

Integrated B.Sc-M.Sc in Applied Statistics



University School of Management and Entrepreneurship
East Delhi Campus, Vivek Vihar Phase II, New Delhi 110095

Table of contents

	Contents	Pg no.
1.	About the Program	2
2	Program Outcomes	2
3	Program Specific Outcomes (PSO) and Program Educational Outcomes (PEO)	3
	3.1 Salient Features	4
	3.2 Minor Programme Structure	5
4	Admission Process	5
	4.1 Eligibility Criteria	5
	4.2 Admission Criteria	6
	4.3 Seat Matrix	7
5	Semester Wise Courses and Credit Structure	9
6	Syllabus	22

About the Program

The Integrated B.Sc-M.Sc in Applied Statistics with a minor in Data Science/Economics/Management provides a comprehensive education in statistical theory, quantitative methods, and data analysis. The program is designed to equip students with a strong foundation in statistics and analytical skills, preparing them for academic, research, and professional roles across industry, government, and emerging data-driven sectors. The curriculum covers a wide range of statistical disciplines, including probability theory, statistical inference, linear and multivariate models, time series analysis, sampling techniques, experimental design, and statistical computing. Students learn fundamental concepts, theories, and applications to develop a well-rounded understanding of data analysis and statistical decision-making.

The programme has been conceptualized and designed through a rigorous consultative process involving leading experts from academia, government, public policy institutions, and industry. Their collective inputs have shaped a curriculum that combines strong theoretical foundations with contemporary applications, interdisciplinary learning, and industry relevance, preparing graduates for higher education, research, public service, and data-driven professional careers.

The course structure includes multidisciplinary courses to broaden the intellectual experience of students; ability enhancement courses to enable students to acquire core competencies such as critical thinking, quantitative reasoning, and academic communication; and skill-enhancement and value-added courses that emphasize practical training, programming, data analytics, and professional skills to enhance employability.

The integrated program has been designed in line with the National Education Policy (NEP) 2020 and the UGC Curriculum and Credit Framework for Undergraduate Programmes (2022), offering minor specialization, interdisciplinary learning, and multiple entry and exit options. The program offers a Minor in Data Science, Economics or Management, enabling students to develop complementary expertise alongside their major in Statistics. Students may exit with a one-year Certificate, two-year Diploma, three-year B.Sc. degree, or complete a four-year B.Sc. (Honours) degree with or without a Minor specialization, with the option to continue into the Integrated M.Sc. program. Overall, the program offers a comprehensive and holistic combination of statistical foundations, interdisciplinary learning, research orientation, and value-added skill development.

Program Outcomes

- **PO1:** Scientific Knowledge. Acquire holistic knowledge and understanding of basic concepts in statistics and its linkages with art, science, and technology.
- **PO2:** Economic and Data-Driven Decision Making. Apply principles of economics and data science to analyze market behavior, public policy, and business strategies using quantitative models and real-world data.
- **PO 3:** Problem Analysis. Develop the capacity to identify, understand, and solve the problems of society through logical reasoning and data scrutiny.

- **PO 4: Modern Tool Usage.** Master statistical software packages including Excel, SPSS, R, and Python to facilitate efficient analysis and decision-making.
- **PO 5: Communication.** Demonstrate effective oral and written communication skills through professional reports, presentations, and group discussions.
- **PO 6: Individual and Team Work.** Develop leadership and team-building skills essential for collaborative research and consultancy projects.
- **PO 7: Research Competency.** Understand basic research concepts, including data collection techniques, experimental design, and the interpretation of results.

Program Specific Outcomes (PSO)

- **PSO 1: Theoretical Mastery.** Build a strong foundation in the mathematical tools (Calculus, Algebra, Analysis) and theoretical statistics (Inference, Probability Theory) required for advanced modelling.
- **PSO 2: Analytical Modelling.** Apply advanced statistical techniques such as Multivariate Analysis, Linear Models, and Time Series Analysis to real-world industrial and economic data.
- **PSO 3: Computational Capability.** Design and implement algorithms for Stochastic Processes and Numerical Methods using high-level programming languages to solve non-analytical problems.
- **PSO 4: Specialized Expertise.** Demonstrate specialized competence in a minor area, such as Data Science (Big Data, Machine Learning) or Economics (Econometrics, Financial Statistics), enhancing employability in niche markets.
- **PSO 5: Quality & Risk Management.** Use statistical tools for Quality Control and Actuarial Science to improve industrial processes and assess financial risks

Program Educational Outcomes (PEO)

- **PEO 1: Professional Excellence.** Graduates will be equipped to excel in academic, research, and professional roles across industry, government, and emerging data-driven sectors by applying advanced statistical and analytical skills.
- **PEO 2: Interdisciplinary Leadership.** Graduates will demonstrate the ability to handle complex problems in Social Sciences, Economics, Engineering, and Bio-sciences using their minor specialisations in Data Science or Economics.
- **PEO 3: Continuous Learning & Research.** Graduates will be prepared to pursue high-level research and contribute to the domain of human knowledge through the use of empirical data and innovative problem-solving.
- **PEO 4: Ethical & Social Responsibility.** Graduates will function as responsible professionals who understand the impact of statistical decision-making on society and the environment

The **Salient Features** of Integrated B.Sc-M.Sc in Applied Statistics program are as under:

S. No.	Program / Exit Award	Requirements
1	Undergraduate Certificate in Applied Statistics	Exit after 1 year on fulfilling: (a) Completion of 44 credits as per first-year curriculum (b) One Vocational Course of 4 credits (during summer vacation)
2	Undergraduate Diploma in Applied Statistics	Exit after 2 years on fulfilling: (a) Completion of 88 credits as per first and second year curriculum (b) One Vocational Course of 4 credits (during summer vacation of 2nd year)
3	3-Year Bachelor of Science (B.Sc.) in Applied Statistics	Exit after 3 years on completion of 130 credits, awarded with or without Minor
4	4-Year Bachelor of Science (B.Sc.) in Applied Statistics (Honours)	Exit after 4 years on completion of 170 credits, awarded with or without Minor
5	Master of Science (M.Sc.) in Applied Statistics	Exit after 5 years on completion of 214 credits

Minimum Credit Requirement							
Discipline	CERTIFICATE	DIPLOMA	3 YEAR UG	3-YEAR UG WITH MINOR DEGREE	4 YEAR Hons.	4 YEAR Hons. WITH MINOR DEGREE	5 YEAR INTEGRATED DEGREE
Departmental Core Course (DCC)	24	48	68	68	88	88	112
Departmental Elective Course (DEC) OR Generic Elective Course (GEC)	8	18	36	36 (26 credits from electives in either of the three minors)	44	44 (34 credits from electives in either of the three minors)	52
Ability Enhancement Course (AEC)	4	8	8	8	8	8	8
Skill Enhancement Course (SEC)	4	8	10	10	10	10	10
Value Addition Course (VAC)	4	6	6	6	6	6	6
Dissertation/ Research Project/Summer Internship			2	2	14	14	26
Total	44	88	130	130	170	170	214

Minor Program Structure

Item	Provision
Minor Disciplines Offered	Economics/ Data Science/ Management
Minor Credits (3-Year B.Sc.)	26 credits (included within total credits)
Minor Credits (4-Year B.Sc. Honours)	34 credits (included within total credits)
When Minor Can Be Opted	From 1 st semester onwards, after earning the prescribed credits
Degree Nomenclature	Integrated B.Sc-M.Sc in Applied Statistics
Minor Basket	Courses to be chosen strictly from the approved Minor baskets in Economics or Data Science or Management

- Initial intake should be limited to 30 in the first year.
- For re-entry into DTU, a student must have completed the number of DCC equivalent credits as given in DTU scheme. The course equivalence will be decided by the BoS of the concerned Department and as decided by the University administration.
- The number of seats in such cases will be supernumerary in nature and this number will be decided by the University administration.

Admission Process

1. Eligibility Criteria:

·The candidate must have appeared in the Common University Entrance Test (CUET) -UG 2026 being conducted by the National Testing Agency (NTA).

·The candidate must have scored at least 50% marks in the 12th board examination from a recognised board and must also have passed Mathematics/Applied Mathematics as a subject in the 12th Board Examination.

·Those who are appearing in the examination may also apply, provided that they submit the proof of eligibility by a specific date declared by the University.

·Candidates belonging to various reserved categories namely OBC (Non-Creamy Layer), Scheduled Caste, Scheduled Tribe, and sub-categories namely Defence, Person with Disability, who apply for seats reserved for them, shall be allowed a relaxation in the minimum marks criterion as mentioned below:

- Other Backward Class (OBC-NCL): Candidates claiming reservation under Other Backward Class (Non-Creamy Layer) category shall be allowed a relaxation of 5% marks in the minimum marks criterion in the qualifying examination.
- Scheduled Caste (SC), Scheduled Tribe (ST): Candidates claiming reservation under Scheduled Caste (SC) or Scheduled Tribe (ST) shall be allowed a relaxation of 10% marks in the minimum marks criterion in the qualifying examination.
- Defence Personnel: Candidates claiming reservation under Defence sub-category (CW) shall be allowed a relaxation of 5% marks in the minimum marks criterion in the qualifying examination.
- Person with Disability (PwD): Candidates claiming reservation under “Person with Disability” (PD) sub-category shall be allowed a relaxation of 10% marks in the minimum marks criterion in the qualifying examination.

2. Admission Criteria:

Admission to the Integrated B.Sc-M.Sc Applied Statistics program for the 2026-27 academic session will be based on the scores obtained in the following combination of subjects in the Common University Entrance Test (CUET)-UG 2025 being administered by the National Testing Agency (NTA):

Mathematics + any two domain-specific subject + English Language

To resolve and determine inter-se merit of candidates having same score in the above-mentioned combination of the four subjects, the following criterion will be used in the stated order of preference:

1. Candidates having higher scores in Mathematics in CUET will be given preference.
2. In case the score in Mathematics is the same, then date of birth will be considered. Elder candidates will be given preference.

