HSNC UNIVERSITY, MUMBAI

Board of Faculty of Science & Technology

Board of Studies in the Subjects of Statistics and Data Science & Business Analytics

1) **Name of Chairperson/Co-Chairperson/Coordinator:-**

   a) Dr Asha Jindal, Associate Professor and Head of Department, Department of Statistics, K. C. college, HSNC University Churchgate, Mumbai –400 020. Email ID- asha.jindal@kccollege.edu.in Mobile no- 9821235627

2) **Two to five teachers each having minimum five years teaching experience amongst the full time teachers of the Departments, in the relevant subject.**

   a) **Dr. S. B. Muley,** Assistant Professor, Department of Statistics, K. C. college, HSNC University Churchgate, Mumbai – 400 020. Email ID sakharam.muley@kccollege.edu.in , Mobile No- 9323817918

   b) **Mrs. Pratiksha Kadam,** Assistant Professor, Department of Statistics, K. C. college, HSNC University Churchgate, Mumbai – 400 020. Email ID pratiksha.kadam@kccollege.edu.in , Mobile No- 7507162816

   c) **Ms. Shailaja Rane,** Assistant Professor, Department of Statistics, K. C. college, HSNC University Churchgate, Mumbai – 400 020. Email ID shailaja.rane@kccollege.edu.in, Mobile No- 7506986359

3) **One Professor / Associate Professor from other Universities or professor / Associate Professor from colleges managed by Parent Body;**

   a) **Dr Anjum Ara Ahmed;** I/C Principal, Rizvi College, Mumbai. Email ID **anjumahmed8@gmail.com, Mobile No-** 8451046220

4) **Four external experts from Industry / Research / eminent scholar in the field relevant to the subject nominated by the Parent Body;**

a. **Prof. Suresh Kumar Sharma,** Professor, Department of Statistics, Panjab University, Chandigarh. Email ID ssharma643@yahoo.co.in, **Mobile No**-9815911381

b. **Mr Mukesh Jain,** Chief Technological Officer, Capgemini. Email ID mdjain@hotmail.com, **Mobile No**-7972637347.

c. **Dr Santosh Gite,** Associate Professor, Dept. of Statistics, University of Mumbai, Mumbai. Email ID santgite@yahoo.com, **Mobile No**- 9167157717.

d. **Mr Prashant Kumar Nair,** Director, Geo Spatial Analytics Global Lead, Intelligent Analytics, Nielsen Connect, Email ID prasif hantkumar.nair@nielsen.com , **Mobile No**-9833747057.

5. Top rankers of the Final Year Graduate and Final Year Post Graduate examination of previous year of the concerned subject as invitee members for discussions on framing or revision of syllabus of that subject or group of subjects for one year.

a) **Ms. Mohaddasah Patel** (undergraduate student 18-19) Email Id- mohaddasah.98@gmail.com ; Mobile no- 9833781878

b) **Ms. Divya Srivastava** (undergraduate student18-19) Email ID- divyasrivastav20@gmail.com ; Mobile no- 8879240305

Part –I

Outline of Choice Based Credit System as outlined by University Grants Commission:

R. ** : The Definitions Of The Key Terms Used In The Choice Based Credit System And Grading System Introduced From TheAcademicYear2020-2021AreAs Under:**

1. **Core Course:** A course, which should compulsorily be studied by a candidate as a core requirement is termed as a core course.

2. **Elective Course:** Generally, a course which can be chosen from a pool of courses and which may be very specific or specialized or advanced or supportive to the discipline/subject of study or which provides an extended scope or which enables an exposure to some other discipline/subject/domain or nurtures the candidate's proficiency/skill is called an Elective Course.

   2.1 **Discipline Specific Elective (DSE) Course:** Elective courses may be offered by the main discipline/subject of study is referred to as Discipline Specific Elective. The University/Institute may also offer discipline related Elective courses of interdisciplinary nature (to be offered by main discipline/subject of study).

