer Internship**)

Syllabus of Statistics at FYUP under CBCS as per NEP-2020
Semester-V
(Examination to be held in Dec. 2024, 2025 and 2026)
Major

Course Code: UMJSTT501 **Course Title: Design of Experiments**
Credits: 03+01
Duration of examination: 03 hours

Max. Marks: 100
Mid-Term:15
End-term:60
Practical Internal :10
Practical External :15

Course Objectives:
The learning objectives include:
- To design and conduct experiments.
- To analyze and interpret data.

Course Learning Outcomes:
After completing this course, students should have developed a clear understanding of:
- The fundamental concepts of design of experiments.
- Introduction to planning valid and economical experiments within given resources.
- Completely randomized design.
- Randomized block design.
- Latin square design.
- Balanced incomplete block design.
- Fractional factorial designs with two levels.

UNIT I

Definition of Analysis of Variance, Assumptions and Limitations of ANOVA, One way classification. Two-way classification with one observation per cell. Multiple comparison tests using critical difference criteria.
Principles of Design of Experiment: Randomization, Replication and Local Control, Choice of size and type of a plot using uniformity trials.

UNIT-II

Basic designs: Completely Randomized Design (CRD), Randomized Block Design (RBD), Latin Square Design (LSD) -layout, model and statistical analysis, relative efficiency, analysis with missing observations.

UNIT III

Incomplete Block Designs: Balanced Incomplete Block Design (BIBD)-parameters, relationships among its parameters, incidence matrix and its properties, Symmetric BIBD, Resolvable BIBD, Affine Resolvable IBD

Syllabus of Statistics at FYUP under CBCS as per NEP-2020
Semester-V
(Examination to be held in Dec. 2024, 2025 and 2026)
Major

Course Code: UMJSTT501 **Course Title: Design of Experiments**
Credits: 03+01
Duration of examination: 03 hours

Max. Marks: 100
Mid-Term:15
End-term:60
Practical Internal :10
Practical External :15

UNIT IV

Factorial experiments: Concepts, notations and advantages, 2^2, $2^3 \ldots 2^n$ and 3^2 factorial experiments, design and analysis, Total and Partial confounding for 2^n ($n \leq 5$), 3^2 and 3^3. Factorial experiments in a single replicate.

SUGGESTED READINGS:

1. Cochran, W.G. and Cox, G.M. (1959). Experimental Design. Asia Publishing House.
2. Das., M.N. and Giri, N.C. (1986). Design and Analysis of Experiments. Wiley Eastern
3. Goon, A.M., Gupta, M.K. and Dasgupta, B. (2005). Fundamentals of Statistics. Vol. II, 8thEd. World Press, Kolkata.
4. Kempthorne, O. (1965). The Design and Analysis of Experiments. John Wiley.
5. Montgomery, D. C. (2008). Design and Analysis of Experiments. John Wiley.

SCHEME OF EXAMINATIONS

THEORY	**Syllabus to be covered in the examination**	**Time allotted**	**% Weightage (Marks)**
Mid-Semester Assessment Test shall be conducted by the course coordinator. **Pattern**: One long answer type question of 10 marks and Five short answer type questions of marks each.	Up to 50%	$1\frac{1}{2}$ hours	15
External End Semester University Exam **Pattern**: As proposed by the BOS and approved by Academic Council	Up to 100%	03 hours	60
Total			**75**
PRACTICAL			
Internal: Daily evaluation of practical records/Viva voce/attendance etc.	10 (including 20% for attendance, 20% for Viva-voce and 40% for internal test and 20% day to day performance)		
External: Final Practical Performance viva voce	100% Syllabus		15 = 10 Exam 05 viva-voce
Total			**25**

Syllabus of Statistics at FYUP under CBCS as per NEP-2020
Semester-V
(Examination to be held in Dec. 2024, 2025 and 2026)

Major

Course Code: UMJSTT501 **Course Title: Design of Experiments**

Credits: 03+01

Duration of examination: 03 hours

Max. Marks: 100
Mid-Term:15
End-term:60
Practical Internal :10
Practical External :15

NOTE FOR PAPER SETTING: End Semester External University Examination

The question paper will contain **TWO** Sections.

Section-A will consist of **FOUR COMPULSORY** short answer type questions (to be answered in 70-80 words) i.e., one question from each unit. Each question shall carry **3 marks.**

Section -B will contain **EIGHT** long answer type questions (to be answered in 500-600 words), Two questions from each unit and the student has to attempt FOUR questions selecting one question from each unit. Each question shall carry 12 marks.

Syllabus of Statistics at FYUP under CBCS as per NEP-2020
Semester-V
(Examination to be held in Dec. 2024, 2025 and 2026)

Major

Course Code: UMJSTT502 **Course Title: STATISTICAL QUALITY CONTROL**

Credits: 03+01
Duration of examination: 03 hours

Max. Marks: 100
Mid-Term:15
End-term:60
Practical Internal :10
Practical External :15

Course Objectives:

The learning objectives include:

- This course will help students to learn techniques and approach of SQC being used in industry to manufacture goods and services of high quality at low cost.
- This course will also give exposure to Six sigma and Index Numbers.

Course Learning Outcomes:

- Statistical process control tools- Control charts for variables, attributes.
- Statistical product control tools- Sampling inspection plans.
- Overview of Six sigma- Lean manufacturing, TQM.
- Overview of Six sigma training plans, VOC, CTQ.

Unit I

Quality: Definition, dimensions of quality, its concept, application and importance. Introduction to Process and Product Controls. Statistical Process Control - Seven tools of SPC, chance and assignable Causes of quality variation. Introduction to Six-Sigma:
Overview of Six Sigma, Lean Manufacturing and Total Quality Management (TQM). Organizational Structure and Six Sigma training plans- Selection Criteria for Six-Sigma roles and training plans. Voice of customers (VOC): Importance and VOC data collection. Critical to Quality (CTQ).

UNIT II

Statistical Control Charts- Construction and Statistical basis of 3-σ Control charts, Control charts for variables: $\bar{X}$ & R-chart, $\bar{X}$ & s-chart. Control charts for attributes: np-chart, p-chart, c-chart and u-chart. Rational Sub-grouping. Comparison between control charts for variables and control charts for attributes. Analysis of patterns on control chart, estimation of process capability.

UNIT III

Acceptance sampling plan: Principle of acceptance sampling plans. Single and Double sampling plan their OC, AQL, LTPD, AOQ, AOQL, ASN, ATI functions with graphical interpretation, use and interpretation of Dodge and Romig's sampling inspection plan tables.

Syllabus of Statistics at FYUP under CBCS as per NEP-2020
Semester-V
(Examination to be held in Dec. 2024, 2025 and 2026)

Major

Course Code: UMJSTT502 **Course Title: STATISTICAL QUALITY CONTROL**

Credits: 03+01
Duration of examination: 03 hours

Max. Marks: 100
Mid-Term:15
End-term:60
Practical Internal :10
Practical External :15

Unit-IV

Introduction to Six-Sigma: Overview of Six Sigma, Lean Manufacturing and Total Quality Management (TQM). Organizational Structure and Six Sigma training plans- Selection Criteria for Six-Sigma roles and training plans. Voice of customers (VOC): Importance and VOC data collection. Critical to Quality (CTQ). Introduction to DMAIC using one case study: Define Phase, Measure Phase, Analyze Phase, Improve Phase and Control Phase.

List of Practical

1. Construction and interpretation of statistical control charts
   - X-bar & R-chart
   - X-bar & s-chart
   - np-chart
   - p-chart
   - c-chart
   - u-chart
2. Single sample inspection plan: Construction and interpretation of OC, AQL, LTPD, ASN, ATI, AOQ, AOQL curves
3. Calculation of process capability and comparison of 3-sigma control limits with specification limits.
4. Use a case study to apply the concept of six sigma application in DMAIC: practical application.

SUGGESTED READINGS:

1. Ehrlich, H. B. (2002). Transactional Six Sigma and Lean Servicing, 2nd Ed., St. Lucie Press.
2. Goon, A.M., Gupta, M.K. and Dasgupta, B. (2002). Fundamentals of Statistics, Vol. I & II, 8th Ed., The World Press, Kolkata.
3. Gupta, S.C. and Kapoor, V.K. (2014). Fundamentals of Mathematical Statistics, 11th Ed., Sultan Chand.
4. David, H. (1995). ISO Quality Systems Handbook, 2nd Ed., Butterworth Heinemann Publication.
5. Montogomery, D. C. (2009). Introduction to Statistical Quality Control, 6th Ed., Wiley India Pvt. Ltd.

Syllabus of Statistics at FYUP under CBCS as per NEP-2020
Semester-V
(Examination to be held in Dec. 2024, 2025 and 2026)

Major

Course Code: UMJSTT502 **Course Title: STATISTICAL QUALITY CONTROL**

Credits: 03+01
Duration of examination: 03 hours

Max. Marks: 100
Mid-Term:15
End-term:60
Practical Internal :10
Practical External :15

SCHEME OF EXAMINATION

THEORY	**Syllabus to be covered in the examination**	**Time allotted**	**% Weightage (Marks)**
Mid-term Assessment Test shall be conducted by the course coordinator. **Pattern**: One long answer type question of 10 marks and Five short answer type questions of marks each.	Up to 50%	$1\frac{1}{2}$ hours	15
External End Semester University Exam **Pattern**: As proposed by the BOS and approved by Academic Council	Up to 100%	03 hours	60
Total			**75**
PRACTICAL			
Internal: Daily evaluation of practical records/ Viva voce/ attendance etc.	10 (including 20% for attendance, 20% for Viva-voce and 40% for internal test and 20% day to day performance)		
External: Final Practical Performance + viva voce	100% Syllabus		15 =10 Exam 05 viva-voce
Total			**25**

NOTE FOR PAPER SETTING: End Semester External University Examination
The question paper will contain **TWO** Sections.

Section-A will consist of **FOUR COMPULSORY** short answer type questions (to be answered in 70-80 words) i.e., one question from each unit. Each question shall carry **3 marks.**

Section -B will contain **EIGHT** long answer type questions (to be answered in 500-600 words), Two questions from each unit and the student has to attempt FOUR questions selecting one question from each unit. Each question shall carry 12 marks.

Syllabus of Statistics at FYUP under CBCS as per NEP-2020
Semester-V
(Examination to be held in Dec. 2024,2025 and 2026)
Major

Course Code: UMJSTT503 **Course Title: OFFICIAL STATISTICS**
Credits: 04+00
Duration of examination: 03 hours **Max. Marks: 100**

Mid-Term:40
End-term:60

Course Learning Outcomes:
After completing this course, students should have developed a clear understanding of Indian Official Statistics.

UNIT I
Official Statistics: (a) Need, Uses, Users, Reliability, Relevance, Limitations, Transparency, its visibility (b) Compilation, Collection, Processing, Analysis and Dissemination, Agencies Involved, Methods. Present official statistical system in India.

UNIT II
Role of Ministry of Statistics & Program Implementation (MoSPI), Central Statistical Office (CSO), National Sample Survey Office (NSSO), and National Statistical Commission. Government of India's Principal publications containing data on the topics such as population, industry and finance.

UNIT III
Index Numbers: Different Types, Need, Data Collection Mechanism, Periodicity, Agencies Involved, Uses.
National Accounts: Definition, Basic Concepts; issues; the Strategy, Collection of Data and Release.

UNIT IV
Sector Wise Statistics: Agriculture, Health, Education, Women and Child etc. Important Surveys & Census, Indicators, Agencies and Usages etc.
Population Census: Need, Data Collected, Periodicity, Methods of data collection, dissemination, Agencies involved.