Seat Matrix: To be determined by the Integrated B.Sc.-M.Sc. Admissions Committee

Delhi Technological University
Scheme Integrated BSc & MSc

Name of Program: Integrated B.Sc. & M.Sc. in Applied Statistics

Nature of Program: Single Major with Minors

Provision of Program: Multiple entries & exits

Name of Minor Track: Data Science/Economics/Management

Schemes
First Semester

S.No.	Sub Code	Teaching scheme			Contact hr/week			Exam duration (ETE)		Relative weightage(%)				
		Course Title	Course Type	Cr.	L	T	P	Th	P	CWS	PRS	MTE	ETE	PRE
1	IMSST101	Statistical Methods-I	DCC 1	4	3	1	0	3	0	25	-	25	50	-
2	IMSST103	Probability Theory-I-Foundations of Probability Theory	DCC 2	4	3	1	0	3	0	25	-	25	50	-
3	IMSST105	Mathematical Analysis-I-Calculus	DCC 3	4	3	1	0	3	0	25	-	25	50	-
4	IMSST107	Business Communication	AEC 1	2	0	0	4	0	3	-	50	-	-	50
5	IMSST109	Computer Applications	SEC 1	2	0	0	4	0	3	-	50	-	-	50
6	IMSST111	Science and Practice of Happiness	VAC 1	2	0	0	4	0	3	-	50	-	-	50
7	GEC code	GEC in Data Science / GEC in Economics/ GEC in Management	GEC 1	4	3	1	0	3	0	25	-	25	50	-
Total				22										

Second semester

S.No.	Sub Code	Teaching scheme			Contact hr/week			Exam duration (ETE)		Relative weightage(%)				
		Course Title	Course Type	Cr.	L	T	P	Th	P	CWS	PRS	MTE	ETE	PRE
1	IMSST102	Statistical Methods-II	DCC 4	4	3	1	0	3	0	25	-	25	50	-
2	IMSST104	Probability Theory-II-	DCC 5	4	3	1	0	3	0	25	-	25	50	-

		Advanced Probability and Distribution Theory												
3	IMSST106	Mathematical Analysis-II- Algebra	DCC 6	4	3	1	0	3	0	25	-	25	50	-
4	IMSST108	Financial Literacy	AEC 2	2	2	0	0	3	0	25	-	25	50	-
5	IMSST110	Statistical Data Analysis using Excel	SEC 2	2	0	0	4	0	3	-	50	-	-	50
6	IMSST112	Environmental Science & Sustainable Development	VAC 2	2	0	0	4	0	3	-	50	-	-	50
7	GEC Code	GEC in Data Science/ GEC in Economics/ GEC in Management	GEC 2	4	3	1	0	3	0	25	-	25	50	-
	Total			22										

Exit: After securing 44 credits-awarded **Undergraduate Certificate in Applied Statistics** (NHEQF Level- 4.5). This certification is contingent upon achieving a minimum of 4 credits through work-based vocational courses offered during the summer term or through internship/apprenticeship experiences, in addition to acquiring 4 credits from skill-based courses undertaken throughout the first and second semester (Total Credit for exit: 22+22+4=**48**).

Third Semester

Teaching scheme					Contact hr/week			Exam duration (ETE)		Relative weightage(%)				
S.No.	Sub Code	Course Title	Course Type	Cr.	L	T	P	Th	P	CWS	PRS	MTE	ETE	PRE
1	IMSST201	Advanced Statistical Inference	DCC 7	4	3	1	0	3	0	25	-	25	50	-
2	IMSST203	Probability Theory-III- Limit Theorems and Asymptotic Probability	DCC 8	4	3	1	0	3	0	25	-	25	50	-
3	IMSST205	Mathematical Analysis- III- Real Analysis	DCC 9	4	3	1	0	3	0	25	-	25	50	-
4	IMSST207	Soft Skills and Personality Development	AEC 3	2	0	0	4	0	3	-	50	-	-	50
5	IMSST209	Analysis of Recent Business Development	SEC 3	2	0	0	4	0	3	-	50	-	-	50
6	GEC Code	GEC in Data Science/ GEC in Economics/	GEC 3	4	3	1	0	3	0	25	-	25	50	-

		GEC in Management												
7	IMSSTxxx/ code GEC	DEC 1/ GEC 4	DEC 1/ GEC 4	2										
	Total			22										

GEC 1-3 is multidisciplinary & not included in minor track

Fourth Semester

	Teaching scheme				Contact hr/week			Exam duration (ETE)		Relative weightage(%)				
S.No.	Sub Code	Course Title	Course Type	Cr.	L	T	P	Th	P	CWS	PRS	MTE	ETE	PRE
1	IMSST202	Applied Statistics	DCC 10	4	3	1	0	3	0	25	-	25	50	-
2	IMSST204	Time Series Analysis	DCC 11	4	3	1	0	3	0	25	-	25	50	-
3	IMSST206	Mathematical Analysis-IV (Differential Equations)	DCC 12	4	3	1	0	3	0	25	-	25	50	-
4	IMSST208	Written Analysis of cases	AEC 4	2	0	0	4	0	3	-	50	-	-	50
5	IMSST210	Statistical Data Analysis using SPSS	SEC 4	2										
6	IMSST212	Logical Reasoning	VAC 3	2	2	0	0	3	0	25	-	25	50	-
7	IMSSTxxx/ code GEC	DEC 2/ GEC 5	DEC 2/ GEC 5	4	3	1	0	3	0	25	-	25	50	-
	Total			22										

Exit: After securing 88 credits-awarded **Undergraduate Diploma in Applied Statistics** (NHEQF Level- 5.0). This certification is contingent upon achieving a minimum of 4 credits through work-based vocational courses offered during the first year or second year summer (Total Credit for exit: 44+44+4=92).

Fifth Semester

	Teaching scheme				Contact hr/week			Exam duration (ETE)		Relative weightage(%)				
S.No.	Sub Code	Course Title	Course Type	Cr.	L	T	P	Th	P	CWS	PRS	MTE	ETE	PRE
1	IMSST301	Linear Models	DCC 13	4	3	1	0	3	0	25	-	25	50	-
2	IMSST303	Survey Sampling and Indian Official Statistics	DCC 14	4	3	1	0	3	0	25	-	25	50	-
3	IMSST305	Statistical Quality Control	DCC 15	4	3	1	0	3	0	25	-	25	50	-
4	IMSST307	Summer Internship		2	-	-	-	-	-	-	40	-	-	60
5	IMSSTxxx/ code GEC	DEC 3/ GEC 6	DEC 3/ GEC 6	4	3	1	0	3	0	25	-	25	50	-
6	IMSSTxxx/ code GEC	DEC 4/ GEC 7	DEC 4/ GEC 7	4	3	1	0	3	0	25	-	25	50	-

	Total	22												
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Sixth Semester

S.No.	Sub Code	Teaching scheme			Contact hr/week			Exam duration (ETE)		Relative weightage(%)				
		Course Title	Course Type	Cr.	L	T	P	Th	P	CWS	PRS	MTE	ETE	PRE
1	IMSST302	Parametric Inference	DCC 16	4	3	1	0	3	0	25	-	25	50	-
2	IMSST304	Bayesian Analysis	DCC 17	4	3	1	0	3	0	25	-	25	50	-
3	IMSST306	Entrepreneurship Development	SEC 5	2	2	0	0	3	0	25	-	25	50	-
4	IMSSTxxx/ code GEC	DEC 5/ GEC 8	DEC 5/ GEC 8	4	3	1	0	3	0	25	-	25	50	-
5	IMSSTxxx/ code GEC	DEC 6/ GEC 9	DEC 6/ GEC 9	2	2	0	0	3	0	25	-	25	50	-
6	IMSSTxxx/ code GEC	DEC 7/ GEC 10	DEC 7/ GEC 10	2	2	0	0	3	0	25	-	25	50	-
	Total			20										

Exit: After completing three years- **Bachelor of (Applied Statistics)- 130 Cr** (NHEQF Level- 5.5). Students who want to undertake 3-Year UG Programme will be awarded UG degree in the relevant Discipline/Subject upon **securing 130 credits**. * Research Methodology shall be offered in VI as DEC5/GEC8 included in minor track.

Credit Division

DCC	Minor/interdis DEC/GEC	Multidisc GEC	AEC	SEC	VAC	Internship	Total
68	26	10	8	10	6	2	130

Seventh Semester

S.No.	Sub Code	Teaching scheme			Contact hr/week			Exam duration (ETE)		Relative weightage(%)				
		Course Title	Course Type	Cr.	L	T	P	Th	P	CWS	PRS	MTE	ETE	PRE
1	IMSST401	Statistical Computing using Python	DCC 18	4	3	1	0	3	0	25	-	25	50	-
2	IMSST403	Introduction to Stochastic processes	DCC 19	4	3	1	0	3	0	25	-	25	50	-
3	IMSST405	Design of Experiments	DCC 20	4	3	1	0	3	0	25	-	25	50	-
4	IMSST407	Project-1	-	6	-	-	-	-	-	-	40	-	-	60
5	IMSSTxxx/ code GEC	DEC 8/ GEC 11	DEC 8/ GEC 11	2	2	0	0	3	0	25	-	25	50	-
	Total			20										

S.No. 5: Project- 1 or Entrepreneurship like Startups, business etc.; The Project 1 or Entrepreneurship will start in VII semester and continued to VIII semester; however, their evaluation will be done in both semesters

Eighth Semester

S.No.	Sub Code	Teaching scheme			Contact hr/week			Exam duration (ETE)		Relative weightage(%)				
		Course Title	Course Type	Cr.	L	T	P	Th	P	CWS	PRS	MTE	ETE	PRE
1	IMSST402	Demography and Vital Statistics	DCC 21	4	3	1	0	3	0	25	-	25	50	-
2	IMSST404	Operations Research	DCC 22	4	3	1	0	3	0	25	-	25	50	-
3	IMSST406	Project- 2	-	6	-	-	-	-	-	-	40	-	-	60
4	IMSSTxxx/ code GEC	DEC 9/ GEC 12	DEC 9/ GEC 12	4	3	1	0	3	0	25	-	25	50	-
5	IMSSTxxx/ code GEC	DEC 10/ GEC 13	DEC 10/ GEC 13	2	2	0	0	3	0	25	-	25	50	-
Total				20										

S.No. 5: Project- 2 or Entrepreneurship like Startups, business etc.; The Project 2 or Entrepreneurship will be in continuation of VII semester and continued to VIII semester; however, their evaluation will be done in both semesters.