   2.2 **Dissertation/Project:** An elective course designed to acquire special/advanced knowledge, such as supplement study/support study to a project work, and a candidate studies such a course on his own with an advisory support by a teacher/faculty member is called dissertation/project. A Project/Dissertation work would be of 6 credits. A Project/Dissertation work may be given in lieu of adiscipline specific elective paper.

   2.3 **Generic Elective (GE) Course:** An elective course chosen generally from an unrelated discipline/subject, with an intention to seek exposure is called a Generic Elective.
   P.S.: A core course offered in a discipline/subject may be treated as an elective by other discipline/subject and vice versa and such electives may also be referred to as Generic Elective.

3. **Choice Base Credit System :** CBCS allows students to choose inter-disciplinary, intra-disciplinary courses, skill oriented papers (even from other disciplines according to their learning needs, interests and aptitude) and more flexibility for students.

4. **Honours Program :** To enhance employability and entrepreneurship abilities among the learners, through aligning Inter Disciplinary / Intra Disciplinary courses with Degree Program. Honours Program will have
40 additional credits to be undertaken by the learner across three years essentially in Inter / Intra Disciplinary course.

   A learner who joins Regular Undergraduate Program will have to opt for Honours Program in the first year of the Program. However, the credits for honours, though divided across three years can be completed within three years to become eligible for award of honours Degree.

5. **Program:** A Program is a set of course that are linked together in an academically meaningful way and generally ends with the award of a Degree Certificate depending on the level of knowledge attained and the total duration of study, B.Sc. Programs.

6. **Course:** A 'course' is essentially a constituent of a 'program' and may be conceived of as a composite of several learning topics taken from a certain knowledge domain, at a certain level. All the learning topics included in a course must necessarily have academic coherence, i.e. there must be a common thread linking the various components of a course. A number of linked courses considered together are in practice, a 'program'.

7. **Bridge Course:** Bridge course is visualized as Pre semester preparation by the learner before commencement of regular lectures. For each semester the topics, whose knowledge is considered as essential for effective and seamless learning of topics of the Semester, will be specified. The Bridge Course can be conducted in online mode. The Online content can be created for the Bridge Course Topics.

8. **Module and Unit:** A course which is generally an independent entity having its own separate identity, is also often referred to as a 'Module' in today's parlance, especially when we refer to a 'modular curricular structure'. A module may be studied in conjunction with other learning modules or studied independently. A topic within a course is treated as a Unit. Each course should have exactly 3 Units.

9. **Self-Learning: 20% of the topics will be marked for Self-Learning.** Topics for Self-Learning are to be learned independently by the student, in a time-bound manner, using online and offline resources including online lectures, videos, library, discussion forums, fieldwork, internships etc.

   Evaluative sessions (physical/online), equivalent to the credit allocation of the Self Learning topics, shall be conducted, preferably, every week for each course. Learners are to be evaluated real time during evaluative sessions. The purpose of evaluative sessions is to assess the level of the students' learning achieved

in the topics earmarked for Self-Learning.

The teacher's role in these evaluative sessions will be that of a Moderator and Mentor, who will guide and navigate the discussions in the sessions, and offer concluding remarks, with proper reasoning on the aspects which may have been missed by the students, in the course of the Self-Learning process.

The modes to evaluate self-learning can be a combination of the various methods such as written reports, handouts with gaps and MCQs, objective tests, case studies and Peer learning. Groups can be formed to present self-learning topics to peer groups, followed by Question and Answer sessions and open discussion. The marking scheme for Self Learning will be defined under Examination and Teaching.

The topics stipulated for self-learning can be increased or reduced as per the recommendations of the Board of Studies and Academic Council from time to time. All decisions regarding evaluation need to be taken and communicated to the stakeholders preferably before the commencement of a semester. Some exceptions may be made inexigencies, like the current situation arising from the lockdown, but such ad hoc decisions are tobe kept to the minimum possible.