SUGGESTED READINGS:

- Guide to current Indian Official Statistics, Central Statistical Office, GOI, New Delhi.
- http://mospi.nic.in/

Syllabus of Statistics at FYUP under CBCS as per NEP-2020
Semester-V
(Examination to be held in Dec. 2024,2025 and 2026)

Major

Course Code: UMJSTT503 **Course Title: OFFICIAL STATISTICS**

Credits: 04+00

Duration of examination: 03 hours **Max. Marks: 100**

Mid-Term:40
End-term:60

SCHEME OF EXAMINATION

THEORY	**Syllabus to be covered in the examination**	**Time allotted**	**% Weightage (Marks)**
Mid-term Assessment Test shall be conducted by the course coordinator. **Pattern**: As proposed by the BOS and approved by Academic Council	Up to 50%	$1\frac{1}{2}$ hours	40
External End Semester University Exam **Pattern**: As proposed by the BOS and approved by Academic Council	Up to 100%	03 hours	60
Total			**100**

Syllabus of Statistics at FYUP under CBCS as per NEP-2020
Semester-V
(Examination to be held in Dec. 2024,2025 and 2026)

Major

Course Code: UMJSTT504 **Course Title: ACTURIAL STATISTICS**
Credits: 02+00
Duration of examination: 2 hours 30min **Max. Marks: 50**

Mid-Term:10
End-term:40

Unit I

Probability Models and Life Tables Utility theory, insurance and utility theory, models for individual claims and their sums, survival function, curtate future lifetime, force of mortality. Life table and its relation with survival function, examples, assumptions for fractional ages, some analytical laws of mortality, select and ultimate tables.

Unit II

Multiple life functions, joint life and last survivor status, insurance and annuity benefits through multiple life functions evaluation for special mortality laws. Multiple decrement models, deterministic and random survivorship groups, associated single decrement tables, central rates of multiple decrement, net single premiums and their numerical evaluations.

Unit III

Distribution of aggregate claims, compound Poisson distribution and its applications. Insurance and Annuities Principles of compound interest. Nominal and effective rates of interest and discount, force of interest and discount, compound interest, accumulation factor, continuous compounding.

SUGGESTED READINGS:

1. Atkinson, M.E. and Dickson, D.C.M. (2000). An Introduction to Actuarial Studies, Elgar Publishing.

2. Bedford, T. and Cooke, R. (2001). Probabilistic risk analysis, Cambridge.

3. Bowers, N. L., Gerber, H. U., Hickman, J. C., Jones D.A. and Nesbitt, C. J. (1986). 'Actuarial Mathematics', Society of Actuaries, Ithaca, Illinois, U.S.A., Second Edition (1997).

4. Medina, P. K. and Merino, S. (2003). A discrete introduction: Mathematical finance and Probability, Birkhauser.

5. Neill, A. (1977). Life Contingencies, Heineman.

6. Philip, M. et. al (1999). Modern Actuarial Theory and Practice, Chapman and Hall.

7. Rolski, T., Schmidli, H., Schmidt, V. and Teugels, J. (1998). Stochastic Processes for Insurance and Finance, Wiley.

Syllabus of Statistics at FYUP under CBCS as per NEP-2020
Semester-V
(Examination to be held in Dec. 2024,2025 and 2026)

Major

Course Code: UMJSTT504 **Course Title: ACTURIAL STATISTICS**

Credits: 02+00

Duration of examination: 2 hours 30min

Max. Marks:50
Mid-Term:10
End-term:40

SCHEME OF EXAMINATION

THEORY	**Syllabus to be covered in the examination**	**Time allotted**	**% Weightage (Marks)**
Mid-term Assessment Test shall be conducted by the course coordinator. **Pattern**: As proposed by the BOS and approved by Academic Council	Up to 50%	$1\frac{1}{2}$ hours	10
External End Semester University Exam **Pattern**: As proposed by the BOS and approved by Academic Council	Up to 100%	$2\frac{1}{2}$ hour	40
Total			**100**

Syllabus of Statistics at FYUP under CBCS as per NEP-2020
Semester-V
(Examination to be held in Dec. 2024, 2025 and 2026)
Minor

Course Code: UMISTT505 **Course Title: Design of Experiments**
Credits: 03+01
Duration of examination: 03 hours **Max. Marks: 100**
Mid-Term:15
End-term:60
Practical Internal :10
Practical External :15

Course Objectives:
The learning objectives include:
- To design and conduct experiments.
- To analyze and interpret data.

Course Learning Outcomes:
After completing this course, students should have developed a clear understanding of:
- The fundamental concepts of design of experiments.
- Introduction to planning valid and economical experiments within given resources.
- Completely randomized design.
- Randomized block design.
- Latin square design.
- Balanced incomplete block design.
- Fractional factorial designs with two levels.

UNIT I

Definition of Analysis of Variance, Assumptions and Limitations of ANOVA, One way classification. Two-way classification with one observation per cell. Multiple comparison tests using critical difference criteria.

Principles of Design of Experiment: Randomization, Replication and Local Control, Choice of size and type of a plot using uniformity trials.

UNIT-II

Basic designs: Completely Randomized Design (CRD), Randomized Block Design (RBD), Latin Square Design (LSD) -layout, model and statistical analysis, relative efficiency, analysis with missing observations.

UNIT III

Incomplete Block Designs: Balanced Incomplete Block Design (BIBD)-parameters, relationships among its parameters, incidence matrix and its properties, Symmetric BIBD, Resolvable BIBD, Affine Resolvable IBD

UNIT IV

Factorial experiments: Concepts, notations and advantages, 2^2, $2^3 \ldots 2^n$ and 3^2 factorial experiments, design and analysis, Total and Partial confounding for 2^n ($n \leq 5$), 3^2 and 3^3. Factorial experiments in a single replicate.

Syllabus of Statistics at FYUP under CBCS as per NEP-2020
Semester-V
(Examination to be held in Dec. 2024, 2025 and 2026)
Minor

Course Code: UMISTT505 **Course Title: Design of Experiments**
Credits: 03+01
Duration of examination: 03 hours

Max. Marks: 100
Mid-Term:15
End-term:60
Practical Internal :10
Practical External :15

SUGGESTED READINGS:

1. Cochran, W.G. and Cox, G.M. (1959). Experimental Design. Asia Publishing House.
2. Das., M.N. and Giri, N.C. (1986). Design and Analysis of Experiments. Wiley Eastern
3. Goon, A.M., Gupta, M.K. and Dasgupta, B. (2005). Fundamentals of Statistics. Vol. II, 8thEd. World Press, Kolkata.
4. Kempthorne, O. (1965). The Design and Analysis of Experiments. John Wiley.
5. Montgomery, D. C. (2008). Design and Analysis of Experiments. John Wiley.

SCHEME OF EXAMINATIONS

THEORY	**Syllabus to be covered in the examination**	**Time allotted**	**% Weightage (Marks)**
Mid-Semester Assessment Test shall be conducted by the course coordinator. **Pattern**: One long answer type question of 10 marks and Five short answer type questions of marks each.	Up to 50%	$1\frac{1}{2}$ hours	15
External End Semester University Exam **Pattern**: As proposed by the BOS and approved by Academic Council	Up to 100%	03 hours	60
Total			**75**
PRACTICAL			
Internal: Daily evaluation of practical records/Viva voce/attendance etc.	10 (including 20% for attendance, 20% for Viva-voce and 40% for internal test and 20% day to day performance)		
External: Final Practical Performance viva voce	100% Syllabus		15 = 10 Exam 05 viva-voce
Total			**25**

Syllabus of Statistics at FYUP under CBCS as per NEP-2020
Semester-V
(Examination to be held in Dec. 2024, 2025 and 2026)

Minor

Course Code: UMISTT505 **Course Title: Design of Experiments**

Credits: 03+01

Duration of examination: 03 hours

Max. Marks: 100
Mid-Term:15
End-term:60
Practical Internal :10
Practical External :15

NOTE FOR PAPER SETTING: End Semester External University Examination

The question paper will contain **TWO** Sections.

Section-A will consist of **FOUR COMPULSORY** short answer type questions (to be answered in 70-80 words) i.e., one question from each unit. Each question shall carry **3 marks.**

Section -B will contain **EIGHT** long answer type questions (to be answered in 500-600 words), Two questions from each unit and the student has to attempt FOUR questions selecting one question from each unit. Each question shall carry 12 marks.

Syllabus of Statistics at FYUP under CBCS as per NEP-2020
Semester-V
(Examination to be held in Dec. 2024, 2025 and 2026)

Summer Internship

Course Code: USESTI506 **Course Title: Summer Internship**
Credits: 00+02 **Max. Marks: 50**

Objectives:
It shall be a short-term internship of 15 days duration in 5th semester for a job/professional training in a suitable organization or hands on training or activity-based course at college level in order to gain work experience.
All students will undergo internships / Apprenticeships in a firm, industry, or organization or Training in labs with faculty and researchers in their own or other HEIs/research institutions during the summer term. Students will be provided with opportunities for internships with local industry, business organizations, health and allied areas, local governments (such as panchayats, municipalities), Parliament or elected representatives, media organizations, artists, crafts persons, and a wide variety of organizations so that students may actively engage with the practical side of their learning and, as a by-product, further improve their employability.
Community engagement and service: The curricular component of 'community engagement and service' seeks to expose students to the socio-economic issues in society so that the theoretical learning can be supplemented by actual life experiences to generate solutions to real-life problems. This can be part of summer term activity.
Field-based learning/minor project: The filed-based learning/minor project will attempt to provide opportunities for students to understand the different socio-economic contexts. It will aim at giving students exposure to development-related issues in rural and urban settings. It will provide opportunities for students to observe situations in rural and urban contexts, and to observe and study actual field situations regarding issues related to socioeconomic development. Students will be given opportunities to gain a first-hand understanding of the policies, regulations, organizational structures, processes, and programmes that guide the development process. They would have the opportunity to gain an understanding of the complex socio-economic problems in the community., and innovative practices required to generate solutions to the identified problems. This may be a summer term project.

SCHEME OF EXAMINATION

The internship shall be under a college teacher who will be designated as Internship Supervisor. After completion of summer internship students will have to produce a report related to the work carried out signed by internship supervisor and college principal. The internship will be evaluated internally by a Board of Examiners set up by the principal of the college.

Note: The minimum passing criteria for the summer internship is 40%.

ANNEXURE - B

Semester 6

UMJSTT601 APPLIED STATISTICS

UMJSTT602 STATISTICAL COMPUTING USING C++PROGRAMMING

UMJSTT603 ECONOMETRICS

UMJSTT604STATISTICS FOR ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING

UMISTT605 APPLIED STATISTICS (Minor)

Syllabus of Statistics at FYUP under CBCS as per NEP-2020
Semester-VI
(Examination to be held in May2025,2026 and 2027)

Major

Course Code: UMJSTT601 **Course Title: APPLIED STATISTICS**
Credits: 03+01
Duration of examination: 03 hours **Max. Marks: 100**

Mid-Term:15
End-term:60
Practical Internal :10
Practical External :15

Objectives: The main objective of this course is to provide knowledge to the students about applied statistics such as Economic statistics, Time series analysis and Econometrics

Unit I

Time series Analysis: - Economic time series, its components, illustration, additive and multiplicative models, determination of trend, analysis of seasonal fluctuations, construction of seasonal indices. Logistic and Modified exponential growth curves.

Unit II

Economic Statistics; Index number its definition, application of index number, price relative quantity or volume relative, link and chain relative problem involved in computational of index numbers, use of averages, simple aggregative and weighted averages methods. Laspeyre's, Paasche's and Fisher's index number, consumer price index.

Unit III

Static laws of demand and supply, price elasticity of demand, analysis of income and allied size distribution, Pareto distribution, graphical test, fitting of pareto law, log-normal distribution and its properties, Lorenz curve and Gini's Coefficients.

Unit IV

Introduction: Definition, Components of Decision Making, Decision Models/Problems, Decision Making Environment, Laplace Criterion (Bayes Criterion of Rationality), Maximax or Minmax Criterion, Expected Monetary Value (EMV), Expected Value of Perfect Information (EVPI) with illustrations.