Exit: After completing Four Years- Bachelor of Applied Statistics (Honours) with Research/Academic Projects/Entrepreneurship - **170 Cr** (NHEQF Level- 6.0) will be awarded UG degree (Honours) with Research in the relevant Discipline/Subject upon **securing 170 credits**.

Credit Division

DCC	Minor/interdis DEC/GEC	Multidisc GEC	AEC	SEC	VAC	Internship	Project	Total
88	34	10	8	10	6	2	12	170

Ninth Semester

S.No.	Sub Code	Teaching scheme			Contact hr/week			Exam duration (ETE)		Relative weightage(%)				
		Course Title	Course Type	Cr.	L	T	P	Th	P	CWS	PRS	MTE	ETE	PRE
1	IMSST501	Non-Parametric and Sequential Methods	DCC 23	4	3	1	0	3	0	25	-	25	50	-
2	IMSST503	Statistical Simulation Techniques	DCC 24	4	3	1	0	3	0	25	-	25	50	-
3	IMSST505	Multivariate Analysis	DCC 25	4	3	1	0	3	0	25	-	25	50	-
4	IMSST507	Project- 3	-	6	-	-	-	-	-	-	40	-	-	60
5	IMSSTxxx	DEC 11	DEC 11	4	3	1	0	3	0	25	-	25	50	-

	Total	22												
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The Project 3 will start in IX semester and continued to X semester; however, their evaluation will be done in both semesters.

Tenth Semester

S.No.	Sub Code	Teaching scheme			Contact hr/week			Exam duration (ETE)		Relative weightage(%)				
		Course Title	Course Type	Cr.	L	T	P	Th	P	CWS	PRS	MTE	ETE	PRE
1	IMSST502	Econometrics Methods	DCC 26	4	3	1	0	3	0	25	-	25	50	-
2	IMSST504	Quasi-Experimental Techniques	DCC 27	4	3	1	0	3	0	25	-	25	50	-
3	IMSST506	Game Theory	DCC 28	4	3	1	0	3	0	25	-	25	50	-
4	IMSST508	Project- 4	-	6	-	-	-	-	-	-	40	-	-	60
5	IMSSTxxx	DEC 12	DEC 12	4	3	1	0	3	0	25	-	25	50	-
		Total		22										

The Project shall continue from last semester; however, their evaluation will be done in both semesters.

Exit: After completing Five Years- Master of Applied Statistics (Honours) with Research/Academic Projects/Entrepreneurship – **214 Cr** (NHEQF Level- 6.5) will be awarded PG degree (Honours) with Research in the relevant Discipline/Subject upon **securing 214 credits**.

DCC	Minor/interdis DEC/GEC	Multidisc GEC	AEC	SEC	VAC	Internship	Project	Total
112	42	10	8	10	6	2	24	214

List of Departmental Elective Course (DEC)

Semester	Elective subjects	Code	Cr.	Contact Hours/ Week			Relative Weights				
				L	T	P	CWS	PRS	MTE	ETE	PRE
III	Biostatistics	IMSSTD21	2	2	0	0	25	-	25	50	-
III	Environmental Statistics	IMSSTD23	2	2	0	0	25	-	25	50	-
IV	Financial Statistics	IMSSTD22	4	3	1	0	25	-	25	50	-
IV	Design and Analysis of Algorithms	IMSSTD24	4	3	1	0	25	-	25	50	-
V	Statistical Techniques for Research Methods	IMSSTD31	4	3	1	0	25	-	25	50	-
V	Actuarial Statistics	IMSSTD33	4	3	1	0	25	-	25	50	-
VI	Project Management	IMSSTD32	2	2	0	0	25	-	25	50	-
VI	Reliability theory and life testing	IMSSTD34	2	2	0	0	25	-	25	50	-
VI	Research Methodology	IMSSTD36	4	3	1	0	25	-	25	50	-
VI	Statistical Computing and Data mining	IMSSTD38	4	3	1	0	25	-	25	50	-
VII	Statistics Comprehensive	IMSSTD41	2	2	0	0	25	-	25	50	-
VII	Order Statistics with applications	IMSSTD43	2	2	0	0	25	-	25	50	-
VIII	Advanced theory of Sample surveys	IMSSTD42	4	3	1	0	25	-	25	50	-
VIII	Advanced theory of Time series analysis	IMSSTD44	4	3	1	0	25	-	25	50	-
VIII	Statistical Analysis using R	IMSSTD46	2	2	0	0	25	-	25	50	-
IX	Asymptotic Statistics	IMSSTD51	4	3	1	0	25	-	25	50	-
X	Advanced theory of Biostatistics	IMSSTD52	4	3	1	0	25	-	25	50	-

List of Generic Elective Courses

Minor-I (Data Sciences)

Semester	Code	Course Title	Credits	Contact Hours/Week			Relative Weights				
				L	T	P	CW	SP	RS	MT	ET
I	DSC101	Introduction to Business Analytics	4	4	0	0	25	-	25	50	-
II	DSC102	Database Management Systems	4	3	0	2	15	25	20	40	-
III	DSC201	SQL Analytics	4	3	0	2	15	25	20	40	-
III	DSC203	Introduction to Python Programming	2	1	0	2	15	25	20	40	-
IV	DSC202	Predictive Modelling	4	3	0	2	15	25	20	40	-
V	DSC301	Introduction to Big Data Systems	4	3	0	2	15	25	20	40	-
V	DSC303	Data Warehousing & Data Mining	4	3	1	0	25	-	25	50	-
VI	DSC302	Machine Learning	4	3	1	0	25	-	25	50	-
VI	DSC304	Decision Analysis and Techniques	4	3	1	0	25	-	25	50	-
VI	DSC306	Statistical Genetics	2	2	0	0	25	-	25	50	-
VII	DSC401	Swarm Optimization	2	2	0	0	25	-	25	50	-
VIII	DSC402	Advanced Machine Learning	4	3	1	0	25	-	25	50	-
VIII	DSC404	Natural Language Processing	2	2	0	0	25	-	25	50	-

Minor-II (Economics)

Semester	Code	Course Title	Credits	Contact Hours/Week			Relative Weights				
				L	T	P	CWS	PRS	MTE	EET	PRE
I	ECO101	Principles of Microeconomics	4	3	1	0	25	-	25	50	-
II	ECO102	Principles of Macroeconomics	4	3	1	0	25	-	25	50	-
III	ECO201	Intermediate Microeconomics	4	3	1	0	25	-	25	50	-
III	ECO203	Financial Economics	2	2	0	0	25	-	25	50	-
IV	ECO202	Intermediate Macroeconomics	4	3	1	0	25	-	25	50	-
V	ECO301	Introductory Econometrics	4	3	1	0	25	-	25	50	-
V	ECO303	Indian Economy	4	3	1	0	25	-	25	50	-
VI	ECO302	Understanding Indian Economic Survey & Union Budget	2	2	0	0	25	-	25	50	-
VI	ECO304	Development Economics	4	3	1	0	25	-	25	50	-
VI	ECO306	International Economics	4	3	1	0	25	-	25	50	-
VII	ECO401	Money & Financial Markets	2	2	0	0	25	-	25	50	-
VIII	ECO402	Public Economics	4	3	1	0	25	-	25	50	-
VIII	ECO404	Comparative Economic Development	2	2	0	0	25	-	25	50	-

Minor-3 (Management)

Semester	Code	Course Title	Credits	Contact Hours/Week			Relative Weights				
				L	T	P*	CWS	PRS	MTE	EET	PRE
I	MGM101	Principles of Management	4	3	1	0	25	-	25	50	-
II	MGM102	Introduction to Business	4	3	1	0	25	-	25	50	-
III	MGM201	Organizational Behaviour	4	3	1	0	25	-	25	50	-
III	MGM203	Financial Accounting	4	3	1	0	25	-	25	50	-
III	MGM205	Marketing Management	4	3	1	0	25	-	25	50	-

III	MGM207	Management Information System	2	2	0	0	25	-	25	50	-
III	MGM209	International Finance	2	2	0	0	25	-	25	50	-
III	MGM211	Personal selling & Sales Force Management	2	2	0	0	25	-	25	50	-
IV	MGM202	Financial Management	4	3	1	0	25	-	25	50	-
IV	MGM204	Consumer Behavior	4	3	1	0	25	-	25	50	-
IV	MGM206	Human Resource Management	4	3	1	0	25	-	25	50	-
V	MGM301	Project appraisal	4	3	1	0	25	-	25	50	-
V	MGM303	Strategic Brand management	4	3	1	0	25	-	25	50	-
V	MGM305	Strategic HRM	4	3	1	0	25	-	25	50	-
V	MGM307	Management of Industrial Relations	4	3	1	0	25	-	25	50	-
V	MGM309	Investment Analysis & Portfolio Management	4	3	1	0	25	-	25	50	-
V	MGM311	Retail marketing	4	3	1	0	25	-	25	50	-
VI	MGM302	Tax Planning and Management	4	3	1	0	25	-	25	50	-
VI	MGM304	Marketing of services	4	3	1	0	25	-	25	50	-
VI	MGM306	Performance & Compensation Management	2	2	0	0	25	-	25	50	-
VII	MGM401	Logistics Planning and Strategy	2	2	0	0	25	-	25	50	-
VII	MGM403	Talent and knowledge management	2	2	0	0	25	-	25	50	-
VII	MGM405	Corporate Tax Laws	2	2	0	0	25	-	25	50	-
VIII	MGM402	Strategic Corporate finance	4	3	1	0	25	-	25	50	-
VIII	MGM404	Digital Marketing	4	3	1	0	25	-	25	50	-
VIII	MGM406	Training and Development	4	3	1	0	25	-	25	50	-
VIII	MGM408	Cross-cultural & International HRM	2	2	0	0	25	-	25	50	-
VIII	MGM410	Integrated Marketing Communication	2	2	0	0	25	-	25	50	-
VIII	MGM412	Business Analysis & valuation	2	2	0	0	25	-	25	50	-