10. **Credit Point:** Credit Point refers to the 'Workload' of a learner and is an index of the number of learning hours deemed for a certain segment of learning. These learning hours may include a variety of learning activities like reading, reflecting, discussing, attending lectures / counseling sessions, watching especially prepared videos, writing assignments, preparing for examinations, etc. Credits assigned for a single course always pay attention to how many hours it would take for a learner to complete a single course successfully. A single course should have, by and large a course may be assigned anywhere between
2 to 8 credit points wherein 1 credit is construed as corresponding to approximately 30 to 40 learning hours.

11. **Credit Completion and Credit Accumulation:** Credit completion or Credit acquisition shall be considered to take place after the learner has successfully cleared all the evaluation criteria with respect to a single course. Thus, a learner who successfully completes a 4 CP (Credit Point) course may be considered to have collected or acquired 4 credits. learner level of performance above the minimum prescribed level (viz. grades / marks obtained) has no bearing on the number of credits collected or acquired. A learner keeps on adding more and more credits as he completes successfully more and more courses. Thus the learner 'accumulates' course wise credits.

12. **Credit Bank:** A Credit Bank in simple terms refers to stored and dynamically updated information regarding the number of Credits obtained by any given learner along with details regarding the course/s for which Credit has been given, the course-level, nature, etc. In addition, all the information regarding the number of Credits transferred to different programs or credit exemptions given may also be stored with the individual's history.

13. **Credit Transfer:** (performance transfer)When a learner successfully completes a program, he/she is allowed to transfer his/her past performance to another academic program having some common courses and Performance transfer is said to have taken place.

14. **Course Exemption:** Occasionally, when two academic programs offered by a single university or by more than one university, may have some common or equivalent course-content, the learner who has already completed one of these academic programs is allowed to skip these 'equivalent' courses while registering for the new program. The Learner is 'exempted' from 'relearning' the common or equivalent content area and from re-appearing for the concerned examinations. It is thus taken for granted that the learner has already collected in the past the credits corresponding to the exempted courses.

Part-II

O*** The fees for transfer of credits or performance will be based on number of credits that a learner has to complete for award of the degree.**

The Scheme of Teaching and Examination:

The performance of the learners shall be evaluated in two components: Internal Assessment with 40% marks by way of continuous evaluation and by Semester End Examination with 60% marks by conducting the theory examination.

INTERNAL ASSESSMENT:- It is defined as the assessment of the learners on the basis of continuous evaluation as envisaged in the credit based system by way of participation of learners in various academic and correlated activities in the given semester of the programme.

A). Internal Assessment – 40% **40 marks**

Practical's (internal Components of the Practical Course)

1. For Theory Courses

Sr. No.	Particulars	Marks
1	**ONE** class test / online examination to be conducted in the given semester	15 Marks
2	One assignment based on curriculum (to be assessed by the teacher Concerned	10 Marks
3	Self-Learning Evaluation	10 Marks
4	Active participation in routine class instructional deliveries	05 Marks

2. For Courses with Practicals

Each practical course can be conducted out of 50 marks with 20 marks for internal and 30 marks for external

Practical's (Internal component of the Practical Course)

Sr. No	Evaluation type	Marks
1	Two Best Practicals /Assignments/Presentation /Preparation of models/ Exhibits **Or** One Assignment/ project/presentation to be assessed by teacher concerned	10
2	Journal	05
3	Viva	05

The semester end examination (external component) of 60 % for each course will be as follows:

i) **Duration – 2 Hours** ii) **Theory Question**

Paper Pattern:-

1. There shall be four questions each of 15 marks. On each unit there will be one question and the fourth one will be based on entire syllabus.
2. All questions shall be compulsory with internal choice within the questions. (Each question will be of 20 to 23 marks with options.)
3. Question may be subdivided into sub-questions a, b, c… and the allocation of marks depend on the weightage of the topic.

The marks will be given for all examinations and they will be converted into grade (quality) points. The semester-end, final grade sheets and transcripts will have only credits, grades, grade points, SGPA and CGPA.