SUGGESTED READINGS:

1. Croxton F.E. and Cowden D.J. (1969); Applied general Statistics, Prentice Hall of India.
2. Goon A.M. Gupta M.K. Das Gupta B. (1986): Fundamentals of Statistics, Vol. II, World Press Calcutta.
3. Guide of current Indian official Statistics: Central Statistical Organization, Govt. of India, New Delhi.
4. Saluja M.P. Indian official Statistical systems. Statistical Publishing Society, 16 Calcutta.
5. Kendall, M.G. (1976). Time Series, 2nd Ed., Charles Griffin and Co Ltd., London and High Wycombe. 6. Chatfield, C. (1980). The Analysis of Time Series –An Introduction, Chapman & Hall.
5. Hamdy A. T(2010). Operations Research-An Introduction, Prentice Hall, 9th Edition, -2010.
6. S. Chandra, Jayadeva, A. Mehra (2009): Numerical Optimization with Application, Narosa Publishing House.
7. A. Ravindran, D. T. Phillips and James J. S.(2009). Operations Research- Principles and Practice, Wiley India

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Syllabus of Statistics at FYUP under CBCS as per NEP-2020
Semester-VI
(Examination to be held in May 2025,2026 and 2027)

Major

Course Code: UMJSTT601 **Course Title: APPLIED STATISTICS**
Credits: 03+01
Duration of examination: 03 hours **Max. Marks: 100**

Mid-Term:15
End-term:60
Practical Internal :10
Practical External :15

7. Gupta, S.C. and Kapoor, V.K. (2014). Fundamentals of Applied Statistics, 11th Ed., Sultan Chand.
8. Gujarati, D. and Guneshker, S. (2007). Basic Econometrics, 4th Ed., McGraw Hill Companies.
9. Johnston, J. (1972). Econometric Methods, 2nd Ed., McGraw Hill International.
10. Koutsoyiannis, A. (2004). Theory of Econometrics, 2 Ed., Palgrave Macmillan Limited.
11. Maddala, G.S. and Lahiri, K. (2009). Introduction to Econometrics, 4 Ed., John Wiley & Sons.

Practical Based on this Course:-

1. Measurement of Trend
2. Measurement of Seasonal indices: a) Simple Averages method b) Ratio-to-Trend method c) Ratio-to-Moving Average method d) Link Relative method
3. Calculate price and quantity index numbers using simple and weighted average of price relatives.
4. To Calculate the Chain Base Index numbers.
5. To Calculate the Consumer Price Index numbers
6. Problems based on estimation of General linear model.

SCHEME OF EXAMINATIONS

THEORY	**Syllabus to be covered in the examination**	**Time allotted**	**% Weightage (Marks)**
Mid-Semester Assessment Test shall be conducted by the course coordinator. **Pattern**: One long answer type question of 10 marks and Five short answer type questions of marks each.	Up to 50%	$1\frac{1}{2}$ hours	15
External End Semester University Exam **Pattern**: As proposed by the BOS and approved by Academic Council	Up to 100%	03 hours	60
Total			**75**

Syllabus of Statistics at FYUP under CBCS as per NEP-2020
Semester-VI
(Examination to be held in May 2025,2026 and 2027)

Major

Course Code: UMJSTT601 **Course Title: APPLIED STATISTICS**
Credits: 03+01
Duration of examination: 03 hours **Max. Marks:**
100

Mid-Term:15
End-term:60
Practical Internal :10
Practical External :15

PRACTICAL		
Internal: Daily evaluation of practical records/Viva voce/attendance etc.	10 (including 20% for attendance, 20% for Viva-voce and 40% for internal test and 20% day to day performance)	
External: Final Practical Performance viva voce	100% Syllabus	15 = 10 Exam 05 viva-voce
Total		**25**

NOTE FOR PAPER SETTING: End SemesterExternal University Examination
The question paper will contain **TWO** Sections.

Section-A will consist of **FOUR COMPULSORY** short answer type questions (to be answered in 70-80 words) i.e., one question from each unit. Each question shall carry **3 marks.**

Section -B will contain **EIGHT** long answer type questions (to be answered in 500-600 words), Two questions from each unit and the student has to attempt FOUR questions selecting one question from each unit. Each question shall carry 12 marks.

Syllabus of Statistics at FYUP under CBCS as per NEP-2020
Semester-VI
(Examination to be held in May 2025,2026 and 2027)

Major

Course Code: UMJSTT602 **Course Title: Statistical Computing with C++**
Credits: 03+01
Duration of examination: 03 hours **Max. Marks: 100**

Mid-Term:15
End-term:60
Practical Internal :10
Practical External :15

Course Objectives:
The learning objectives include:
- To understand computer programming and its roles in problem solving.
- To understand basic data structures and develop logics which will help them to create well-structured programs using C language.
- Learning the basic programming language will help students to easily switch over to any other language in future.

Course Learning Outcomes: After completing this course, students should have developed a clear understanding of:
- Various data types, operators, library functions, Input/Output operations.
- Decision making and branching and looping.
- Arrays, Character and strings.
- User- defined functions, recursion functions.
- Storage class of Variables.
- Pointers and arrays, arrays of pointers, pointers as function arguments, functions returning pointers.
- Structure, array of structures, structure pointers.
- Dynamic memory allocation functions.
- Pre-processors: Macro substitution, macro with argument.
- File inclusion in C/C++, I/O operations on files

Unit I
Flowchart, Algorithm and problem solving. General concepts of programming. C++ character set, C++ tokens (identifiers, keywords, constants, and operators), structure of C++ program, cout, cin, Use of I/O operators, Cascading of I/O operators. Data Types: Built-in data types- int , char, float, double, Integer constants, Character Constants, String Constants. Variable: Declaration of variable of built in data types. Operators: Arithmetic operators, Relational Operators. Logical operators. Increment and decrement operator. Conditional operator, Precedence of operators. Type Conversion: Automatic type conversion, type casting. C++ short hands (--, ++, =), Assignment statement, variables initialization.

Syllabus of Statistics at FYUP under CBCS as per NEP-2020
Semester-VI
(Examination to be held in May 2025, 2026 and 2027)

Major

Course Code: UMJSTT602 **Course Title: Statistical Computing with C++**
Credits: 03+01
Duration of examination: 03 hours **Max. Marks: 100**

Mid-Term:15
End-term:60
Practical Internal :10
Practical External :15

Unit II

Flow of control: Conditional statements, General form of if-else statement, if else if ladder, Nested if? As an alternative to if, General form of switch, Nested Switch. Simple control statement, for loop statement, while loop, do while loop. Variation in loop statements; Nested Loops, Loop termination: break, continue, go to, exit (), Single character input get char (), single character output (put char ()), gets and puts functions. Structured Data Type: Array, General form of Declaration and Use: one dimensional array, String two dimensional, Array initialization.

Unit III

Functions: General form, Function Prototype, definition of function, accessing a function. Passing arguments to function, Specifying argument Data type, Default argument, Constant argument, Call by value and Call by reference, returning value and their types, Calling function with arrays, Scope rules of function and variables, Local and Global variables, Storage class specifiers: extern, auto, register and static. Standard Header files – string.h, math.h, stdlib.h ,iostream.h. Standard library functions-string and char related functions: isalnum(), isalpha(), isdigit(), islower(), isupper(), tolower(), toupper(), strcpy(), strcat(), strlen(), strcmp (). Mathmatical functions: fabs(), frexp() ,fmod (), log(), log10(), pow(), sqrt(), cos(), abs().

Unit IV

Structures: specifying a structure, defining a structure variable, accessing structure members . Functions and structures, arrays of structures, arrays within a structure, Structure within structure Class: Specifying a class, public and private data members and member functions, defining objects , calling member function, constructor and destructor functions.

SUGGESTED READINGS:

1. Robert Lafure(2002): C ++ Programming SAMS (USA)
2. Satish Jain(2003): Computer fundamentals and C++ Programming Vol. I, Ratna Sagar Pvt. Ltd., Delhi.
3. Al Stevens (1997): Teach Yourself C++, fifth Edition, Wiley Publications, New Delhi.
4. Ravichandran(2011): Programming in C++,McGraw Hill
5. Ankit Asthana (2007): Programming in C++.Narosa Publication
6. Balagurusamy, E. (2011). Programming in ANSI C, Ed., and Tata McGraw Hill.
7. Gottfried, B.S. (1998). Schaum's Outlines: Programming with C, 2nd Ed., Tata McGraw Hill
8. Kernighan, B.W. and Ritchie, D. (1988). C Programming Language, 2nd Ed., Prentice Hall.

Syllabus of Statistics at FYUP under CBCS as per NEP-2020
Semester-VI
(Examination to be held in May 2025,2026 and 2027)

Major

Course Code: UMJSTT602 **Course Title: Statistical Computing with C++**
Credits: 03+01
Duration of examination: 03 hours **Max. Marks: 100**

Mid-Term:15
End-term:60
Practical Internal :10
Practical External :15

Practical based on this Course: To make students familiar with the computation work, programming in C++ language and data analysis.

SCHEME OF EXAMINATIONS

THEORY	**Syllabus to be covered in the examination**	**Time allotted**	**% Weightage (Marks)**
Mid-Semester Assessment Test shall be conducted by the course coordinator. **Pattern**: One long answer type question of 10 marks and Five short answer type questions of marks each.	Up to 50%	$1\frac{1}{2}$ hours	15
External End Semester University Exam **Pattern**: As proposed by the BOS and approved by Academic Council	Up to 100%	03 hours	60
Total			**75**
PRACTICAL			
Internal: Daily evaluation of practical records/Viva voce/attendance etc.	10 (including 20% for attendance, 20% for Viva-voce and 40% for internal test and 20% day to day performance)		
External: Final Practical Performance viva voce	100% Syllabus		15 = 10 Exam 05 viva-voce
Total			**25**

NOTE FOR PAPER SETTING: End SemesterExternal University Examination
The question paper will contain **TWO** Sections.

Section-A will consist of **FOUR COMPULSORY** short answer type questions (to be answered in 70-80 words) i.e., one question from each unit. Each question shall carry **3 marks.**

Section -B will contain **EIGHT** long answer type questions (to be answered in 500-600 words), Two questions from each unit and the student has to attempt FOUR questions selecting one question from each unit. Each question shall carry 12 marks.

Syllabus of Statistics at FYUP under CBCS as per NEP-2020
Semester-VI
(Examination to be held in May 2025,2026 and 2027)

Major

Course Code: UMJSTT603 **Course Title: Econometrics**
Credits: 03+01
Duration of examination: 03 hours **Max. Marks: 100**

Mid-Term:15
End-term:60
Practical Internal :10
Practical External :15

Course Objectives:• A broad knowledge of regression analysis relevant for analysing economic data.
• Interpretation and critical evaluation of the outcomes of empirical analysis.
• Distinguish the results of violating the assumptions of classical regression model.
• To judge the validity of the economic theories and carry out their evaluation in numerical terms.
• To extract useful information about important economic policy issues from the available data.
Course Learning Outcomes: After completing this course, students should have developed a clear understanding of:
• The fundamental concepts of econometrics.
• Specification of the model.
• Multiple Linear Regression.
• Multicollinearity.
• Heteroscedasticity.
• Autocorrelation.
• Autoregressive and Lag models. Contents:

UNIT I Introduction: Objective behind building econometric models, nature of econometrics, model building, role of econometrics. General linear model (GLM).Estimation under linear restrictions.
UNIT II Multicollinearity: Introduction and concepts, detection of multicollinearity, consequences, tests and solutions of multicollinearity.
UNIT III Generalized least squares estimation, Aitken estimators. Autocorrelation: concept, consequences of autocorrelated disturbances, detection and solution of autocorrelation.
UNIT IV Heteroscedastic disturbances: Concepts and efficiency of Aitken estimator with OLS estimator under heteroscedasticity. Consequences of heteroscedasticity. Tests and solutions B.Sc. (Hons.) Statistics 87 of heteroscedasticity. Autoregressive and Lag models.

SUGGESTED READINGS:

1. Gujarati, D. and Guneshker, S. (2007). Basic Econometrics, 4th Ed., McGraw Hill Companies.
2. Johnston, J. (1972). Econometric Methods, 2nd Ed., McGraw Hill International.
3. Koutsoyiannis, A. (2004). Theory of Econometrics, 2 Ed., Palgrave Macmillan Limited.
4. Maddala, G.S. and Lahiri, K. (2009). Introduction to Econometrics, 4 Ed., John Wiley & Sons.