Syllabus

Semester I

IMSST101	Statistical Methods- I	3-1-0
Course Objectives: To introduce students to the principles of statistical investigation and exploratory data analysis, focusing on collection, organisation, summarisation, and interpretation of univariate and bivariate data in line with foundational ISI Statistical Methods training. Course Outcomes: CO1: Understand and explain basic concepts of data classification, tabulation, and graphical representation. CO2: Apply measures of central tendency, dispersion, skewness, and kurtosis to summarize and interpret data. CO3: Understand and apply the theory of attributes to visualize the relation among data attributes CO4: Analyse bivariate data using measures of association, correlation, and introductory regression concepts.		
Unit-I: Introduction: Statistical Methods: Definition and scope of Statistics, concepts of statistical population and sample. Types of observations and data: Concepts of population and sample, quantitative and qualitative data, cross-sectional and time-series data, discrete and continuous data. Different types of scales: Nominal, ordinal, interval, and ratio. Collection and Scrutiny of Data: Primary data. Secondary data – its major sources. Complete enumeration. Construction of tables with one or more factors of classification, frequency distributions and cumulative frequency distributions and their graphical representations (Histograms, frequency polygon), stem and leaf displays.		
Unit-II: Descriptive Statistics Measures of Central Tendency: Mathematical and positional, partition values, Measures of Dispersion: range, quartile deviation, mean deviation, standard deviation, coefficient of variation, graphical representation of various measures of location and dispersion (Ogives, Histograms, Box Plot) Moments: Raw moments, Central moments, Absolute moments, Factorial moments, Sheppard's corrections, skewness and kurtosis, Types of frequency distributions.		
Unit-III: Theory of attributes: consistency and independence of data with special reference to attributes, Association of attributes: concept, Yules coefficient of Colligation and Coefficient of Colligation.		
Unit-IV: Bivariate data: Definition, scatter diagram, Karl Pearson's coefficient of correlation. Spearman's rank correlation coefficient (Introductory with interpretation). Principle of least squares method, lines of regression, properties of regression coefficients, angle between two regression lines, and residual variance. Use of regression for prediction and data summarization		

Suggested Readings

- Goon, A.M., Gupta, M.K. and Dasgupta, B. (2016). *Fundamentals of Statistics*, Vol. I, 8th Ed. The World Press, Kolkata.
- Gupta, S. C. and Kapoor, V. K. (2020). *Fundamentals of Mathematical Statistics*, 12th Edn., S. Chand and Sons. Delhi.
- Tukey, J.W. (1977). *Exploratory Data Analysis*, Addison-Wesley Pub. Co. N.Y.
- Bernstein, S. and Bernstein, R. (2020). *Schaums: Outline of Elements of Statistics I Descriptive Statistics and Probability*. McGraw Hill.
- Myatt, G. J. and Johnson, W.P. (2014). *Making sense of data: A practical guide to exploratory data analysis and data mining*. 2nd Edn, John Wiley & Sons, Inc. N. J.
- Agresti, A., Christine Franklin, C. and Klingenberg, B. (2017). *Statistics: the art and science of learning from data*. Pearson. Boston.
- Heumann, C., Schomaker, M. and Shalabh (2016). *Introduction to Statistics and Data Analysis with Exercises, Solutions and Applications in R*. Springer.

IMSST103	Probability Theory-I (Foundations of Probability Theory)	3-1-0
Course Objectives: To provide a rigorous introduction to probability theory and random variables for modeling and analyzing uncertainty in statistical problems. Course Outcomes: CO1: Understand and apply classical, statistical, and axiomatic approaches to probability, including events, sample spaces, and algebra of events. CO2: Analyze conditional probability, independence of events, Bayes' theorem, and geometric probability to solve probabilistic problems. CO3: Define and work with discrete and continuous random variables, distribution functions, and transformations of random variables. CO4: Compute and interpret mathematical expectation, variance, and covariance, and apply their properties in probabilistic analysis		
Unit-I: Introduction: Probability: Introduction, random experiments, sample space, events, algebra of events, Discrete sample spaces and Probability models. Equally likely set-up and Combinatorial probability. Fluctuations in coin tossing and random walks, combination of events. Definitions of Probability – classical, statistical, Limitations of Classical definition. Probability of union and intersection of events, Probability of occurrence of exactly m and at least m events out of n events, Examples based on classical approach and repeated trials, Kolmogorov's Axiomatic definition and problems based on it, Matching problems.		

Unit-II: Composite Experiments, Conditional Probability, laws of addition and multiplication, theorem of total probability, Examples based on conditional probability and laws of addition and multiplication, independent events – Pairwise mutual independence, Bayes’ theorem and its applications, Geometric probability, Polya’s urn scheme.
Unit-III: Random variables, distribution function and properties, Discrete random variables - p.m.f., discrete distribution function, Continuous random variables - p.d.f, illustrations and properties of random variables. Measures of central tendency, dispersion, skewness and kurtosis for continuous probability distributions, Examples based on random variables, Continuous distribution functions and their properties, Univariate transformation of random variables, Examples based on univariate transformations.
Unit-IV: Joint distributions of discrete random variables, independence, conditional distributions, conditional expectation. Distribution of sum of two independent random variables. Functions of more than one discrete random variables.
Suggested Readings • Goon, A.M., Gupta, M.K. and Dasgupta, B. (2016). Fundamentals of Statistics, Vol. I, 8th Ed. The World Press, Kolkata. • Goon, A.M., Gupta, M.K. and Dasgupta, B. (2017). An Outline of statistical theory, Vol. I, The World Press, Kolkata. • Gupta, S. C. and Kapoor, V. K. (2020). Fundamentals of Mathematical Statistics, 12th Edn., S. Chand and Sons. Delhi. • Chung, K.L. (2000). A Course in Probability Theory, 3rd Edn. Academic Press. • Parzen, E. (1960). Modern probability theory and its applications. John Wiley. • Feller, W. (1968) An introduction to probability theory and its applications. Vol. I, 3rd Edn. John Wiley & Sons Inc., New York. • Ross, S.M. (2002). A first course in Probability, 6th Ed., Pearson.

IMSST105	Mathematical Analysis-I (Calculus)	3-1-0
Course Objectives: To develop a strong foundation in the fundamentals of differential calculus/Integral calculus to essential for statistical theory, modeling, and multivariate analysis. Course Outcomes: CO1: The fundamental concepts of Differential calculus. Apply limits, continuity, partial and total differentiation, solve indeterminate forms using L’Hospital’s rule, apply Leibnitz rule, and analyze homogeneous functions using Euler’s theorem.		

CO2: Apply limits and continuity, perform partial and total differentiation, solve indeterminate forms using L'Hospital's rule, apply Leibnitz rule, and analyze homogeneous functions.

CO3: Apply integration techniques and evaluate definite integrals to solve mathematical and applied statistical problems effectively.

CO4: Apply differentiation under integral sign, evaluate double integrals, perform variable transformations, and analyze properties and relationships of Beta and Gamma functions.

Unit I: Differential Calculus: Limits of function, continuous functions, properties of continuous functions, partial differentiation and total differentiation. Indeterminate forms: L-Hospital's rule, Leibnitz rule for successive differentiation. Euler's theorem on homogeneous functions.

Unit-II: Maxima and minima of functions of one and two variables, constrained optimization techniques (with Lagrange multiplier) along with some problems. Jacobian, concavity and convexity, points of inflexion of function, singular points. Theory of asymptotes (Only for cartesian forms).

Unit-III: Review conic sections and their Graphs, Monotonicity, Maxima and Minima, Concavity, Convexity, Point of inflection & Asymptotes, Polar coordinates, Curvature, Envelope of a family of curves, Graphs of functions and curves.

Unit-IV: Review of indefinite and definite integrals, Fundamental theorem of integral calculus, Integral as the limit of sum, Area, Volume and surface of revolution, Arc lengths, Double and triple integrals, Change of order of integration, Change of variables, Dirichlet's integral, Application of multiple integrals.

Suggested Readings

- W. Rudin: Principles of Mathematical Analysis.
- Tom Apostol: Mathematical Analysis.
- Tom Apostol: Calculus I and II.
- R. Courant and F. John: Introduction to Calculus and Analysis, Vol. I, II.
- Edward D Gaughan: Introduction to Analysis.

Course Objectives: To develop effective oral, written, listening, and reading communication skills required for professional and workplace interactions. Course Outcomes: CO1: Demonstrate effective oral communication skills through public speaking, group discussions, interviews, and professional presentations. CO2: Prepare clear and professional written communication including résumés, business and employment-related letters, and workplace messages. CO3: Apply effective listening techniques to improve comprehension, interpersonal communication, and professional interaction. CO4: Enhance reading skills through regular engagement with newspapers and business-related texts to improve vocabulary, comprehension, and awareness.
Unit I: Oral communication- Public speaking, extempore, group discussion, interview skills, presentation skills
Unit II: Written communication- Resume writing, Business letters- Need, Functions and Layout of Letter Writing, Types of Letter Writing: Persuasive Letters, Request Letters, Sales Letters and Complaints; Employment related letters Interview Letters, Promotion. Letters, Resignation Letters, Whats app message to colleagues and seniors
Unit III: Listening communication- art of effective listening.
Unit IV: Reading skills- Students are expected to read newspaper daily. It is a practical subject with intent of developing oral and written communication skills of the students. It is an indicative syllabus; course coordinator may other learning items.
Suggested Readings • Lesikar et al, "Business Communication: Making Connections in a Digital World". Tata McGraw Hill Publishing Company Ltd. New Delhi, 2014. • C. L. Boove, J. V. Thill, M. Chaturvedi, "Business Communication Today", Pearson, 2014. • Krizan et al, "Effective Business Communication", Cengage Learning, 2014. • O. Scot, "Contemporary Business Communication", Biztantra, New Delhi, 2012. • Chaney & Martin, "Intercultural Business Communication", Pearson Education, 2012.