3. Project and Assignment:

- Project or Assignment, which can in the following forms
  - Case Studies
  - Videos
  - Blogs
  - Research paper (Presented in Seminar/Conference)
  - Field Visit Report
  - Presentations related to the subject (Moot Court, Youth Parliament, etc.)
  - Internships (Exposition of theory into practice)
  - Open Book Test
  - any other innovative methods adopted with the prior approval of Director Board of Examination and Evaluation.

4.Self-Learning Evaluation

- **20% OF THE TOPICS OF CURRICULUM ARE LEARNED BY THE STUDENT THROUGH SELF LEARNING USING ONLINE / OFFLINE ACADEMIC RESOURSE SPECIFIED IN THE CURRICULUM.**

- **HENCE 20% OF THE LECTURES SHALL BE ALLOCATED FOR EVALUATION OF STUDENTS ON SELF LEARNING TOPICS**

- The identified topics in the syllabus shall be learnt independently by the students in a time bound manner preferably from online resources. Evaluative sessions shall be conducted by the teachers and will carry 10 Marks.

  CLUB The self-learning topics into 3-4 GROUPS OF TOPICS ONLY FOR EVALUATION.

- **PRESCRIBE TIME DURATION (IN DAYS) FOR COMPLETION OF EACH GROUP OF TOPIC AND EARMARK SELF LEARNING EVALUATION LECTURES IN THE TIMETABLE. HENCE EACH GROUP OF TOPIC CAN BE ASSIGNED 3 REGULAR LECTURES FOR THIS EVALUATION FOR ENTIRE CLASS**

3 Sub Topics
Each evaluative session shall carry 3 Marks (3 x 3 Units = 9 Marks). Students who participate in all evaluative sessions shall be awarded 1 additional Mark.

4 Sub Topics
Each evaluative session shall carry 2.5 Marks (2.5 x 4 Units = 10 Marks)

- **EVALUATION OF SELF LEARNING TOPICS CAN COMMENCE IN REGULAR LECTURES ASSIGNED FOR SELF LEARNING EVALUATION IN THE TIMETABLE**

3 Evaluative sessions

Each evaluative session shall carry 3 Marks (3 x 3 = 9 Marks).
Students who participate in all evaluative sessions shall be awarded 1 additional Mark.

4 Evaluative sessions

Each evaluative session shall carry 2.5 Marks (2.5 x 4 = 10

Marks). <u>Methods for Evaluation of Self-learning topics:</u>

- Seminars/presentation (PPT or poster), followed by Q&A – Objective questions /Quiz / Framing of MCQ questions.
- Debates
- Group discussion
- You-Tube videos (Marks shall be based on the quality and viewership)
- Improvisation of videos
- Role Play followed by question-answers

TEACHERS CAN FRAME OTHER METHODS OF EVALUATION ALSO PROVIDED THAT THE METHOD, DULY APPROVED BY THE COLLEGE EXAMINATION COMMITTEE, IS NOTIFIED TO THE STUDENTS AT LEAST 7 DAYS BEFORE THE COMMENCEMENT OF THE EVALUATION SESSION AND IS FORWARDED FOR INFORMATION AND NECESSARY ACTION AT LEAT 3 DAYS BEFORE THE COMMENCEMENT OF THE EVALUATION SESSION

- Viva Voce
- Any other innovative method

SEMESTER END EXAMINATION: - It is defined as the examination of the learners on the basis of performance in the semester end theory / writtenexaminations.

B. Semester End Examination- 60 % ***60 Marks***

1) Duration – These examinations shall be of 2 Hours duration.
2) Question Paper Pattern: -
   i. There shall be four questions each of 15 marks.
   ii. All questions shall be compulsory with internal choice within the questions.
   iii. Question may be sub-divided into sub-questions a, b, c, d & e only and the allocation of marks depends on the weightage of the topic.