Syllabus of Statistics at FYUP under CBCS as per NEP-2020
Semester-VI
(Examination to be held in May 2025,2026 and 2027)

Major

Course Code: UMJSTT603 **Course Title: Econometrics**

Credits: 03+01

Duration of examination: 03 hours **Max. Marks: 100**

Mid-Term:15
End-term:60
Practical Internal :10
Practical External :15

PRACTICAL /LAB WORK

List of Practicals:

1. Problems based on estimation of General linear model.
2. Testing of parameters of General linear model.
3. Forecasting of General linear model.
4. Problems related to consequences of Multicollinearity.
5. Diagnostics of Multicollinearity.
6. Problems related to consequences of Autocorrelation (AR(I)).
7. Diagnostics of Autocorrelation.
8. Estimation of General linear model under Autocorrelation.
9. Problems related to consequences Heteroscedasticity.
10. Diagnostics of Heteroscedasticity.
11. Estimation of problems of General linear model under Heteroscedastic disturbance terms.
12. Problems concerning specification errors as a reason for induction of Autocorrelation, Heteroscdasticity and Multicollinearity.
13. Problems related to General linear model under (Aitken Estimation).
14. Problems on Autoregressive and Lag models.

SCHEME OF EXAMINATIONS

THEORY	**Syllabus to be covered in the examination**	**Time allotted**	**% Weightage (Marks)**
Mid-Semester Assessment Test shall be conducted by the course coordinator. **Pattern**: One long answer type question of 10 marks and Five short answer type questions of marks each.	Up to 50%	$1\frac{1}{2}$ hours	15
External End Semester University Exam **Pattern**: As proposed by the BOS and approved by Academic Council	Up to 100%	03 hours	60
Total			**75**

Syllabus of Statistics at FYUP under CBCS as per NEP-2020
Semester-VI
(Examination to be held in May 2025,2026 and 2027)

Major

Course Code: UMJSTT603 **Course Title: Econometrics**

Credits: 03+01

Duration of examination: 03 hours **Max. Marks: 100**

Mid-Term:15
End-term:60
Practical Internal :10
Practical External :15

PRACTICAL		
Internal: Daily evaluation of practical records/Viva voce/attendance etc.	10 (including 20% for attendance, 20% for Viva-voce and 40% for internal test and 20% day to day performance)	
External: Final Practical Performance viva voce	100% Syllabus	15 = 10 Exam 05 viva-voce
Total		**25**

NOTE FOR PAPER SETTING: End SemesterExternal University Examination

The question paper will contain **TWO** Sections.

Section-A will consist of **FOUR COMPULSORY** short answer type questions (to be answered in 70-80 words) i.e., one question from each unit. Each question shall carry **3 marks.**

Section -B will contain **EIGHT** long answer type questions (to be answered in 500-600 words), Two questions from each unit and the student has to attempt FOUR questions selecting one question from each unit. Each question shall carry 12 marks.

Syllabus of Statistics at FYUP under CBCS as per NEP-2020
Semester-VI
(Examination to be held in May 2025,2026 and 2027)

Major

Course Code: UMJSTT604 **Course Title: Statistics for Artificial Intelligence and Machine Learning**

Credits: 03+01
Duration of examination: 03 hours **Max. Marks: 100**

Mid-Term:15
End-term:60
Practical Internal :10
Practical External :15

Objectives: To acquaint students with advanced knowledge of Artificial Intelligence and Statistical Learning.

Unit-I

Artificial Intelligence, Foundation and History of AI, Applications of AI, AI Representation, Future of AI, Issues in Design of Search Programs - Blind Search or Depth First Search, Breadth First Search, Logic Programming.

Unit-II

Heuristic Search, Heuristic Search Methods - Generate and Test, Hill Climbing Problem, reduction–constraint satisfaction - Means-end analysis., Simulated Annealing.

Unit-III

Introduction: Basic definitions – Learning - Machine Learning vs AI - Machine Learning– features –samples – labels - Real-world applications and problems – hypothesis test - approaches of machine learning model - Data preprocessing. Representation of formal ML model: The statistical learning framework – training - testing – validation - cross validation - parametric and non-parametricmethods- Difference between Parametric and Non-Parametric Methods and examples.

Unit-IV

Supervised learning Algorithms: Introduction-Approaches for classification-Decision Tree classification algorithm-Tree Pruning-Rule based Classification-IF-THEN rules classification Naïve Bayesian classification, Neural Network classification, classification by Back propagation algorithm. Support Vector Machine (SVM)-Lazy learners; k-Nearest Neighbor(k-NN) Algorithm-Case Based reasoning (CRR)-Random Forest Algorithm.

Syllabus of Statistics at FYUP under CBCS as per NEP-2020
Semester-VI
(Examination to be held in May 2025,2026 and 2027)

Major

Course Code: UMJSTT604 **Course Title: Statistics for Artificial Intelligence and Machine Learning**

Credits: 03+01
Duration of examination: 03 hours
Max. Marks: 100

Mid-Term:15
End-term:60
Practical Internal :10
Practical External :15

SUGGESTED READINGS:

1. Rich, E. & Knight K. (2010) Artificial Intelligence, 3rd Edition, Tata McGraw-Hill

2. Ela Kumar (2008) Artificial Intelligence, I.K. International Publishing House Pvt. Ltd., New Delhi

3. Srinivasaraghavan, A. & Joseph, V. (2019) Machine Learning, Wiley

4. Natarajan, B.K. (1991) Machine Learning: A Theoretical Approach, Morgan Kaufmann

5. Alpaydin, E. (2014) Introduction to Machine Learning, third edition, MITPress

6. Dinesh Kumar, U. & Pradhan, M. (2019) Machine learning using Python, Wiley

7. Motwani, B (2020) Data Analytics using Python, Wiley

8. Hastie,T., Tibshirani R. & Friedman J. (2017) The Elements of Statistical Learning: Data Mining, Inference, and Prediction,2nd Edition Springer

SCHEME OF EXAMINATIONS

THEORY	**Syllabus to be covered in the examination**	**Time allotted**	**% Weightage (Marks)**
Mid-Semester Assessment Test shall be conducted by the course coordinator. **Pattern**: One long answer type question of 10 marks and Five short answer type questions of marks each.	Up to 50%	$1\frac{1}{2}$ hours	15
External End Semester University Exam **Pattern**: As proposed by the BOS and approved by Academic Council	Up to 100%	03 hours	60
Total			**75**

Syllabus of Statistics at FYUP under CBCS as per NEP-2020
Semester-VI
(Examination to be held in May 2025,2026 and 2027)

Major

Course Code: UMJSTT604 **Course Title: Statistics for Artificial Intelligence and Machine Learning**

Credits: 03+01
Duration of examination: 03 hours **Max. Marks: 100**

Mid-Term:15
End-term:60
Practical Internal :10
Practical External :15

PRACTICAL		
Internal: Daily evaluation of practical records/Viva voce/attendance etc.	10 (including 20% for attendance, 20% for Viva-voce and 40% for internal test and 20% day to day performance)	
External: Final Practical Performance viva voce	100% Syllabus	15 = 10 Exam 05 viva-voce
Total		**25**

NOTE FOR PAPER SETTING: End SemesterExternal University Examination
The question paper will contain **TWO** Sections.

Section-A will consist of **FOUR COMPULSORY** short answer type questions (to be answered in 70-80 words) i.e., one question from each unit. Each question shall carry **3 marks.**

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Syllabus of Statistics at FYUP under CBCS as per NEP-2020
Semester-VI
(Examination to be held in May 2025,2026 and 2027)
Minor

Course Code: UMISTT605 **Course Title: APPLIED STATISTICS**
Credits: 03+01
Duration of examination: 03 hours **Max. Marks:**
100

Mid-Term:15
End-term:60
Practical Internal :10
Practical External :15

Objectives: The main objective of this course is to provide knowledge to the students about applied statistics such as Economic statistics, Time series analysis and Econometrics

Unit I

Time series Analysis: - Economic time series, its components, illustration, additive and multiplicative models, determination of trend, analysis of seasonal fluctuations, construction of seasonal indices. Logistic and Modified exponential growth curves.

Unit II

Economic Statistics; Index number its definition, application of index number, price relative quantity or volume relative, link and chain relative problem involved in computational of index numbers, use of averages, simple aggregative and weighted averages methods. Laspeyre's, Paasche's and Fisher's index number, consumer price index.

Unit III

Static laws of demand and supply, price elasticity of demand, analysis of income and allied size distribution, Pareto distribution, graphical test, fitting of pareto law, log-normal distribution and its properties, Lorenz curve and Gini's Coefficients.

Unit IV

Introduction: Definition, Components of Decision Making, Decision Models/Problems, Decision Making Environment, Laplace Criterion (Bayes Criterion of Rationality), Maximax or Minmax Criterion, Expected Monetary Value (EMV), Expected Value of Perfect Information (EVPI) with illustrations.

SUGGESTED READINGS:

1. Croxton F.E. and Cowden D.J. (1969); Applied general Statistics, Prentice Hall of India.
2. Goon A.M. Gupta M.K. Das Gupta B. (1986): Fundamentals of Statistics, Vol. II, World Press Calcutta.
3. Guide of current Indian official Statistics: Central Statistical Organization, Govt. of India, New Delhi.
4. Saluja M.P. Indian official Statistical systems. Statistical Publishing Society, 16 Calcutta.
5. Kendall, M.G. (1976). Time Series, 2nd Ed., Charles Griffin and Co Ltd., London and High Wycombe. 6. Chatfield, C. (1980). The Analysis of Time Series –An Introduction, Chapman & Hall.

Syllabus of Statistics at FYUP under CBCS as per NEP-2020
Semester-VI
(Examination to be held in May 2025,2026 and 2027)
Minor

Course Code: UMISTT605 **Course Title: APPLIED STATISTICS**
Credits: 03+01
Duration of examination: 03 hours **Max. Marks:**
100

Mid-Term:15
End-term:60
Practical Internal :10
Practical External :15

7. Gupta, S.C. and Kapoor, V.K. (2014). Fundamentals of Applied Statistics, 11th Ed., Sultan Chand.
8. Gujarati, D. and Guneshker, S. (2007). Basic Econometrics, 4th Ed., McGraw Hill Companies.
9. Johnston, J. (1972). Econometric Methods, 2nd Ed., McGraw Hill International.
10. Koutsoyiannis, A. (2004). Theory of Econometrics, 2 Ed., Palgrave Macmillan Limited.
11. Maddala, G.S. and Lahiri, K. (2009). Introduction to Econometrics, 4 Ed., John Wiley & Sons.

Practical Based on this Course:-

1. Measurement of Trend
2. Measurement of Seasonal indices: a) Simple Averages method b) Ratio-to-Trend method c) Ratio-to-Moving Average method d) Link Relative method
3. Calculate price and quantity index numbers using simple and weighted average of price relatives.
4. To Calculate the Chain Base Index numbers.
5. To Calculate the Consumer Price Index numbers
6. Problems based on estimation of General linear model.

SCHEME OF EXAMINATIONS

THEORY	**Syllabus to be covered in the examination**	**Time allotted**	**% Weightage (Marks)**
Mid-Semester Assessment Test shall be conducted by the course coordinator. **Pattern**: One long answer type question of 10 marks and Five short answer type questions of marks each.	Up to 50%	$1\frac{1}{2}$ hours	15
External End Semester University Exam **Pattern**: As proposed by the BOS and approved by Academic Council	Up to 100%	03 hours	60
Total			**75**

Syllabus of Statistics at FYUP under CBCS as per NEP-2020
Semester-VI
(Examination to be held in May 2025,2026 and 2027)

Minor

Course Code: UMISTT605 **Course Title: APPLIED STATISTICS**

Credits: 03+01

Duration of examination: 03 hours **Max. Marks:**
100

Mid-Term:15
End-term:60
Practical Internal :10
Practical External :15

PRACTICAL		
Internal: Daily evaluation of practical records/Viva voce/attendance etc.	10 (including 20% for attendance, 20% for Viva-voce and 40% for internal test and 20% day to day performance)	
External: Final Practical Performance viva voce	100% Syllabus	15 = 10 Exam 05 viva-voce
Total		**25**

NOTE FOR PAPER SETTING: End SemesterExternal University Examination
The question paper will contain **TWO** Sections.