IMSTST109	COMPUTER APPLICATIONS	0-0-4
Course Objectives: This is a basic paper for students to familiarize them with computer and it's applications in the relevant fields and exposes them to other related papers of IT. Course Outcomes: CO1: Learn Microsoft Office applications and work with the Microsoft Office interface. CO2: Effectively participate in all stages of preparation of computerized accounts		

CO3: To learn to apply standard spreadsheet features to produce a representation and analysis of numerical data.
Unit-I: Basics of Computer: Characteristics of Computers, Input-output Devices (Hardware, Software, Human ware and Firmware), Function of Different Units of Computer, and Classification of Computers. Computer Memory: Primary Memory, Secondary memory. Introduction to MS-Word, MS-Excel / Spread Sheets. Advanced Excel: Introduction, features, applications and advanced functions of Excel. IT Applications: Application of information Technology in Railways, Airlines, Banking, Online Banking System, Insurance, Inventory Control, Financial systems, Hotel management, Education, entertainment and health, Types of Software, Concepts of Computer Networks, Introduction to Operating System
Unit-II: Introduction to MS-Word: Introduction to Word Processing, it's Features, Formatting Documents, Paragraph Formatting, Indents, Page Formatting, Header and Footer, Bullets and Numbering, Tabs, Tables, Formatting the Tables, Finding and Replacing Text, Mail Merging etc.
Unit-III: Introduction to MS-Excel: Introduction to Electronic Spreadsheets, Entering Data, Entering Series, Editing Data, Cell Referencing, ranges, Formulae, Functions, Auto Sum, Copying Formula, Formatting Data, Creating Tables, Graphs and charts, Creating Database, Sorting Data, Filtering etc. Introduction to MS PowerPoint: PowerPoint, Features of MS PowerPoint Clipping, Slide Animation, Slide Shows, Formatting etc.
Unit-IV: Computerized Accounting Software : The students must be familiar with preparation of computerized accounts (By using Tally Software or any other popular accounting software): including creation of company, vouchers and recording transactions, preparing reports – cash book and bank book, ledger accounts, trial balance, profit and loss account (income statement) and balance sheets.
Text Books: • A. Leon & M. Leon, "Introduction to Information Technology", Vikas Publishing House, 2012. • Sinha, K. Pradeep, "Foundations of Computing", BPB Publisher, 2012 • Joseph A. Brady and Ellen F Monk, "Problem Solving Cases in Microsoft and Excel", Thomson Learning, 2012.

IMSST111	SCIENCE AND PRACTICE OF HAPPINESS	0-0-4
Course Objectives: The course aims to provide an understanding of different facets of happiness. It also offers several interventions through which students can learn to remain happy.		
Course Outcomes:		
CO1: Understand, comprehend and mould their emotions		
CO2: Recognize sources of displeasure and happiness		
CO3: Exhibit desirable behaviours like empathy, compassion, love, and trust		
Unit-I: Understanding Emotions: The importance of different emotions, why stay happy, Emotion contagion, different theories of emotions, Introducing the different perspectives of happiness		
Unit-II: Science of happiness: Understanding the neuroscience of happiness, Brain-behaviour relationship in happiness, Science of belief, Measuring happiness: Why do we need to measure happiness:, How can we measure happiness, Importance of measuring happiness , Role of technology, Understanding employee happiness, Designing happy workplaces, Role of humour in workplace, Communicating happiness: Designing effective messages, Body language and nonverbal cues of happiness, Role of gestures in spreading/understanding happiness		
Unit-III: Practice of happiness: Introduction to different practices that help calm the mind and foster happiness, Mindfulness practices, Self-awareness, Self-motivation, Sharing examples, cases, practices that have been implemented and which have yielded result in spreading happiness, Happy leaders: The emotional impact of a team leader on its members		

Sensitivity training, Creativity and happiness: Creativity Vs routine, Understanding the role of flow, Importance of intuition
Unit-IV: Creativity and happiness: Creativity Vs routine, Understanding the role of flow Importance of intuition, Relationship and wellbeing: The importance of relationship, Nurturing relationship, Importance of networking, Career, life and happiness: Understanding the importance of career and its limits, Work life balance, Achieving personal and professional success, Consumer Happiness: How to keep your consumers happy, Practices adopted by marketers to keep consumers happy, Sensory engagement and happiness: Engaging the senses to keep oneself and others happy, Building resilience: Resilience in times of uncertainty and stress, Nurturing skills, values, perception and mindset for resilience
Text Books • The bell of mindfulness - Thich Nhat Hanh • The art of happiness: A handbook for living - Dalai Lama • What makes you not a Buddhist - Dzongsar Khensé Rinpoche • Happiness: Transforming the landscape: Centre for Bhutan Studies, Bhutan (can be downloaded online) • A compass towards just and harmonious society - Centre for Bhutan Studies (can be downloaded online) • New Development Paradigm - Bhutan government submission to the UNGA (can be downloaded online) • Laugh your way to happiness - Lesley Lyle

Semester II

IMSST102	Statistical Methods-II	3-1-0
Course Objectives: To develop a rigorous foundation in statistical inference based on sampling distributions and to introduce regression and linear model concepts through least squares methodology,		
Course Outcomes:		
CO1: Apply sampling distributions and inferential methods, including estimation and hypothesis testing, to one-sample statistical problems.		
CO2: Construct point and interval estimators and conduct hypothesis tests using exact small-sample methods		
CO3: Formulate and interpret simple linear regression models using least squares principles		
CO4: Extend regression ideas to multiple regression and analyse residual structure and model adequacy		
Unit-I: Sampling distributions, basic concepts of inference (estimation & hypothesis testing), point estimation & interval estimation (χ^2 , t and F distributions (derivation-based understanding). Null and alternate hypothesis, simple & composite hypotheses, critical region, tests for one sample problems (z test, t-test, one way ANOVA), test for mean and variance, type I/II errors, concepts of estimation: unbiasedness, consistency (introductory)		
Unit-II: Introduction to Regression Linear regression- obtaining lines of Regression, Regression Coefficients, Properties of Regression Coefficients, Angle between Two Lines of Regression, Standard Error of Estimate or Residual Variance, Correlation Coefficient between Observed and Estimated Values. Geometric interpretation of regression, Residual analysis and diagnostics.		

Unit-III: Correlation Ratio, Intra-class Correlation, Multiple and Partial Correlation- Yule's Notation, Plane of Regression, Properties of Residuals- Variance of the Residual, Coefficient of Partial Correlation.

Unit-IV: Multiple Linear Regression Model, Residual Analysis, Coefficient of Multiple Correlation- Properties of Multiple Correlation Coefficient, Estimation and hypothesis testing in case of simple and multiple regression models, Model Adequacy and model comparison.

Suggested Readings

- Goon, A.M., Gupta, M.K. and Dasgupta, B. (2016). *Fundamentals of Statistics*, Vol. I, 8th Ed. The World Press, Kolkata.
- Gupta, S. C. and Kapoor, V. K. (2020). *Fundamentals of Mathematical Statistics*, 12th Edn., S. Chand and Sons. Delhi.
- Tukey, J.W. (1977). *Exploratory Data Analysis*, Addison-Wesley Pub. Co. N.Y.
- Bernstein, S. and Bernstein, R. (2020). *Schaums: Outline of Elements of Statistics I Descriptive Statistics and Probability*. McGraw Hill.
- Myatt, G, J. and Johnson, W.P. (2014). *Making sense of data: A practical guide to exploratory data analysis and data mining*. 2nd Edn, John Wiley & Sons, Inc. N. J.
- Agresti, A., Christine Franklin, C. and Klingenberg, B. (2017). *Statistics: the art and science of learning from data*. Pearson. Boston.
- Heumann, C., Schomaker, M. and Shalabh (2016). *Introduction to Statistics and Data Analysis with Exercises, Solutions and Applications in R*. Springer.

IMSST104

Probability Theory-II (Advanced Probability and Distribution Theory)

3-1-0

Course Objectives: To deepen understanding of advanced probability concepts involving expectation, joint distributions, correlation structures, and standard probability distributions.

Course Outcomes:

CO1: Apply advanced concepts of mathematical expectation, moments, cumulants, and characteristic functions to analyze random variables and their transformations.

CO2: Analyze joint, marginal, and conditional distributions of two random variables and apply bivariate transformations using Jacobian techniques.

CO3: Evaluate correlation and regression measures using expectation, including partial, multiple, intra-class correlation, and properties of residuals.

CO4: Apply discrete and continuous probability distributions such as Binomial, Poisson, Normal, and Uniform distributions for modeling and fitting real-world data.

Unit-I: Uncountable sample spaces and concept of events and random variables, properties of probability, Introduction to cumulative distribution functions (CDF) and properties. Distributions with densities. Standard univariate densities (Uniform, Exponential, Beta, Gamma, Normal and other densities, Functions of random variables with densities Mathematical Expectation: Conditional expectations and its properties. Bivariate transformations with illustrations. Moments, moment generating function and its properties. Cumulants, cumulant generating function and its properties. Characteristic function and its properties. Inversion theorem for continuous random variables (without proof) along with applications.
Unit-II: Some inequalities involving expectation - Cauchy Schwartz Inequality, Jensen's inequality. Two-dimensional random variables: Joint probability mass function/ Joint probability density function, marginal and conditional probability mass function/ probability density function, independence of random variables, examples based on joint/marginal/conditional PMF/PDF. Conditional expectation and variance, Jacobian of transformation, Bivariate transformation of random variables and Examples based on bivariate transformation.
Unit-III: Properties of various measures of correlation and regression using expectation, Correlation Ratio, Intra-class correlation, Partial and multiple correlation – definition, Yule's notation, plane of regression, properties of residuals, multiple and partial correlation coefficients and their properties (derivation based on three variables), relationship between multiple, partial and total correlations and examples based on them.
Unit-IV: Introduction to cumulative distribution functions (CDF) and properties. Distributions with densities. Standard univariate densities (Uniform, Exponential, Beta, Gamma, Normal and other densities), Functions of random variables with densities Bivariate continuous distributions, bivariate CDFs, independence, distribution of sums, products and quotients for bivariate continuous distributions, Student-t, χ^2, F densities, Bivariate Normal distribution. Multivariate distributions and properties. Multivariate densities and multivariate singular distributions. Distributions of functions of random vectors and Jacobian formula. Examples of multivariate densities. Conditional and marginal distributions, Independence, Conditional expectation, Examples.
Suggested Readings • Goon, A.M., Gupta, M.K. and Dasgupta, B. (2016). <i>An Outline of Statistical Theory</i>, Vol. I, The World Press, Kolkata. • Gupta, S. C. and Kapoor, V. K. (2020). <i>Fundamentals of Mathematical Statistics</i>, 12th Edn., S. Chand and Sons. Delhi. • Hogg, R.V., Tanis, E.A. and Rao, J.M. (2009). <i>Probability and Statistical Inference</i>, 7th Ed., Pearson Education, New Delhi. • Miller, I. and Miller, M. (2006). <i>John E. Freund's Mathematical Statistics with Applications</i>, 8th Ed., Pearson Education, Asia. • Mood, A.M. Graybill, F.A. and Boes, D.C. (2007). <i>Introduction to the Theory of Statistics</i>, 3rd Ed., (Reprint), Tata McGraw-Hill Pub. Co. Ltd. • Rohatgi, V. K and Saleh M. E. (2015). <i>An Introduction to Probability and Statistics</i>, 3rd Edn. John Wiley & Sons, Inc., New Jersey. • Mukhopadhyay, P. (2016). <i>Mathematical Statistics</i>. Books And Allied, India.