THE MARKS OF THE INTERNAL ASSESSMENT SHOULD NOT BE DISCLOSED TO THE STUDENTS TILL THE RESULTS OF THE CORRESPONDING SEMESTER IS DECLARED.

HSNC University Mumbai

(2020-2021)

Ordinances and Regulations

With Respect to

Choice Based Credit System

(CBCS)

For the Programmes Under

The Faculty of Science and Technology

For the Course

Data Science & Business Analytics

Curriculum – First Year Undergraduate Programmes

Semester-I and Semester -II

2020-2021

Data Science & Business Analytics

Part 1-
Preamble

B. Sc. Data Science and Business Analytics program is of minimum 140 credits cover six semesters. Data is the new oil. The analytics may be input for human decisions or may drive fully automated decisions. It helps decision maker in building strategies to perform deep-dive understanding and provide descriptive, predictive and prescriptive analytics. It is used to run the business effectively and is instrumental in growing the business. It is the area for huge potential for corporate investments. Business Analytics include identifying KPIs, measurement strategy, data analysis, complex statistical model and analysis, data mining and deep understanding of cause-and-effect models. Business analytics can drive key decision making in the organization and help executive decision makers in building strategy, predictive analysis, forecasting, risk analysis, identify and prevent fraud, market analysis, etc. Data Scientists use these skills are able to provide insights into discrete data sets, build complex model and present them in Scorecard format and use the same in executive reviews to lead data-driven discussion and decisions. Some of the impactful use of this is in the areas of Management Information Systems, Financial Service, Marketing Research, Process Improvements, Six Sigma, Process Excellence, Scorecard, Dashboard, End-to-End Product Management, etc.

The program emphasizes both theory and modern applications of Data Science and Business analytics and is structured to provide knowledge and skills in depth necessary for the employability of students in industry, in academics and other government and non-government organizations. The program has some unique features like independent projects, number of elective courses and extensive computer training of statistical computations including standard software packages like C++, SQL, SPSS, SAS, MINITAB, R and PYTHON etc. Due to Cluster University, the department got the academic autonomy and it's been utilized to add the

new and need based elective courses. The independent project work is one among the important components of this program. The syllabus has been framed to possess a decent balance of theory, methods and applications of statistics. It is possible for the students to study basic courses from other disciplines like economics, life sciences, computer science and Information Technology in place of optional/electives. The thrust of the course is to prepare students to enter into a promising career after graduation, as also provide to them a platform for pursuing higher studies resulting in post-graduation degrees.

1. **Course objective: The main course objectives are**
   - Provide hands-on training to students to develop and enhance the strong analytical, quantitative modeling skills and business skills for solving team-based, real-world business problems and to make students ready for the role of Data Scientist.
   - Provide opportunity to work on some real-life data/problems or simulated data through building the business Intelligence reports, scorecard and dashboard.

SEMESTER-I

US-FDS-101 Business Statistics- I

Objective: The objective of the course is to make the students conversant with various techniques used in summarization, certainty involved in uncertainty in happening of events, decision making and analysis of data. The focus will be both on theoretical as well as practical approach using commonly used Statistical Software.

US-FDS-102 Mathematical Foundation-I

Objective: The primary **objective** to provide **mathematical** background and sufficient experience on various topics of discrete **mathematics** logic and proofs, combinatorics, graphs, algebraic structures, formal languages and differential equations.

US-FDS-103 C++ programming

Objective: Develop a greater understanding of the issues involved in programming language design and implementation, Develop an in-depth understanding of functional, logic, and object-oriented programming paradigms , Understand design/implementation issues involved with variable allocation and binding, control flow, types, subroutines, parameter passing, Develop an understanding of the compilation process

US-DS-104 MS Excel

Objective: MS Excel skill will make able to:Indicate the names and functions of the Excel interface components, Enter and edit data, Format data and cells, Construct formulas, including the use of built-in functions, and relative and absolute references, Create and modify charts, Preview and print worksheets, Use the Excel online Help feature along with Data visualization and Data Analytics.