Section-A will consist of **FOUR COMPULSORY** short answer type questions (to be answered in 70-80 words) i.e., one question from each unit. Each question shall carry **3 marks.**

Section -B will contain **EIGHT** long answer type questions (to be answered in 500-600 words), Two questions from each unit and the student has to attempt FOUR questions selecting one question from each unit. Each question shall carry 12 marks.

ANNEXURE-C

Semester 7

UMJSTT701 ADVANCED PROBABILITY THEORY

UMJSTT702 MULTIVARIATE ANALYSIS

UMJSTT703 ADVANCED RESEARCH METHODS AND TECHNIQUES

UMJSTT704 FINANCIAL STATISTICS

UMISTT705 ADVANCED PROBABILITY THEORY(Minor)

Syllabus of Statistics at FYUP under CBCS as per NEP-2020
Semester-VII
(Examination to be held in Dec. 2025,2026 and 2027)

Major

Course Code: UMJSTT701 **Course Title: Advanced Probability Theory**

Credits: 04+00

Duration of examination: 03 hours **Max. Marks: 100**

Mid-Term:40
End-term:60

Objectives: This course introduces the students to concepts of Probability and Measure Theory.

Unit- I

Fields, sigma minimal sigma field, sigma-field generated by a class of subsets, Borel fields. Sequence of sets, limsup and liminf of sequence of sets, Measure, probability measure, properties of a measure, Continuity theorem of measure, Caratheodory extension theorem (statement only), Idea of Lebesgue and Lebesgue-Steiltjes measure, Signed measure, Jordan-Hahn decomposition theorem.

Unit- II

Measurable functions, integration of a measurable function with respect to a measure, Monotone convergence theorem, Fatou's lemma, dominated convergence theorem, Radon Nikodym Theorem, Product measure, Fubini's Theorem.

Unit- III

Convergence of sequence of random variables, Borel-Cantelli Lemma, Zero-One Laws of Borel and Kolmogorov, Almost sure convergence, convergence in mean, convergence in probability,convergence in distribution, Kolmogorov's inequality, weak law and strong law of large numbers of sequences, three series criterion.

Unit- IV

Characteristic functions and their properties, Parseval relation, Uniqueness theorem, Inversion theorem, Levy's continuity theorem (statement only), Central Limit Theorems of Lindeberg-Levy, Liapounov and Lindberg-Feller.

Books Recommended:

1. Robert Ash (1972) Real Analysis and Probability, Academic Press
2. Billinsley, P. (1986) Probability and Measure, Wiley
3. Dudley, R.M. (2002) Real Analysis and Probability, Cambridge University Press
4. Kingman,J.F.C. and
Taylor, S.J.(1966)
Introduction to measure and probability, Cambridge University
press
5. Bhat, B. R. (2014) Modern Probability Theory, New Age International Private Limited
6. Basu, A.K. (2012) Probability and Measure theory, Narosa Pub. House
7. Rohtagi,V. K. and Saleh
A.K.M.E. (2015)
An Introduction to Probability and Statistics, Wiley
8. Chung, K. L. (2001) A Course in Probability Theory, Academic Press
9. Feller, W. (1998) Introduction to Probability and its Application Vol. II, Wiley
Eastern Ltd

Syllabus of Statistics at FYUP under CBCS as per NEP-2020
Semester-VII
(Examination to be held in Dec. 2025,2026 and 2027)

Major

Course Code: UMJSTT701 **Course Title: Advanced Probability Theory**

Credits: 04+00

Duration of examination: 03 hours **Max. Marks: 100**

Mid-Term:40
End-term:60

SCHEME OF EXAMINATION

THEORY	**Syllabus to be covered in the examination**	**Time allotted**	**% Weightage (Marks)**
Mid-term Assessment Test shall be conducted by the course coordinator. **Pattern**: As proposed by the BOS and approved by Academic Council	Up to 50%	$1\frac{1}{2}$ hours	40
External End Semester University Exam **Pattern**: As proposed by the BOS and approved by Academic Council	Up to 100%	03 hours	60
Total			**100**

Syllabus of Statistics at FYUP under CBCS as per NEP-2020
Semester-VII
(Examination to be held in Dec. 2025,2026 and 2027)

Major

Course Code: UMJSTT702 **Course Title: Multivariate Analysis**

Credits: 03+01

Duration of examination: 03 hours

Max. Marks: 100
Mid-Term:15
End-term:60
Practical Internal :10
Practical External :15

Objectives: The aim of this course is to provide the knowledge of Multivariate Analysis to the students.

Unit I

Multivariate normal distribution, Maximum likelihood estimates of mean vector and dispersion matrix, Distribution of sample mean vector, Wishart matrix-its distribution and properties, Null distribution of simple, partial and multiple correlation coefficients and their testing of significance.

Unit II

Hotelling's T^2 statistic-its distribution and application in testing of mean vector for one and more multivariate normal populations, Mahalonobis D2 staistics and its application. Problem of classification, probabilities of misclassification and their estimation, classification into more than two multivariate normal populations, Discrimination procedures for discriminating between two multivariate populations-sample discriminant function.

Unit III

Multivariate linear regression model-estimation of parameters, Distribution of sample regression coefficients, tests of linear hypothesis about regression coefficients, Multivariate Analysis of Variance (MANOVA) of one and two way classified data.

Unit IV

Principal Components Analysis, Factor Analysis Canonical variates and canonical correlations.

Books Recommended

1. Anderson, T.W(2003): An introduction to Multivariate Statistical Analysis, Wiley
2. Morrison, D.F(2003).: Multivariate Analysis, McGraw Hill
3. Johnson, R. and Wichern (2012): Applied Multivariate Statistical Analysis, PHI.
4. Jobson, D.B(1997).: Applied Multivariate Analysis, Springer

Syllabus of Statistics at FYUP under CBCS as per NEP-2020
Semester-VII
(Examination to be held in Dec. 2025,2026 and 2027)
Major

Course Code: UMJSTT702 **Course Title: Multivariate Analysis**
Credits: 03+01
Duration of examination: 03 hours

Max. Marks: 100
Mid-Term:15
End-term:60
Practical Internal :10
Practical External :15

PRACTICAL/LAB WORK
List of Practicals:
1. Bivariate Normal Distribution and it's properties.
2. Multivariate Normal Distribution and it's properties.
3. Partial Correlation Coefficient.
4. Multiple Correlation Coefficient.
5. Plane of Regression.
6. Principal Component Analysis.
7. Discriminant analysis.
8. Factor Analysis.

SCHEME OF EXAMINATION

THEORY	**Syllabus to be covered in the examination**	**Time allotted**	**% Weightage (Marks)**
Mid-term Assessment Test shall be conducted by the course coordinator. **Pattern**: One long answer type question of 10 marks and Five short answer type questions of marks each.	Up to 50%	$1\frac{1}{2}$ hour	15
External End Semester University Exam **Pattern**: As proposed by the BOS and approved by Academic Council	Up to 100%	03 hours	60
Total			**75**
PRACTICAL			
Internal: Daily evaluation of practical records/ Viva voce/ attendance etc.	10 (including 20% for attendance, 20% for Viva-voce and 40% for internal test and 20% day to day performance)		
External: Final Practical Performance + viva voce	100% Syllabus		15 =10 Exam 05 viva-voce
Total			**25**

Syllabus of Statistics at FYUP under CBCS as per NEP-2020
Semester-VII
(Examination to be held in Dec. 2025,2026 and 2027)

Major

Course Code: UMJSTT702 **Course Title: Multivariate Analysis**

Credits: 03+01

Duration of examination: 03 hours **Max. Marks: 100**

Mid-Term:15
End-term:60
Practical Internal :10
Practical External :15

NOTE FOR PAPER SETTING: End Semester External University Examination

The question paper will contain **TWO** Sections.

Section-A will consist of **FOUR COMPULSORY** short answer type questions (to be answered in 70-80 words) i.e., one question from each unit. Each question shall carry **3 marks.**

Section -B will contain **EIGHT** long answer type questions (to be answered in 500-600 words), Two questions from each unit and the student has to attempt FOUR questions selecting one question from each unit. Each question shall carry 12 marks.

Syllabus of Statistics at FYUP under CBCS as per NEP-2020
Semester-VII
(Examination to be held in Dec. 2025,2026 and 2027)

Major

Course Code: UMJSTT703 **Course Title: ADVANCED RESEARCH METHODS AND TECHNIQUES**

Credits: 03+01
Duration of examination: 03 hours

Max. Marks: 100
Mid-Term:15
End-term:60
Practical Internal :10
Practical External :15

Objectives:

- To provide scientific approaches to develop the domain of human knowledge through empirical studies.
- To enable the student researchers to understand basic concepts and aspects related to research, data collection, analyses and interpretation.
- To identify areas of research misconduct and predatory publications.

UNIT I

Introduction: Meaning, objection and motivation in research, types of research, research approach, significance of research. Research problems: definition, selection and necessity of research problems.

UNIT II

Develop a questionnaire, collect survey data pertaining to a research problem (such as gender discriminations in private v/s government sector, unemployment rates, removal of subsidy, impact on service class v/s unorganized sectors), interpret the results and draw inferences.

UNIT III

Ethics: definition, moral philosophy, nature of moral judgements and reaction. Ethics with respect to science and research. Intellectual honesty and research integrity. Scientific misconducts: Falsification, Fabrication, and Plagiarism (FFP). Redundant publications: duplicate and overlapping publications, salami slicing. Selective reporting and misrepresentation of data.

UNIT IV

Publication ethics: definition, introduction and importance. Best practices /Standards setting initiatives and guidelines: COPE. WAME, etc. Conflicts of interest. Publication misconduct: definition, concept, problems that lead to unethical behavior and vice versa, types. Violation of publication ethics, authorship and contributorship. Identification of publication misconduct, complaints and appeals. Predatory publishers and journals

SUGGESTED READINGS:

1. Kothari, C.R. (2015). Research Methodology: Methods and Techniques, 3rd Edition reprint, New Age International Publishers.
2. Kumar, R. (2011). Research Methodology: A Step-by-Step Guide for Beginners, SAGE publications.
3. Cochran, W.G. and Cox, G.M. (1959). Experimental Design. Asia Publishing House.

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Syllabus of Statistics at FYUP under CBCS as per NEP-2020
Semester-VII
(Examination to be held in Dec. 2025,2026 and 2027)

Major

Course Code: UMJSTT703 **Course Title: ADVANCED RESEARCH METHODS AND TECHNIQUES**

Credits: 03+01
Duration of examination: 03 hours

Max. Marks: 100
Mid-Term:15
End-term:60
Practical Internal :10
Practical External :15

PRACTICAL/LAB WORK

List of Practicals:

- Data Preparation: Processing and Analysis of Data: Processing Operations, measures of central tendency and dispersion
- Testing of Hypothesis: Basic concepts concerning testing of hypothesis. Test statistic, critical region, critical value and decision rule.
- Important Parametric Tests. Hypothesis testing of Means, and Proportions.
- : Hypothesis testing for Difference between Means and Proportions.
- Hypothesis testing for variance and equality of variances of two normal populations.
- Chi-Square Tests: Test of difference of more than two proportions, Test of Independence of Attributes.
- Test of Goodness of Fit. Interpretation and Report Writing: Meaning and technique of interpretation.
- Interpretation and Report Writing: Steps involved in report writing and it's significance. Layout, mechanics and precautions for writing research reports.
- Practicals on identifying predatory journals and use of plagiarism softwares.