IMSST106	Mathematical Analysis-II (Algebra)	3-1-0
Course Objectives: To develop a strong foundation in matrix algebra and linear algebraic structures essential for statistical theory, modeling, and multivariate analysis. Course Outcomes: CO1: Analyze and apply properties of different types of matrices and determinants in solving systems of linear equations and related problems. CO2: Use matrix operations, rank concepts, and vector space theory to examine linear dependence, independence, and solution spaces. CO3: Apply eigenvalues, eigenvectors, spectral decomposition, and the Cayley–Hamilton theorem in statistical and mathematical contexts. CO4: Utilize quadratic forms, generalized inverses, and orthogonal transformations for applications in statistics, optimization, and multivariate analysis.		
Unit-I: Algebra of matrices - A review related to triangular, symmetric and skew symmetric matrices, singular and non-singular matrices and their properties. Idempotent matrices, Hermitian and skew Hermitian matrices, orthogonal matrices, Trace of a matrix, unitary, involutory and nilpotent matrices. Adjoint and inverse of a matrix and related properties. Partitioning of matrices and simple properties.		
Unit-II: Determinants of Matrices: Definition, properties and applications of determinants for 3rd and higher orders, evaluation of determinants of order 3 and more using transformations. Symmetric and Skew symmetric determinants, Circulant determinants, Jacobi's Theorem, product of determinants. Use of determinants in solution to the system of linear equations, row reduction and echelon forms, the matrix equations $AX=B$, solution sets of linear equations, linear independence, Applications of linear equations, inverse of a matrix		
Unit-III: Vector spaces, Subspaces, sum of subspaces, Span of a set, Linear dependence and independence, dimension and basis, Gram Schmidt Orthogonalization Process. Rank of a matrix, row-rank, column-rank, standard theorems on ranks, rank of the sum and the product of two matrices.		
Unit-IV: Generalized inverse (concept, properties with illustrations). Characteristic roots and characteristic vector, Properties of characteristic roots and characteristic vector, Cayley Hamilton theorem and application, Spectral Decomposition. Quadratic forms, Derivatives of linear functions and quadratic forms. Linear orthogonal transformation and their diagonalization.		
Suggested Readings - Searle, S.R.: Matrix Algebra useful for Statistics, John Wiley & Sons, 1982. - Krishnamurthy, V., Mainra, V.P. and Arora, J.L. (2015). An Introduction to Linear Algebra, East West Press Pvt. Ltd., New Delhi. - Biswas, S. (1997). A Textbook of Matrix Algebra, New Age International. - Singal, M.K. and Singal, Asha Rani: Algebra, R. Chand & Co., 2011. - Hadley, G.: Linear Algebra, Narosa Publishing House (Reprint), 2002.		

- Gupta, S. C.: An Introduction to Matrices (Reprint), Sultan Chand & Sons, 2008.

IMSST108	Financial Literacy	(2-0-0)
Course Objectives: This course is designed to equip individuals with the essential knowledge and skills necessary to make informed financial decisions. The primary goal of the course is to enhance individuals' understanding of financial concepts, such as budgeting, saving, investing, and managing debt. By the end of the course, participants should be able to effectively identify and evaluate financial risks and opportunities. Furthermore, the course aims to empower individuals to develop sound financial habits and behaviours, enabling them to achieve their financial goals and establish a solid foundation for long-term financial well-being Course Outcomes: Upon completion of the course, the student would be able to: CO1: Identify and categorise key banking concepts, such as different types of banks, banking services offered, and various types of accounts CO2: Demonstrate analytical skills to analyse foreign exchange concepts and the importance of foreign exchange in the economy CO3: Design and apply financial planning strategies CO4: Identify scams and frauds prevalent in the financial sector		
Unit-I: Banking- Definition, Role of Bank in growth of saving and Investment, Types of banks , Services offered by banks, Deposits and Loans, Types of A/c, Opening a bank A/c, How to Transact with banks, KYC norms, (A/c opening form, Address Proof), How to read bank statement, Banking products and services, Calculating Interests – Saving, FD, Simple and Compound Interest, Power of compounding Loans, Types of loans, taking a home loan, Definition of EMI, Calculation of EMI, Post office-Account and transactions		
Unit-II: Foreign Exchange and Investment- Basics of foreign Exchange, Importance and Use of Foreign Exchange, Regulator Role of RBI, mutual funds. Principles of Investment–Safety, Liquidity and Return, Investment plans, Hybrid plans-Ulip, SIP and VIP of mutual funds, index funds		
Unit-III: Financial Planning Meaning, Household financial health checkup, Important life stages, Medical and other Emergencies; Insurance, Meaning, Need and Wants, Loss protection, Life, non-life and health, Benefits of Insurance, Term plans, Social obligations Budgeting, Buying a house, Plan a vacation, Retirement planning, Price of procrastination, Market and financial instruments, Primary market, Secondary market, Financial Statement analysis		
Unit-IV: Scams and Frauds- Insider trading, Money laundering; Consumer protection and redressal mechanism, Rights of Consumers, Applicable to financial services, Filing a complaint, Complain to entity concerned, Regulators, Arbitration, Consumer courts, Govt. Websites-(PG Portals), Investor Associations, Taxes - Meaning, Need of Taxes, Types of taxes, How taxes impact income, Income, wealth and gift tax, Service tax, STT, Stamp Duty, Tax planning v/s tax evasion, Tax rates, Tax free bonds, Tax saving investment		
Suggested Readings		

- S. Braunstein and C. Welch, Financial literacy: An overview of practice, research, and policy, Fed. Res. Bull, 2002
- A. S. Cole and Gauri Kartini Shastry, Smart money: The effect of education, cognitive ability, and financial literacy on financial market participation, Harvard Business School, 2009
- Gitman, Joehnk and Billingsley, Personal financial planning, Cengage Learning, 2016
- M. Jeff, Personal finance student edition, Prentice Hall, 2010

IMSST110	Statistical Data Analysis using Excel	0-0-4
Course Objectives: To equip students with practical skills in data cleaning, management, visualization, and statistical analysis using advanced features and analytical tools of Microsoft Excel. Course Outcomes: CO1: Apply Excel fundamentals, formulas, functions, and data management techniques for efficient data organization, cleaning, and MIS reporting. CO2: Use logical, mathematical, statistical, lookup, text, and date-time functions to perform data computations and multivariable analysis. CO3: Create and interpret charts, pivot tables, and dashboards, and apply Excel's Data Analysis ToolPak for descriptive statistics and basic inferential analysis. CO4: Analyze real-world datasets using Excel to generate meaningful insights, interpret statistical outputs, and support data-driven decision-making.		
Unit-I: Basics of Excel- Essential shortcuts, Paste Special (Value, Transpose), Absolute & Relative referencing, Data Analytics using Excel: Sort & Filter, SUBTOTAL, SUMIFS, COUNTIFS, Pivot Table for multivariable analysis, Computations, Sum, Max, Min, Average, Count, Generating multiple reports, VLOOKUP, HLOOKUP, IF, Nested IFs, AND, OR etc. Data Cleaning and MIS reporting: LEFT, RIGHT, MID, UPPER, PROPER, LOWER, TRIM, Find & Replace, Go To Etc. MIS reporting: Automatic row-wise Subtotal, Conditional Formatting, File Password Select Dashboard Techniques, Grouping, Hide-Unhide Columns & Rows etc.		
Unit-II: Basic Terminology, Navigating & Exploring Excel Interface, Data Types, Number Formatting, Operators, Basic Calculation, Mathematical & Logical Operators, Alignment Tools, Styles & Cells Format, Page Setup (Print Title, Page Breaks, Print Area, Scale to Fit), Editing and Formatting Data, Creating Hyperlink, Basic Keyboard Shortcuts, Auto Sum, Data Filter, Data Sorting & Remove Duplicates, Freezing Panes, Hiding Gridlines, Auto Fill, Flash Fill, Paste Special		
Unit-III Cell reference Types (Absolute and Relative cell address), Creating our own formula, Linking multiple sheets and workbook, Name Manager, Name Range & Excel Tables, Find and Replace Tool, Text functions: Len, Left, Right, Mid, search, Find, Substitute, Date and time functions: Now, Today, Day, Days, Days360, Month, Year, Date, Hour, Minute, Weekday, Edate, Networkdays, Eomonth, Workday, Mathematical functions: Abs, Int, Exp, Ln, Log, Rand, Randbetween, round, sqrt, power, sumif, Sumsq, Sumproduct, Floor, Ceiling, Minverse, Mmult, Mdeterm, Counting functions: Countif, Countifs, Counta, Countblank, Statistical Functions: Frequency, Min, Max, Average, Var, Varp, Stdev, Stdevp, Median, Mode, Quartile, Percentile, Devsq, Frequency, Intercept,		

Slope, Kurt, Skew, Logical Functions: If & Nested If, And, Or, Not (Combining If with And, Or, Not), Istext, Isblank, Isnumber, Iserror, Lookup functions: Vlookup, Hlookup, Index, Match, Offset

Unit-IV Charts: Barchart (Horizontal, Vertical, Clustered, Stacked), Piechart, Line chart, Scatterplot, Pivot Table (Grouping Items, Calculated Field, Pivot Chart)

Data Analytics ToolPak (Descriptive Statistics, Sampling, Histogram , Rank and Percentile, Correlation, Regression)

Suggested Readings.