US-FDS-105 Introduction to Cyber Security

Objective: To prepare students with the technical knowledge and skills needed to protect and defend computer systems and networks. To develop graduates that can identify, analyze, and remediate computer **security** breaches.

SEMESTER-II

US-FDS-201 :Business Statistics- II

Objective: The objective of the course is to provide a systematic account of theory of testing and closely related theory of point estimation and confidence sets, together with their applications

US-FDS- 202: Applied Linear Algebra

Objective: Techniques of linear algebra useful in various Statistics courses will be covered in this course. After learning this course, the students will be well equipped to apply these techniques in many major Statistics courses like Linear Inference, Multivariate Analysis and Operations Research etc.

US-FDS-203: R programming

Objective: The objective of the course is to make the students conversant with various techniques used in summarization and analysis of data. The focus will be both on theoretical as well as practical approach using FOSS Statistical Software.

US-FDS-204: Database Management System with SQL

Objective: Learning SQL skill, which stands for Structured Query Language, is a programming language that is used to communicate with and manipulate databasesIn order to control the information in those databases, SQL is used, which allows users to retrieve the specific data they are looking for when they need it.

US-FDS-205: Business Analytics

Objective: Learning Business Priorities, Effective communication starts with a purpose, knowing what you want to accomplish helps you communicate more, Reaching the Right Audiences. To

learn process of turning raw data into useful information. It is a process of sorting a large amount of data to find out patterns and establish trends and developing relationships.

2. Salient features, how it has been made more relevant.

1) Syllabus is prepared by top most industry experts, eminent statisticians, Data Scientist and reputed faculties of KC College.
2) Skills covered includes Statistics, Data Analytics, Business Analytics, Data Visualization, machine learning algorithm, Text Mining, Forecasting/ Predictive Analytics, Hypothesis Testing etc.
3) Tools and Technology covered includes R, Python, My SQL, tableau, c++, SPSS, Minitab, Excel, Maya and many more.
4) Course includes several Assignments and Case Studies.
5) Getting industrial experience by working on industry relevant live projects and internship.
6) University/ College has tie up with 100+ companies to provide job to many students.
7) University/ College has a dedicated placement cell for the participants who will complete course.
8) Teaching Faculties will include good blend of Academicians and Industry Experts.
9) Focus is to prepare Participants with clear, concise concept to experts in data Science field to add quality and value to institute they join.
10) University/ College has well placed Alumni working at top position.

3. Learning Outcomes.

Students will learn Analytics from basics concepts to creating basic models for predictions. Students will learn how analytics is actually used large corporations like Microsoft, Jio, Amazon and other top companies globally. In the hands-on session, Students will gain skills on identifying opportunities for Analytics, Machine Learning, IoT, AI, Blockchain, coming up with right set of metrics/KPIs, use cases, defining the metrics, measuring and implementing it. Students will be able to come up with specific Analytics Opportunities, Define Metrics and KPIs successfully for any business.

Part 2- The Scheme of Teaching and Examination is as under:
Semester – I
Summary

Sr. No.	Choice Based Credit System			Subject Code	Remarks
1	Core Course (Business Statistics – I, Mathematical Foundation-I, Data Mining, C++ Programming), (Practicals of US-FDS-101, US-FDS-102, US-FDS-103, US-FDS-104, US-FDS-105)			US-FDS-101, US-FDS-102, US-FDS-103, US-FDS-1P1	
2	Elective Course	Discipline Specific Elective (DSE) Course			
		2.1	Interdisciplinary Specific Elective (IDSE) Course (MS Excel)	US-FDS-104	
		2.2	Dissertation/Project		
		2.3	Generic Elective (GE) Course		
3	Ability Enhancement Courses (AEC) (Introduction to Cyber Security)			US-FDS-105	
	Skill Enhancement Courses (SEC)				