SCHEME OF EXAMINATION

THEORY	**Syllabus to be covered in the examination**	**Time allotted**	**% Weightage (Marks)**
Mid-term Assessment Test shall be conducted by the course coordinator. **Pattern**: One long answer type question of 10 marks and Five short answer type questions of marks each.	Up to 50%	$1\frac{1}{2}$ hours	15
External End Semester University Exam **Pattern**: As proposed by the BOS and approved by Academic Council	Up to 100%	03 hours	60
Total			**75**

Syllabus of Statistics at FYUP under CBCS as per NEP-2020
Semester-VII
(Examination to be held in Dec. 2025,2026 and 2027)

Major

Course Code: UMJSTT703 **Course Title: ADVANCED RESEARCH METHODS AND TECHNIQUES**

Credits: 03+01
Duration of examination: 03 hours

Max. Marks: 100
Mid-Term:15
End-term:60
Practical Internal :10
Practical External :15

PRACTICAL		
Internal: Daily evaluation of practical records/ Viva voce/ attendance etc.	10 (including 20% for attendance, 20% for Viva-voce and 40% for internal test and 20% day to day performance)	
External: Final Practical Performance + viva voce	100% Syllabus	15 =10 Exam 05 viva-voce
Total		**25**

NOTE FOR PAPER SETTING: End Semester External University Examination
The question paper will contain **TWO** Sections.

Section-A will consist of **FOUR COMPULSORY** short answer type questions (to be answered in 70-80 words) i.e., one question from each unit. Each question shall carry **3 marks.**

Section -B will contain **EIGHT** long answer type questions (to be answered in 500-600 words), Two questions from each unit and the student has to attempt FOUR questions selecting one question from each unit. Each question shall carry 12 marks.

Syllabus of Statistics at FYUP under CBCS as per NEP-2020
Semester-VII
(Examination to be held in Dec. 2025,2026 and 2027)
Major

Course Code: UMJSTT704 **Course Title: Financial Statistics**
Credits: 03+01
Duration of examination: 03 hours **Max. Marks: 100**
Mid-Term:15
End-term:60
Practical Internal :10
Practical External :15

Course Objectives:

- To understand financial markets and in particular, derivative markets.
- To develop an understanding of stochastic calculus.
- To apply the techniques of stochastic calculus to price the products of derivative markets.

UNIT I

Introduction to investment and markets: Cash flows- deterministic and random, Basic theory of interest, bonds and yields, Term structure of interest rates, Portfolio Theory.

UNIT II

Introduction to derivatives, Tools Needed for Option Pricing: Forward contracts, spot price, forward price, future price, Call and put options, Zero-coupon bonds and discount bonds, Pricing derivatives: Arbitrage relations and perfect financial markets, Pricing futures, Putcall parity for European and American options, Relationship between strike price and option price. Discrete Stochastic Processes, Binomial processes, General random walks, Geometric random walks, Binomial models, Trinomial models.

UNIT III

Continuous time processes – Brownian motion, Geometric Brownian motion, Wiener process; Introduction to stochastic calculus: stochastic integration, stochastic differential equations and their solutions; Itô's lemma.

UNIT IV

Intrinsic of option markets: Black-Scholes differential equation, Black-Scholes formula for European and American options, Implied volatility, Binomial Model for European options: Cox-Ross-Rubinstein approach to option pricing. Discrete dividends, Trinomial model for American options, Hedging portfolios: Delta, Gamma and Theta hedging.

SUGGESTED READINGS:

1. David, G. L. (2015). Investment Science, Oxford University Press(South Asian edition)
2. Franke, J., Hardle, W.K. and Hafner, C.M. (2011). Statistics of Financial Markets: An Introduction, 3rd Ed., Springer Publications.
3. Stanley, L. S. (2012). A Course on Statistics for Finance, Chapman and Hall/CRC.

Syllabus of Statistics at FYUP under CBCS as per NEP-2020
Semester-VII
(Examination to be held in Dec. 2025,2026 and 2027)
Major

Course Code: UMJSTT704 **Course Title: Financial Statistics**
Credits: 03+01
Duration of examination: 03 hours

Max. Marks: 100
Mid-Term:15
End-term:60
Practical Internal :10
Practical External :15

PRACTICAL / LAB WORK
List of Practicals:
Mode of Conducting Practical Examination: The students should be encouraged to perform practical problems on computers using whatsoever software/package as far as possible.
1. To compute NPV and to obtain IRR of the investments.
2. To verify "no arbitrage" principle.
3. To price future / forward contracts.
4. To construct binomial trees and to evaluate options using these trees.
5. Simulation of continuous time stochastic processes.
6. To price options using Black – Scholes formula.
7. Pricing of options using discrete time models.
8. Impact of dividend on option prices.
9. Call-put parity for options.
10. Application of Greeks to hedge investment portfolios.

SCHEME OF EXAMINATION

THEORY	**Syllabus to be covered in the examination**	**Time allotted**	**% Weightage (Marks)**
Mid-term Assessment Test shall be conducted by the course coordinator. **Pattern**: One long answer type question of 10 marks and Five short answer type questions of marks each.	Up to 50%	$1\frac{1}{2}$ hours	15
External End Semester University Exam **Pattern**: As proposed by the BOS and approved by Academic Council	Up to 100%	03 hours	60
Total			**75**
PRACTICAL			
Internal: Daily evaluation of practical records/ Viva voce/ attendance etc.	10 (including 20% for attendance, 20% for Viva-voce and 40% for internal test and 20% day to day performance)		
External: Final Practical Performance + viva voce	100% Syllabus		15 =10 Exam 05 viva-voce
Total			**25**

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Syllabus of Statistics at FYUP under CBCS as per NEP-2020
Semester-VII
(Examination to be held in Dec. 2025,2026 and 2027)
Major

Course Code: UMJSTT704 **Course Title: Financial Statistics**
Credits: 03+01
Duration of examination: 03 hours **Max. Marks: 100**
Mid-Term:15
End-term:60
Practical Internal :10
Practical External :15

NOTE FOR PAPER SETTING: End Semester External University Examination
The question paper will contain **TWO** Sections.
Section-A will consist of **FOUR COMPULSORY** short answer type questions (to be answered in 70-80 words) i.e., one question from each unit. Each question shall carry **3 marks.**
Section -B will contain **EIGHT** long answer type questions (to be answered in 500-600 words), Two questions from each unit and the student has to attempt FOUR questions selecting one question from each unit. Each question shall carry 12 marks.

Syllabus of Statistics at FYUP under CBCS as per NEP-2020
Semester-VII
(Examination to be held in Dec. 2025,2026 and 2027)

Minor

Course Code: UMISTT705 **Course Title: Advanced Probability Theory**

Credits: 04+00

Duration of examination: 03 hours **Max. Marks: 100**

Mid-Term:40
End-term:60

Objectives: This course introduces the students to concepts of Probability and Measure Theory.

Unit- I

Fields, sigma minimal sigma field, sigma-field generated by a class of subsets, Borel fields. Sequence of sets, limsup and liminf of sequence of sets, Measure, probability measure, properties of a measure, Continuity theorem of measure, Caratheodory extension theorem (statement only), Idea of Lebesgue and Lebesgue-Steiltjes measure, Signed measure, Jordan-Hahn decomposition theorem.

Unit- II

Measurable functions, integration of a measurable function with respect to a measure, Monotone convergence theorem, Fatou's lemma, dominated convergence theorem, Radon Nikodym Theorem, Product measure, Fubini's Theorem.

Unit- III

Convergence of sequence of random variables, Borel-Cantelli Lemma, Zero-One Laws of Borel and Kolmogorov, Almost sure convergence, convergence in mean, convergence in probability,convergence in distribution, Kolmogorov's inequality, weak law and strong law of large numbers of sequences, three series criterion.

Unit- IV

Characteristic functions and their properties, Parseval relation, Uniqueness theorem, Inversion theorem, Levy's continuity theorem (statement only), Central Limit Theorems of Lindeberg-Levy, Liapounov and Lindberg-Feller.

Books Recommended:

1. Robert Ash (1972) Real Analysis and Probability, Academic Press
2. Billinsley, P. (1986) Probability and Measure, Wiley
3. Dudley, R.M. (2002) Real Analysis and Probability, Cambridge University Press
4. Kingman,J.F.C. and Taylor, S.J.(1966) Introduction to measure and probability, Cambridge University press
5. Bhat, B. R. (2014) Modern Probability Theory, New Age International Private Limited
6. Basu, A.K. (2012) Probability and Measure theory, Narosa Pub. House
7. Rohtagi,V. K. and Saleh A.K.M.E. (2015) An Introduction to Probability and Statistics, Wiley
8. Chung, K. L. (2001) A Course in Probability Theory, Academic Press
9. Feller, W. (1998) Introduction to Probability and its Application Vol. II, Wiley Eastern Ltd

Syllabus of Statistics at FYUP under CBCS as per NEP-2020
Semester-VII
(Examination to be held in Dec. 2025,2026 and 2027)

Minor

Course Code: UMISTT705 **Course Title: Advanced Probability Theory**

Credits: 04+00

Duration of examination: 03 hours

Max. Marks: 100
Mid-Term:40
End-term:60

SCHEME OF EXAMINATION

THEORY	**Syllabus to be covered in the examination**	**Time allotted**	**% Weightage (Marks)**
Mid-term Assessment Test shall be conducted by the course coordinator. **Pattern**: As proposed by the BOS and approved by Academic Council	Up to 50%	$1\frac{1}{2}$ hours	40
External End Semester University Exam **Pattern**: As proposed by the BOS and approved by Academic Council	Up to 100%	03 hours	60
Total			**100**

Annexure-B

Semester 8

UMJSTT801 ADVANCED LINEAR MODELS

UMJSTT802 ADVANCED STATISTICAL INFERENCE

UMJSTT803 SURVIVAL ANALYSIS AND BIOSTATISTICS

UMJSTT804 ADVANCE PYTHON FOR DATA HANDLING

UMISTT805 SURVIVAL ANALYSIS AND BIOSTATISTICS (MINOR)

UMJSTT806 LINEAR MODELS

UMISTT807 LINEAR MODELS (MINOR)

USESTT808 RESEARCH PROJECT/ DESSERTATION

Course Code: UMJSTT801 **Course Title: ADVANCED LINEAR MODELS**

Credits: 03+01
Duration of examination: 03 hours

Max. Marks: 100
Mid-Term:15
End-term:60
Practical Internal :10
Practical External :15

Course Objectives:

The learning objectives include developing a clear understanding of the fundamental concepts of linear models and a range of associated skills allowing the students to work effectively with them.

UNIT I

Gauss-Markov set up: Theory of linear estimation, Estimability of linear parametric functions, Method of least squares, Gauss-Markov theorem, Estimation of error variance. Distribution of quadratic forms.

UNIT II

Regression analysis: Simple Regression analysis, Estimation and hypothesis testing in case of simple and multiple regression analysis, Confidence intervals and Prediction intervals, Concept of model matrix and its use in estimation. Effect of orthogonal columns in the X matrix, Partial F-test and Sequential F-test, Bias in regression estimates.

UNIT III

Model checking: Prediction from a fitted model, Residuals and Outliers, Lack of fit and pure error, Violation of usual assumptions concerning normality, Homoscedasticity and collinearity, Diagnostics using quantile-quantile plots. Model Building: Techniques for Variable selection. Polynomial Regression models: Orthogonal Polynomials.

UNIT IV

Time series: Random Component: Variate difference method. Stationary Time series: Weak stationarity, autocorrelation function and the correlogram. Some Special Processes: Moving-average (MA) process and Autoregressive (AR) processes. Estimation of the parameters of AR (1) and AR (2). Autocorrelation functions of AR(1) and AR(2) processes.

SUGGESTED READINGS:

1. Draper, N. R. and Smith, H. (1998): Applied Regression Analysis, 3rd Ed., John Wiley and Sons.

2. Montgomery, D. C., Peck, E. A. and Vining, G. G. (2004): Introduction to Linear Regression Analysis, 3rd Ed., John Wiley and Sons.