- William Fischer (2016) Excel: QuickStart Guide - From Beginner to Expert.
- Greg Harvey Excel 2016 All-in-One for Dummies (For Dummies (Computer/Tech))
- Held, B. (2007). Microsoft Excel Functions and Formulas. Wordware Publishing, Inc.
- Remenyi, D., Onofrei, G. and English, J. (2011). An Introduction to Statistics using Microsoft Excel. Academic Publishing Limited.

Practical/Lab Work List of Practical

A. Introducing some important functions through practical exercises

1. Entering data with numerical, categorical, nominal, text, date, and time variables efficiently [no extra spacing, no empty rows/ columns/ first row as variable names/ using numerical codes for categorical variables, formatting cells], and performing following data-handling tasks.

- a. Row and column totals, averages, etc.
- b. Sorting and ranking cases.
- c. Using logical functions to perform conditional calculations.
- d. Using lookup functions.
- e. Applying date and time functions
- f. Using text functions
- g. Filter and advanced filter.

B. Using inbuilt functions for descriptive statistics and user-defined formulae for performing the following practical work.

2. Arithmetic Mean, Harmonic Mean, Geometric Mean, Median and Mode for raw ungrouped data.
3. Range, Semi Interquartile Range, Standard Deviation, Mean Deviation. Coefficient of variation for raw ungrouped data.
4. Construction of continuous frequency table for the given raw data.
5. Arithmetic Mean, Harmonic Mean, Geometric Mean, Median and Mode for grouped data.

6. Range, Semi Interquartile Range, Standard Deviation, Mean Deviation. Coefficient of variation for grouped data.
7. Moments, skewness and kurtosis
8. Sheppard's corrections on moments
9. Combined mean and variance
10. Correlation coefficient for a bivariate frequency distribution (using formula bar and functions)
11. Spearman's rank correlation (using formula bar and functions)
- C. Applying matrix-based inbuilt functions
12. Addition, subtraction and multiplication of Matrices
13. Determinant, Transpose, Adjoint and Inverse of matrices.
- D. Using Pivot tables to perform the following tasks
14. Practical questions on the theory of attributes [by creating contingency tables]
15. Creating summary tables and comparing summary measures for different groups [summary of measures, like mean/ median/frequency/total etc., for a numerical data classified (grouped) on the basis of one or more factor (categorical) variables]
- E. Visualizing data through charts and plots
16. Plotting simple Bar chart to compare summaries of variables grouped by one factor.
17. Plotting clustered and stacked Bar charts to compare summaries of variables grouped by multiple factors.
18. Histogram plot
19. Plotting of Frequency curve and Frequency polygon for given raw data.
20. Plotting of Pie chart, Ogive curves and finding median graphically
- F. Fitting of curves through scatter plot options, and through user-defined formulae
21. Plotting of scatter diagram, Fitting and plotting a straight line.
22. Fitting and plotting an exponential curve, Fitting and plotting of second-degree curves.
23. Plotting line graph and multiple lines graph to compare trends for various groups.
24. Fit and plot the lines of regression. [using inbuilt functions for slope and intercept]

Course Objectives: To provide an understanding of ecosystems, environmental issues, sustainability, and the legal and policy framework for environmental protection and management.

Course Outcomes:

CO1: Understand the structure and functioning of ecosystems, biodiversity, and the principles of sustainable development, including global environmental protocols.

CO2: Analyze water and air pollution, their sources, effects, and conservation methods, including legal and policy measures such as rainwater harvesting and river action plans.

CO3: Evaluate solid, hazardous, and biomedical waste management strategies and understand the role of environmental impact assessment and management systems.

CO4: Apply knowledge of Indian environmental laws and the legal framework, including the Water, Air, and Environment Protection Acts, in environmental governance and protection initiatives.

Unit-I: Ecosystems and how they work: Types of Eco-Systems, Geosphere – Biosphere and Hydrosphere introduction. Major issues of Biodiversity, Conservation of Biodiversity. Concept of sustainability and international efforts for environmental protection: Concept of Sustainable Development, Emergence of Environmental Issues. International Protocols, WTO, Kyoto Protocol, International Agreement on Environmental Management.

Unit-II: Water Pollution: Water Resources of India, Hydrological Cycle, Methods of Water Conservation and Management, Rainwater Harvesting and their legal aspects, River Action Plan, Ground and Surface Water Pollution; Wastewater Management.

Air Pollution: Air Pollution and Air Pollutants, Sources of Air Pollution and its Effect on Human Health and Vegetations. Green House Effect, Global Warming and Climate Change.

Unit-III: Solid Waste: Management – and Various Method Used, Composting, Land Fill Sites etc. Hazardous Waste Management, Biomedical Waste Management.
Environmental Impact Assessment and Environmental Management System - Introduction and its Impact.

Unit-IV: Introduction to Indian Environmental laws: Legal framework: the Indian Penal Code, Role of Judiciary in Environmental Protection, Water (Prevention and Control of Pollution) Act, 1974, Environment (Protection) Act, 1986, Air (Prevention & Control of Pollution) Act, 1981,

Suggested Readings

- G. T. Miller, “Environmental Science: Working with the Earth”, Cengage Learning India Pvt. Ltd, 2011.
- S. P. Mishra and S. N. Panday, “Essential Environment Studies”, Ane Books Pvt. Ltd. 2014.
- R. J. Chhatwal, “Environmental Science”, UDH Publishers & Distributers (P) Ltd, 2012.
- M. K. Roy, “Sustainable Development”, Ane Books Pvt. Ltd, 2014.
- D. K. Asthana, “Textbook on Environmental Studies”, 2014.
- N. Arumugam, V. Kumaresan, “Environmental Science & Engineering”, Saras Publication, 2014.

DSC101	Introduction to Business Analytics	4-0-0
Course Objectives: This course is designed to provide participants with a foundational understanding of business analytics and its practical applications within organizational contexts.		
Course Outcomes: DSC101.1: Understand how managers use business analytics to formulate and solve business problems and to support managerial decision making. DSC101.2: Analyse complex problems using advanced analytics tools DSC101.3: Learn how to use and apply Excel and Excel add-ins to solve business problems.		
Unit-I: Introduction to Business Analytics: Concept of Analytics, Types of Analytics, Application fields - Marketing Analytics, Finance Analytics, HR Analytics, Operation Analytics, organization and source of data, importance of data quality, dealing with missing or incomplete data, Role of Data Scientist in Business & Society		
Unit-II: Data Visualization: Introduction, Data summarization methods; Tables, Graphs, Charts, Histograms, Frequency distributions, Relative Frequency and their applications in business. Descriptive Statistics: Overview of data, Types of data, modifying data in MS-Excel, Applications of Measures of Central Tendency and Dispersion in business through MS- Excel,, Outlier Analysis. Advanced Data Dashboard through Power BI tool.		
Unit-III: Spreadsheet Models and Linear Optimization Models: Spreadsheet Models: Building good spreadsheet models, What if analysis, Excel functions for modeling, V LOOKUP, H LOOKUP, Auditing spreadsheet models. Linear Optimization Models: Maximization & Minimization Problems: Formulation, Use of Excel to solve business problems: e.g. marketing mix, capital budgeting, portfolio optimization		
Unit-IV: Decision Making under uncertainty: Probability distributions: Continuous and discrete distributions, Concept of Simulation, advantages and disadvantages of Simulation, Random number generation, Monte Carlo Simulation and its applications, Simulating the value of PI through excel		
Suggested Readings • Camm, J.D., Cochran, J.J., Fry, M.J., Ohlmann, J.W., Anderson, D.R. (2015), Essentials of Business Analytics, Cengage Learning, Second Edition. • Prasad, R. N., Acharya, S. (2011), Fundamentals of Business Analytics, Wiley. • Schniederjans, M.J., Schniederjans, D.G., Starkey, C.M. (2014), Business Analytics: Principles, Concepts and Applications, Pearson.		
DSC102	Database Management System	3-0-2

Course Objectives:

The course objectives for a Database Management Systems (DBMS) course are to provide students with a solid foundation in the theory and practice of database management systems. The course aims to introduce students to the basic concepts of database management systems, including data models, data normalization, and relational algebra. Students will be taught how to design and implement databases using Structured Query Language (SQL).

Course Outcomes:

DSC201.1: Understand the fundamentals of database systems, including data models, data normalization, and relational algebra.

DSC201.2: Understand the role of database management systems in modern organizations and their impact on data-driven decision making.

DSC201.3: Develop the ability to design and implement database applications using a modern database management system.

Unit-I: Database system concepts and its architecture, Data models schema and instances, Data independence and database language and interface, Data definition languages, DML. Database Structure.

Unit-II: Data modelling using Entity Relationship Model: E.R. model concept, notation for ER diagrams mapping constraints, Keys, Concept of super key, candidate key, primary key generalizations, Aggregation, reducing ER diagrams to tables, extended ER model.

Unit-III: Relational Data Model and Language: Relational data model concepts, integrity constraints, Keys domain constraints, referential integrity, assertions, triggers, foreign key relational algebra and relational calculus, SQL data definition queries and updates in SQL.3. Data Base Design: Functional dependencies, normal forms, 1NF, 2NF, 3NF and BCNF, multi-valued dependencies and fourth normal form.

Unit-IV: Transaction processing concepts: Transaction processing system, schedule and recoverability, Testing of serializability, Serializability of schedules, conflict & view serializable schedule, recovery from transaction failures, and Concurrency Control.