First Year Semester I Internal and External Detailed Evaluation Scheme

Sr. No.	Subject Code	Subject Title	Periods Per Week						Seasonal Evaluation Scheme				Tot al Mark s
			Units	S. L.	L	T	P	Credit	S. L. E	CT	TA	SEE	
1	US-FDS-101	Business Statistics - I	3	1/5	3	0	2	3	10	20	10	60	100
2	US-FDS-102	Mathematical Foundation-I	3	1/5	3	0	0	3	10	20	10	60	100
3	US-FDS-103	C++ Programming	3	1/5	3	0	0	3	10	20	10	60	100
4	US-FDS-104	MS Excel	3	1/5	3	0	0	3	10	20	10	60	100
5	US-FDS-105	Introduction to Cyber Security	3	1/5	3	0	0	3	10	20	10	60	100
6	US-FDS-1P1	Practicals of US-FDS-101, US-FDS-102, US-FDS-103, US-FDS-104,	3 practical per batch	0	0	0	5	5	0	0	0	50 marks per practical	150
	Total Hours / Credit							20	Total Marks				650

*** Three hours per week to be taken for CONTINUOUS self –learning Evaluation.**

First Year Semester I - Units – Topics – Teaching Hours

S.N	Subject Code	Subject Unit Title		Hours	Total No. of Hours	Credit	Tot al Marks
1	US-FDS-101	I	Summarization Measures	15	45	3	100 (60+30 +10)
		II	Elementary Probability Theory and Some Standard Distributions	15			
		III	Decision Theory	15			
2	US-FDS-102	I	Discrete Mathematics	15	45	3	100 (60+30 +10)
		II	Introduction to Combinatorics and Graph Theory	15			
		III	Differential Equations	15			
		II	Data Preparation & Basic Mining tools	15			
		III	Advanced Mining tools	15			
3	US-FDS-103	I	Basics of C++	15	45	3	100 (60+30 +10)
		II	Statements, Operators and Functions	15			
		III	Arrays, Pointers and Strings	15			
	US-	I	Basics of Excel	15	45	3	100
		II	Intermediate Excel	15			

4	FDS-104	III	Statistical Computations	15			(60+30 +10)
5	US-FDS-105	I	Social Media Security	15	45	3	100 (60+30+10)
		II	Security Guidelines	15			
		III	Social Engineering and IT Security	15			
6	US-FDS-106	I	Practicals of US-FDS-101, US-FDS-102, US-FDS-103, US-FDS-104,	45	45 x 3=135	5	150
		II		45			
		III		45			
			TOTAL			20	650

- **Lecture Duration =1 Hour.**
- **One Credit =15 hours**

L: Lecture: Tutorials P: Practical Ct-Core Theory, Cp-Core Practical, SLE- Self learning evaluation CT-Commutative Test, SEE- Semester End Examination , PA-Project Assessment, AT- Attendance

Part -3 Detailed Scheme Theory

Curriculum Topics along with Self-Learning topics - to be covered, through self-learning mode along with the respective Unit. Evaluation of self-learning topics to be undertaken before the concluding lecture instructions of the respective UNIT

US-FDS-101 Business Statistics- I **(Total Hours : 45 Lectures)**

Unit-1: Summarization Measures **[15 H]**

1.1 Introduction to definition of Statistics, Application and scope of Statistics

1.2 Conceptofpopulationandsample.Finite,Infinitepopulation,parameter and statistic

1.3 Types of data: Qualitative and quantitative data; Time series data and cross section data, discrete and continuous data.

1.4 Different types of scales: nominal, ordinal, interval and ratio.

1.5 Simple Random Sampling

1.6 Concept of central tendency of data .Requirements of good measure.

1.7 For Raw Data, Ungrouped Frequency Data, Grouped Frequency Data:

i. Mathematical averages Arithmetic mean (Simple, weighted mean, combined mean), Geometric mean, Harmonic mean,

ii. Locational averages: Median, Mode and

iii. Partition Values: Quartiles, Deciles and Percentiles.