Syllabus of Statistics at FYUP under CBCS as per NEP-2020
Semester-VIII
(Examination to be held in May 2026,2027 and 2028)
Major

Course Code: UMJSTT801 **Course Title: ADVANCED LINEAR MODELS**

Credits: 03+01
Duration of examination: 03 hours

Max. Marks: 100
Mid-Term:15
End-term:60
Practical Internal :10
Practical External :15

3. Rencher, A. C. and Schaalje, G. B. (2008): Linear Models in Statistics, 2nd Ed., John Wiley and Sons.

4. Weisberg, S. (2005): Applied Linear Regression, 3rd Ed., John Wiley and Sons.

PRACTICAL/LABWORK

List of Practicals

1. Estimability when X is a full rank matrix.
2. Estimability when X is not a full rank matrix.
3. Distribution of Quadratic forms.
4. Simple Linear Regression.
5. Multiple Regression.
6. Tests for Linear Hypothesis.
7. Bias in regression estimates.
8. Lack of fit.
9. Stepwise regression procedure.
10. Analysis of Variance of a one way classified data.
11. Analysis of Variance of a two way classified data with one observation per cell.
12. Analysis of Variance of a two way classified data with m (> 1) observations per cell.
13. Analysis of Covariance of a one way classified data.
14. Residual Analysis.
15. Orthogonal Polynomials.

Syllabus of Statistics at FYUP under CBCS as per NEP-2020
Semester-VIII
(Examination to be held in May 2026,2027 and 2028)
Major

Course Code: UMJSTT801 **Course Title: ADVANCED LINEAR MODELS**

Credits: 03+01
Duration of examination: 03 hours

Max. Marks: 100
Mid-Term:15
End-term:60
Practical Internal :10
Practical External :15

SCHEME OF EXAMINATION

THEORY	**Syllabus to be covered in the examination**	**Time allotted**	**% Weightage (Marks)**
Mid-term Assessment Test shall be conducted by the course coordinator. **Pattern**: One long answer type question of 10 marks and Five short answer type questions of marks each.	Up to 50%	$1\frac{1}{2}$ hours	15
External End Semester University Exam **Pattern**: As proposed by the BOS and approved by Academic Council	Up to 100%	03 hours	60
Total			**75**
PRACTICAL			
Internal: Daily evaluation of practical records/ Viva voce/ attendance etc.	10 (including 20% for attendance, 20% for Viva-voce and 40% for internal test and 20% day to day performance)		
External: Final Practical Performance + viva voce	100% Syllabus		15 =10 Exam 05 viva-voce
Total			**25**

NOTE FOR PAPER SETTING: End Semester External University Examination

The question paper will contain **TWO** Sections.

Section-A will consist of **FOUR COMPULSORY** short answer type questions (to be answered in 70-80 words) i.e., one question from each unit. Each question shall carry **3 marks.**

Section -B will contain **EIGHT** long answer type questions (to be answered in 500-600 words), Two questions from each unit and the student has to attempt FOUR questions selecting one question from each unit. Each question shall carry 12 marks.

Syllabus of Statistics at FYUP under CBCS as per NEP-2020
Semester-VIII
(Examination to be held in May 2026,2027 and 2028)
Major

Course Code: UMJSTT802 **Course Title: ADVANCED STATISTICAL INFERENCE**

Credits: 04+00
Duration of examination: 03 hours

Max. Marks: 100
Mid-Term:40
End-term:60

Objectives: To provide advanced knowledge of Inferential Statistics for decision making.

Unit-I

Generalization of Neyman-Pearson Lemma (without proof), Unbiasedness in hypothesis testing, UMPU tests for two-sided hypothesis – in case of exponential families, similar tests and tests of Neyman structure and its relation to bounded completeness, UMPU test for multiparameter exponential families and its applications to Binomial and Poisson populations.

Unit-II

Review of maximum likelihood estimation, MLE in Pitman family, MLE in censored and truncated distribution, Cramer family, Cramer-Huzurbazar theorem, solution of likelihood equation by method of scoring, Introduction to Sequential Estimation and Sequential Cramer –Rao inequality.

Unit-III

Probability Integral Transform and its inverse, Order Statistics and their distributions, Coverage probabilities and confidence intervals, tolerance intervals, empirical distribution function and its properties, asymptotic distributions of order-statistics, bounds on expected values.

Unit-IV

Single Sample problems, problem of location, Mathisen-Median test, Rosenbaum Statistics I and II, Linear rank statistics, Prediction intervals, Goodness of fit tests, Kolmogrov-Smirnov-one sample Statistic, sign test, Wilcoxon- Signed rank statistics, Walsh averages, general Linear rank statistics, Noether's Conditions, asymptotic distributions of above statistics.

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Course Code: UMJSTT802 **Course Title: ADVANCED STATISTICAL INFERENCE**

Credits: 04+00
Duration of examination: 03 hours

Max. Marks: 100
Mid-Term:40
End-term:60

Books Recommended:

1. Lehman, E.L. (1998) Theory of Point Estimation, Springer

2. Lehman, E.L. (1998) Testing Statistical Hypothesis, Springer

3. Goon, A.M., Gupta, M.K. & Das Gupta, B. (2003) An outline of Statistical Theory, World Press Pvt. Ltd.

4. Rohatgi, V.K. (1998) An Introduction to Probability Theory and Mathematical Statistics, Wiley

5. Rohatgi, V.K. (1997) Statistical Inference, Wiley 6. Kale, B.K. (2007) Parametric Inference, Alpha science Int. Ltd. 7. Zacks, S. (1981) Theory of Statistical Inference, John Wiley

SCHEME OF EXAMINATION

THEORY	**Syllabus to be covered in the examination**	**Time allotted**	**% Weightage (Marks)**
Mid-term Assessment Test shall be conducted by the course coordinator. **Pattern**: As proposed by the BOS and approved by Academic Council	Up to 50%	$1\frac{1}{2}$ hours	40
External End Semester University Exam **Pattern**: As proposed by the BOS and approved by Academic Council	Up to 100%	03 hours	60
Total			**100**

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Major

Course Code: UMJSTT803 **Course Title: SURVIVAL ANALYSIS AND BIOSTATISTICS**

Credits: 04+00
Duration of examination: 03 hours

Max. Marks: 100
Mid-Term:40
End-term:60

Course Objectives:

The learning objectives include:

- To analyse censored data and its application in public health.
- Estimate death probabilities by using the theory of competing risks in a cause-specific mortality study.
- Need of conducting clinical trials for introducing new drug.
- To compute probability of gametes in different generations under random mating.

UNIT I

Survival Analysis: Functions of survival times, survival distributions and their applications exponential, gamma, Weibull, Rayleigh, lognormal, death density function for a distribution having bath-tub shaped hazard function. Censoring Schemes: Type I, Type II and progressive or random censoring with biological examples. Estimation of mean survival time and variance of the estimator for Type I and Type II censored data with numerical examples. Non-parametric methods: Actuarial and Kaplan-Meier methods for estimating survival function and variance of the Estimator.

UNIT II

Competing Risk Theory: Indices for measurement of probability of death under competing risks and their inter-relations. Estimation of probabilities of death using maximum likelihood principle and modified minimum Chi-square methods. Theory of independent and dependent risks. Bivariate normal dependent risk model.

UNIT III

Stochastic Epidemic Models: Simple epidemic models, general epidemic model definition and concept (without derivation). Duration of an epidemic.

UNIT IV

Statistical Genetics: Introduction, concepts-Genotype, Phenotype, Dominance, Recessiveness, Linkage and Recombination, Coupling and Repulsion. Mendelian laws of Heredity, Random mating, Gametic Array relation between genotypic array and gametic array under random mating. Distribution of genotypes under random mating. Clinical Trials: Planning and design of clinical trials, Phase I, II and III trials. Blinding: Single, Double, Triple.

Course Code: UMJSTT803 **Course Title: SURVIVAL ANALYSIS AND BIOSTATISTICS**

Credits: 04+00
Duration of examination: 03 hours

Max. Marks: 100
Mid-Term:40
End-term:60

SUGGESTED READINGS:

1. Biswas, S. (2007). Applied Stochastic Processes: A Biostatistical and Population Oriented Approach, Reprinted 2nd Ed., New Central Book Agency.

2. Elandt-Johnson R.C (1971). Probability model and Statistical Methods in Genetics, John Wiley & Sons.

3. Indrayan, A. (2008). Medical Biostatistics, 2nd Ed., Chapman and Hall/CRC.

4. Lee, E.T. and Wang, J.W. (2003). Statistical Methods for Survival data Analysis, 3rd Ed., John Wiley & Sons.

5. Narayan P. (1999). Statistical Genetics, New Age International Pvt. Ltd. 6. Miller, R. G. (2011). Survival Analysis. John Wiley & Sons.

SCHEME OF EXAMINATION

THEORY	**Syllabus to be covered in the examination**	**Time allotted**	**% Weightage (Marks)**
Mid-term Assessment Test shall be conducted by the course coordinator. **Pattern**: As proposed by the BOS and approved by Academic Council	Up to 50%	$1\frac{1}{2}$ hour	40
External End Semester University Exam **Pattern**: As proposed by the BOS and approved by Academic Council	Up to 100%	03 hours	60
Total			**100**

Major

Course Code: UMJSTT804

Course Title: ADVANCE PYTHON FOR DATA HANDLING

Credits: 03+01
Duration of examination: 03 hours

Max. Marks: 100
Mid-Term:15
End-term:60
Practical Internal :10
Practical External :15

Unit I
Introduction: Introduction to Data Science, Exploratory Data Analysis and Data Science Process. Motivation for using Python for Data Analysis, Introduction of Python shell iPython and Jupyter Notebook.
Essential Python Libraries: NumPy and Pandas.

Unit II
Getting Started with Pandas: Arrays and vectorized conputation, Introduction to pandas Data Structures, Essential Functionality, Summarizing and Computing Descriptive Statistics.

Unit III
Data Loading, Storage and File Formats. Reading and Writing Data in Text Format, Web Scraping, Binary Data Formats, Interacting with Web APIs, Interacting with Databases
Data Cleaning and Preparation.
Handling Missing Data, Data Transformation, String Manipulation

Unit IV
Data Wrangling: Hierarchical Indexing, Combining and Merging Data Sets Reshaping and Pivoting.
Data Visualization matplotlib: Basics of matplotlib, plotting with pandas and seaborn, other python visualization tools.

SUGGESTED READINGS:

1. McKinney, W. (2012). Python for data analysis: Data wrangling with Pandas, NumPy, and IPython. " O'Reilly Media, Inc.".
2. Swaroop, C. H. (2003). A Byte of Python. Python Tutorial.

PRACTICAL/LABWORK

List of Practicals

- Simple Programmes involving arithmetic operators
- Computation of factorial of a number
- Write a program to input the value of x and n and print the sum of the logarithmic and trigonometric series.
- Input a number and check if the number is a prime number.
- Programme to handle the matrices.
- Count and display the number of vowels, consonants, uppercase, lowercase characters in string.

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Course Code: UMJSTT804 **Course Title: ADVANCE PYTHON FOR DATA HANDLING**

Credits: 03+01
Duration of examination: 03 hours

Max. Marks: 100
Mid-Term:15
End-term:60
Practical Internal :10
Practical External :15

- Find the largest/smallest number in a list/tuple
- Input a list of numbers and swap elements at the even location with the elements at the odd location.
- Input a list/tuple of elements, search for a given element in the list/tuple.
- Input a list of numbers and find the smallest and largest number from the list.
- Create a dictionary with the roll number, name and marks of n students in a class and display the names of students who have scored marks above 75.

SCHEME OF EXAMINATION

THEORY	**Syllabus to be covered in the examination**	**Time allotted**	**% Weightage (Marks)**
Mid-term Assessment Test shall be conducted by the course coordinator. **Pattern**: One long answer type question of 10 marks and Five short answer type questions of marks each.	Up to 50%	$1\frac{1}{2}$ hours	15
External End Semester University Exam **Pattern**: As proposed by the BOS and approved by Academic Council	Up to 100%	03 hours	60
Total			**75**
PRACTICAL			
Internal: Daily evaluation of practical records/ Viva voce/ attendance etc.	10 (including 20% for attendance, 20% for Viva-voce and 40% for internal test and 20% day to day performance)		
External: Final Practical Performance + viva voce	100% Syllabus		15 =10 Exam 05 viva-voce
Total			**25**

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Major

Course Code: UMJSTT804

Course Title: ADVANCE PYTHON FOR DATA HANDLING

Credits: 03+01
Duration of examination: 03 hours

Max. Marks: 100
Mid-Term:15
End-term:60
Practical Internal :10
Practical External :15

NOTE FOR PAPER SETTING: End Semester External University Examination

The question paper will contain **TWO** Sections.