Suggested Readings

- Elmasri, Navathe, "Fundamentals of Database systems", Addison Wesley
- Korth, Silbertz, Sudarshan, "Data base concepts", McGraw-Hill.
- Ramakrishna, Gehkre, "Database Management System", McGraw-Hill
- Sumathi S. & Esakkirajan S. (2007) Fundamentals of Relational Database Management
- Systems, Springer

GEC Syllabus – Economics**ECO101****Principles of Microeconomics****3-1-0**

Course Objectives: The course aims to provide students with a comprehensive understanding of foundational microeconomic principles and concepts. Throughout the course, students will explore topics such as scarcity and choice, demand and supply dynamics, elasticity, consumer theory, production and costs, and perfect competition.

Course Outcomes:

ECO101.1: Identify and list the key principles and concepts of microeconomics, including scarcity, opportunity cost, supply and demand, elasticity, consumer theory, production and costs, and perfect competition

ECO101.2: Describe the effects of changes in supply and demand on market equilibrium, utilizing the concept of elasticity to analyse the responsiveness of quantity demanded or supplied to price changes

ECO101.3: Differentiate production processes and costs, evaluating the behaviour of profit- maximizing firms, the relationship between production inputs and outputs, and the impact of scale economies and diseconomies on costs

Unit-I: Introduction: Problem of scarcity and choice: scarcity, choice and opportunity cost; production possibility frontier; economic systems. Demand and supply: law of demand, determinants of demand, shifts of demand versus movements along a demand curve, market demand, law of supply, determinants of supply, shifts of supply versus movements along a supply curve, market supply, market equilibrium. Applications of demand and supply: price rationing, price floors, consumer surplus, producer surplus. Elasticity: price elasticity of demand, calculating elasticity, determinants of price elasticity, other elasticities.

Unit-II: Consumer Theory: Budget constraint, concept of utility, diminishing marginal utility, Diamond-water paradox, income and substitution effects; consumer choice: indifference curves, derivation of demand curve from indifference curve and budget constraint.

Unit-III: Production and Costs: Production: behaviour of profit maximising firms, production process, production functions, law of variable proportions, choice of technology, isoquant and iso-costlines, cost minimizing equilibrium condition. Costs: costs in the short run, costs in the long run, revenue and profit maximization, minimizing losses, short run industry supply curve, economies and diseconomies of scale, long run adjustments

Unit-IV: Perfect Competition: Assumptions: theory of a firm under perfect competition, demand and revenue; equilibrium of the firm in the short run and long run; long run industry supply curve: increasing, decreasing and constant cost industries. Welfare: allocative efficiency under perfect competition

Suggested

Readings

- Bernheim, B., Whinston, M. (2009). Microeconomics. Tata McGraw-Hill
- Case, K., Fair, R. (2007). Principles of economics, 8th ed. Pearson Education
- Mankiw, N. (2007). Economics: Principles and applications, 4th ed. South Wester

ECO102

Principles of Macroeconomics

3-1-0

Course Objectives:

The course covers essential macroeconomic concepts and aims to provide students with a comprehensive understanding of the functioning of the economy as a whole. The course begins with an introduction to macroeconomics, emphasizing its significance and exploring the basic issues studied in this field.

Course Outcomes:

ECO102.1: Describe the factors that determine national income, including the concepts of GDP and national income measurement

ECO102.2: Analyse and solve problems related to national income determination, including the role of aggregate expenditure, consumption and investment functions, and the equilibrium GDP.

ECO102.3: Justify the impact of fiscal policy on the economy, including changes in government expenditure and taxes

Unit-I: Introduction: Problem of scarcity and choice: scarcity, choice and opportunity cost; production possibility frontier; economic systems. Demand and supply: law of demand, determinants of demand, shifts of demand versus movements along a demand curve, market demand, law of supply, determinants of supply, shifts of supply versus movements along a supply curve, market supply, market equilibrium. Applications of demand and supply: price rationing, price floors, consumer surplus, producer surplus. Elasticity: price elasticity of demand, calculating elasticity, determinants of price elasticity, other elasticities.

Unit-II: Consumer Theory: Budget constraint, concept of utility, diminishing marginal utility, Diamond-water paradox, income and substitution effects; consumer choice: indifference curves, derivation of demand curve from indifference curve and budget constraint.

Unit-III: Production and Costs: Production: behaviour of profit maximising firms, production process, production functions, law of variable proportions, choice of technology, isoquant and iso-costlines, cost minimizing equilibrium condition. Costs: costs in the short run, costs in the long run, revenue and profit maximization, minimizing losses, short run industry supply curve, economies and diseconomies of scale, long run adjustments

Unit-IV:

Unit-IV: Perfect Competition: Assumptions: theory of a firm under perfect competition, demand and revenue; equilibrium of the firm in the short run and long run; long run industry supply curve: increasing, decreasing and constant cost industries. Welfare: allocative efficiency under perfect competition

Suggested

- Bernheim, B., Whinston, M. (2009). Microeconomics. Tata McGraw-Hill
- Case, K., Fair, R. (2007). Principles of economics, 8th ed. Pearson Education
- Mankiw, N. (2007). Economics: Principles and applications, 4th ed. South Wester

Readings

GEC Syllabus- MANAGEMENT

MGM101	PRINCIPLES OF MANAGEMENT	3-1-0
Course Objectives: The course aims at providing fundamental knowledge and exposure to the concepts, theories and practices in the field of management. Course Outcomes: BBA101.1: Evaluate the global context for taking managerial actions of planning, organizing and controlling. BBA101.2: Apply management principles into management practices and ability to determine the most effective action to undertake in specific situations. BBA101.3: Analyze how the managerial tasks of planning, organizing, and controlling can be executed in a variety of circumstances.		
Unit-I: Introduction: Concept, Nature, Process and Significance of Management; Managerial levels, skills, Functions and Roles; Management vs. Administration; Coordination as Essence of Management; Development of Management Thought: Classical, Neo-Classical, Behavioral, Systems and Contingency Approaches.		
Unit-II: Planning: Nature, Scope and Objectives of Planning; Types of plans; Planning Process; Business Forecasting; MBO: Concept, Types, Process and Techniques of Decision-Making; Bounded Rationality. Organising: Concept, Nature, Process and Significance; Principles of an Organization; Span of Control; Departmentation; Types of an Organization; Authority-Responsibility; Delegation and Decentralization; Formal and Informal Organization.		
Unit-III: Staffing: Concept, Nature and Importance of Staffing. Motivating and Leading: Nature and Importance of Motivation; Types of Motivation; Theories of Motivation: Maslow, Herzberg, X, Y and Z; Leadership: Meaning and Importance; Traits of a leader; Leadership Styles – Likert's Systems of Management, Tannenbaum & Schmidt Model and Managerial Grid.		
Unit-IV: Controlling: Nature and Scope of Control; Types of Control; Control Process; Control Techniques – Traditional and Modern; Effective Control System. Communication: Basic Forms of Communication, Process of Communication, Principles of Effective Business Communication, 7Cs; Media of Communication: Types of Communication: Barriers of Communication.		
Text Books • S.P. Robbins, "Fundamentals of Management: Essentials Concepts and Applications", Pearson Education, 2014. • Stoner, Freeman and Jr. Gilbert "Management", Pearson Education, 2014. • H. Koontz, "Essentials of Management", McGraw Hill Education, 2012. • C. B. Gupta, "Management Concepts and Practices", Sultan Chand and Sons, New Delhi, 2012. • A. W. Ghillyer, "Management- A Real World Approach", McGraw Hill Education, 2010. • K. Mukherjee, "Principles of Management", McGraw Hill Education, 2012.		

MGM102	INTRODUCTION TO BUSINESS	3-1-0
Course Objectives: The course aims to introduce the students to the business field. It seeks to develop an understanding of the business processes, management and its functional areas. Course Outcomes: Upon completion of the course, the student would be able to: BBA101.1: Discuss the different forms of business organization. BBA101.2: Assess how the managerial tasks of planning, organizing, leading and controlling can be executed in a variety of circumstances BBA101.3: Discuss basic financial concepts like debit, credit, time value of money, ROI etc. BBA 101.4: Describe basic marketing concepts like 4Ps, social marketing, negative marketing etc.		

Unit-I: Business and its Environment: Role of Business in the Economy Global business environment. Forms of business organization. Limited and Unlimited Liability: LLP. Entrepreneurship - stages, characteristics, policy and schemes; Business Ethics and Corporate Responsibility.
Unit-II: Principles of Management: Definition and Functions of Management: Planning, Organizing, Staffing, Directing and Controlling. Management Process. Early Thinkers in Management – Taylor and Fayol. People Management. Motivation. Content Theories: Maslow and Herzberg; Process Theories. Organizational Structures – Types.
Unit-III: Accounting and Financial Management: Basic concepts in accounting, debt and credit, balance sheet, income statements, cash flows, financial statement, acid ratios, time value of money and return on investment. Three functions of Financial Management. Financial institutions, banks and NBFIs; Functions of the stock exchange.
Unit-IV: Marketing and Sales: Role of marketing in a business. De-marketing, negative marketing, social marketing and societal marketing. Marketing plan. Marketing process, segmentation targeting and positioning. The Marketing Mix Strategy: 4 Ps. Consumer behavior stages. Concept of customer value and satisfaction. Product and new development process. Elements of a brand. Digital marketing and social media marketing.
Text Books • Laura Dias and Amit Shah, Introduction to Business, 2012, McGraw Hill Education: New Delhi. ISBN-10: 125902864X, ISBN-13: 978-1121085084 • Ebert, R. J. & Griffin, R. W. (2015). Business Essentials (10th ed.) Upper Saddle River, NJ: Pearson Education, Inc. ISBN-13: 978-0-13-345442-0 • Nickels, W. G., McHugh, J., & McHugh, S. (2015). Understanding Business 11th ed. Irwin, McGraw-Hill New York, ISBN 9780259310034. • Bovee, Courtland L & Thill, John V. Business in Action, 5th edition, 2011 (FGCU Custom Ed) ISBN: 13-978-0-13-213965-6 • Madura, Jeff, Introduction to Business, 3rd Edition, 2003, South-Western, USA. ISBN-10: 0324186266; ISBN-13: 978-0324186260