Section-A will consist of **FOUR COMPULSORY** short answer type questions (to be answered in 70-80 words) i.e., one question from each unit. Each question shall carry **3 marks.**

Section -B will contain **EIGHT** long answer type questions (to be answered in 500-600 words), Two questions from each unit and the student has to attempt FOUR questions selecting one question from each unit. Each question shall carry 12 marks.

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Course Code: UMISTT805 **Course Title: SURVIVAL ANALYSIS AND BIOSTATISTICS**

Credits: 04+00
Duration of examination: 03 hours

Max. Marks: 100
Mid-Term:40
End-term:60

Course Objectives:

The learning objectives include:

- To analyse censored data and its application in public health.
- Estimate death probabilities by using the theory of competing risks in a cause-specific mortality study.
- Need of conducting clinical trials for introducing new drug.
- To compute probability of gametes in different generations under random mating.

UNIT I

Survival Analysis: Functions of survival times, survival distributions and their applications exponential, gamma, Weibull, Rayleigh, lognormal, death density function for a distribution having bath-tub shaped hazard function. Censoring Schemes: Type I, Type II and progressive or random censoring with biological examples. Estimation of mean survival time and variance of the estimator for Type I and Type II censored data with numerical examples. Non-parametric methods: Actuarial and Kaplan-Meier methods for estimating survival function and variance of the Estimator.

UNIT II

Competing Risk Theory: Indices for measurement of probability of death under competing risks and their inter-relations. Estimation of probabilities of death using maximum likelihood principle and modified minimum Chi-square methods. Theory of independent and dependent risks. Bivariate normal dependent risk model.

UNIT III

Stochastic Epidemic Models: Simple epidemic models, general epidemic model definition and concept (without derivation). Duration of an epidemic.

UNIT IV

Statistical Genetics: Introduction, concepts-Genotype, Phenotype, Dominance, Recessiveness, Linkage and Recombination, Coupling and Repulsion. Mendelian laws of Heredity, Random mating, Gametic Array relation between genotypic array and gametic array under random mating. Distribution of genotypes under random mating. Clinical Trials: Planning and design of clinical trials, Phase I, II and III trials. Blinding: Single, Double, Triple.

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Minor

Course Code: UMISTT805 **Course Title: SURVIVAL ANALYSIS AND BIOSTATISTICS**

Credits: 04+00
Duration of examination: 03 hours

Max. Marks: 100
Mid-Term:40
End-term:60

SUGGESTED READINGS:

1. Biswas, S. (2007). Applied Stochastic Processes: A Biostatistical and Population Oriented Approach, Reprinted 2nd Ed., New Central Book Agency.

2. Elandt-Johnson R.C (1971). Probability model and Statistical Methods in Genetics, John Wiley & Sons.

3. Indrayan, A. (2008). Medical Biostatistics, 2nd Ed., Chapman and Hall/CRC.

4. Lee, E.T. and Wang, J.W. (2003). Statistical Methods for Survival data Analysis, 3rd Ed., John Wiley & Sons.

5. Narayan P. (1999). Statistical Genetics, New Age International Pvt. Ltd. 6. Miller, R. G. (2011). Survival Analysis. John Wiley & Sons.

SCHEME OF EXAMINATION

THEORY	**Syllabus to be covered in the examination**	**Time allotted**	**% Weightage (Marks)**
Mid-term Assessment Test shall be conducted by the course coordinator. **Pattern**: As proposed by the BOS and approved by Academic Council	Up to 50%	$1\frac{1}{2}$ hours	40
External End Semester University Exam **Pattern**: As proposed by the BOS and approved by Academic Council	Up to 100%	03 hours	60
Total			**100**

60

14

Course Code: UMJSTT806 **Course Title: LINEAR MODELS**

Credits: 03+01

Duration of examination: 03 hours

Max. Marks: 100
Mid-Term:15
End-term:60
Practical Internal :10
Practical External :15

Course Objectives:

The learning objectives include developing a clear understanding of the fundamental concepts of linear models and a range of associated skills allowing the students to work effectively with them.

UNIT I

Gauss-Markov set up: Theory of linear estimation, Estimability of linear parametric functions, Method of least squares, Gauss-Markov theorem, Estimation of error variance. Distribution of quadratic forms.

UNIT II

Regression analysis: Simple Regression analysis, Estimation and hypothesis testing in case of simple and multiple regression analysis, Confidence intervals and Prediction intervals, Concept of model matrix and its use in estimation. Effect of orthogonal columns in the X matrix, Partial F-test and Sequential F-test, Bias in regression estimates.

UNIT III

Analysis of Variance and Covariance: Definition of fixed, random and mixed effect models, analysis of variance and covariance in one-way classified data for fixed effect models, analysis of variance in two-way classified data with equal number of observations per cell for fixed effect models.

UNIT IV

Model checking: Prediction from a fitted model, Residuals and Outliers, Lack of fit and pure error, Violation of usual assumptions concerning normality, Homoscedasticity and collinearity, Diagnostics using quantile-quantile plots. Model Building: Techniques for Variable selection. Polynomial Regression models: Orthogonal Polynomials.

SUGGESTED READINGS:

1. Draper, N. R. and Smith, H. (1998): Applied Regression Analysis, 3rd Ed., John Wiley and Sons.

2. Montgomery, D. C., Peck, E. A. and Vining, G. G. (2004): Introduction to Linear Regression Analysis, 3rd Ed., John Wiley and Sons.

3. Rencher, A. C. and Schaalje, G. B. (2008): Linear Models in Statistics, 2nd Ed., John Wiley and Sons.

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15

Course Code: UMJSTT806 **Course Title: LINEAR MODELS**

Credits: 03+01

Duration of examination: 03 hours

Max. Marks: 100
Mid-Term:15
End-term:60
Practical Internal :10
Practical External :15

4. Weisberg, S. (2005): Applied Linear Regression, 3rd Ed., John Wiley and Sons.

PRACTICAL/LABWORK

List of Practicals

1. Estimability when X is a full rank matrix.
2. Estimability when X is not a full rank matrix.
3. Distribution of Quadratic forms.
4. Simple Linear Regression.
5. Multiple Regression.
6. Tests for Linear Hypothesis.
7. Bias in regression estimates.
8. Lack of fit.
9. Stepwise regression procedure.
10. Analysis of Variance of a one way classified data.
11. Analysis of Variance of a two way classified data with one observation per cell.
12. Analysis of Variance of a two way classified data with m (> 1) observations per cell.
13. Analysis of Covariance of a one way classified data.
14. Residual Analysis.
15. Orthogonal Polynomials.

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Course Code: UMJSTT806 **Course Title: LINEAR MODELS**
Credits: 03+01
Duration of examination: 03 hours

Max. Marks: 100
Mid-Term:15
End-term:60
Practical Internal :10
Practical External :15

SCHEME OF EXAMINATION

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Total			**75**
PRACTICAL			
Internal: Daily evaluation of practical records/ Viva voce/ attendance etc.	10 (including 20% for attendance, 20% for Viva-voce and 40% for internal test and 20% day to day performance)		
External: Final Practical Performance + viva voce	100% Syllabus		15 =10 Exam 05 viva-voce
Total			**25**

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Section -B will contain **EIGHT** long answer type questions (to be answered in 500-600 words), Two questions from each unit and the student has to attempt FOUR questions selecting one question from each unit. Each question shall carry 12 marks.

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Course Code: UMISTT807 **Course Title: LINEAR MODELS**
Credits: 03+01
Duration of examination: 03 hours

Max. Marks: 100
Mid-Term:15
End-term:60
Practical Internal :10
Practical External :15

Course Objectives:

The learning objectives include developing a clear understanding of the fundamental concepts of linear models and a range of associated skills allowing the students to work effectively with them.

UNIT I

Gauss-Markov set up: Theory of linear estimation, Estimability of linear parametric functions, Method of least squares, Gauss-Markov theorem, Estimation of error variance. Distribution of quadratic forms.

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2. Montgomery, D. C., Peck, E. A. and Vining, G. G. (2004): Introduction to Linear Regression Analysis, 3rd Ed., John Wiley and Sons.

3. Rencher, A. C. and Schaalje, G. B. (2008): Linear Models in Statistics, 2nd Ed., John Wiley and Sons.

4. Weisberg, S. (2005): Applied Linear Regression, 3rd Ed., John Wiley and Sons

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18

Course Code: UMISTT807 **Course Title: LINEAR MODELS**
Credits: 03+01
Duration of examination: 03 hours

Max. Marks: 100
Mid-Term:15
End-term:60
Practical Internal :10
Practical External :15

PRACTICAL/LABWORK

List of Practicals

1. Estimability when X is a full rank matrix.
2. Estimability when X is not a full rank matrix.
3. Distribution of Quadratic forms.
4. Simple Linear Regression.
5. Multiple Regression.
6. Tests for Linear Hypothesis.
7. Bias in regression estimates.
8. Lack of fit.
9. Stepwise regression procedure.
10. Analysis of Variance of a one way classified data.
11. Analysis of Variance of a two way classified data with one observation per cell.
12. Analysis of Variance of a two way classified data with m (> 1) observations per cell.
13. Analysis of Covariance of a one way classified data.
14. Residual Analysis.
15. Orthogonal Polynomials.

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19

Course Code: UMISTT807 **Course Title: LINEAR MODELS**
Credits: 03+01
Duration of examination: 03 hours

Max. Marks: 100
Mid-Term:15
End-term:60
Practical Internal :10
Practical External :15

SCHEME OF EXAMINATION

THEORY	**Syllabus to be covered in the examination**	**Time allotted**	**% Weightage (Marks)**
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External End Semester University Exam **Pattern**: As proposed by the BOS and approved by Academic Council	Up to 100%	03 hours	60
Total			**75**
PRACTICAL			
Internal: Daily evaluation of practical records/ Viva voce/ attendance etc.	10 (including 20% for attendance, 20% for Viva-voce and 40% for internal test and 20% day to day performance)		
External: Final Practical Performance + viva voce	100% Syllabus		15 =10 Exam 05 viva-voce
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NOTE FOR PAPER SETTING: End Semester External University Examination

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Course Code: USESTT808 **Course Title: RESEARCH PROJECT/ DISSERTATION**

Credits: 00+12

Max. Marks: 300
Dissertation:200
Viva/presentation:100

Objectives:
Project work is considered an unique course involving applying knowledge in solving/ analyzing/ exploring a real-life situation/ complex problem/ data analysis. Project work has the intention to provide research competencies at the undergraduate level. It enables the acquisition of special/advanced knowledge through support study/a project work. This course is applicable to students in 8" semester of undergraduate research program.

Guidelines:

The following mechanism shall be adopted for completion of the project:

I. Admission to Honours with Research Programme (4^{th} year, 7^{th} Semester) shall be on the basis of the cumulative score (75% marks and above in the first five semesters) and subject to availability of permanent faculty with doctoral degree and infrastructure and number of seats in the College.

2. Research Project work (12 credits) shall be started at the beginning of 7^{th} Semester.

3. There shall be a Project Synopsis in the programme based on the major area/subject. The permanent faculty with Ph.D. and research experience (as per UGC guidelines) shall be the research project supervisor after being recognized by the Departmental Research Committee (DRC) of the Nodal Department.

4. The college offering FYUGP with Research should have its own College Research Committee (CRC) for each discipline with at least one member from any University of the region.

5. The project report/dissertation shall be evaluated by the external expert from other University/Colleges to be nominated by the Principal out of the panel supplied by the CRC.

6. Project proposal to be scrutinized by the College Research Committee for the concerned subject.

7. Evaluation of Dissertation shall be offline and Viva-Voce shall be either offline or online as per the convenience of the examiner.

Research Project = 12 credits (300 marks)

1. Dissertation = 08 credits (200 marks)
2. Viva/presentation = 04 credits (100 marks)

Note : A separate guideline shall be issued with regard to the payment of remuneration to the external expert for evaluation

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