Merits and demerits of different measures & their applicability.

1.8 Concept of dispersion. Requirements of good measure.

1.9 Absolute and Relative measures of dispersion: Range, Quartile Deviation, Mean absolute deviation, Standard deviation.

1.10 Variance and Combined variance, raw moments and central moments and relations between them. Their properties

1.11 Concept of Skewness and Kurtosis: Coefficient of skewness and kurtosis based on moments.

Unit -2: Elementary Probability Theory and Some Standard Distribution [15H]

2.1 Probability Theory: Concept of random experiment/trial and possible outcomes; Sample Space and Discrete Sample Space; Events their types, Algebra of Events, Mutually Exclusive and Exhaustive Events, Complimentary events.
Classical definition of Probability, Addition theorem (without proof), conditional probability.
Independence of Events: $P(A \cap B) = P(A) P(B)$. Simple examples.

2.2 Random Variable: Probability distribution of a discrete and continuous random variable; Expectation and Variance of random variable, simple examples on probability distributions.

2.3 Discrete Probability Distribution: Binomial, Poisson (Properties and applications only, no derivations are expected).

2.4 Continuous Probability distribution: Normal Distribution. (Properties and applications only, no derivations are expected)

Unit -3: Decision Theory **[15H]**

3.1 Decision making situation, Decision maker, Courses of Action, States of Nature, Pay-off and Pay-off matrix.

3.2 Decision making under uncertainty, Maximin, Maximax, Minimax regret and Laplace criteria; simple examples to find optimum decision.

3.3 Formulation of Payoff Matrix. Decision making under Risk, Expected Monetary Value (EMV).

3.4 Decision Tree; Simple Examples based on EMV. Expected Opportunity Loss (EOL), simple examples based on EOL.

Self-Learning topics (Unit wise)

Sub Unit	Topics
2.1	Probability Theory: Concept of random experiment/trial and possible outcomes; Sample Space and Discrete Sample Space; Events their types, Algebra of Events, Mutually Exclusive and Exhaustive Events, Complimentary events. Classical definition of Probability, Addition theorem (without proof), conditional probability. Independence of Events: $P(A \cap B) = P(A) P(B)$. Simple examples.
2.2	Random Variable: Probability distribution of a discrete and continuous random variable; Expectation and Variance of random variable, simple examples on probability distributions.
2.3	Discrete Probability Distribution: Binomial, Poisson (Properties and applications only, no derivations are expected).

Online Resources

'Introduction to Probability and Statistics' by Prof. G. Srinivasan from IIT Madras available on the Swayam portal https://nptel.ac.in/courses/111/106/111106112/
'Introduction to Probability Theory and Stochastic Processes' by Prof. S Dhramaraja from IIT Delhi available on the Swayam portal https://nptel.ac.in/courses/111/102/111102111/ for unit II
Statistics for Business Economics' by Dr. Patel from University School of Sciences available on the Swayam portal http://ugcmoocs.inflibnet.ac.in/ugcmoocs/view_module_ug.php/227
'Business Statistics' by Dr Mukesh Kumar Barua from IIT Roorkee available on the Swayam portal https://nptel.ac.in/courses/110/107/110107114/

US-FDS-102 Mathematical Foundation-I (Total Hours: 45)

Unit -I: Discrete Mathematics [15 H]

1.1 Logic, sets, relations, functions.
1.2 The concept of algorithms and algorithmic thinking in problem solving
1.3 Summation techniques: manipulations of sums and multiple sums, finite calculus
1.4 Asymptotics and the big-Oh notation

Unit - 2: Introduction to Combinatorics and Graph Theory [15 H]

2.1 Counting techniques, pigeonhole principle, inclusion-exclusion.
2.2 Recurrence relations, solving recurrences using generating functions.
2.3 Master Theorem for solving recurrences.
2.4 Graphs
2.5 Basic graph algorithms
2.6 Trees
2.7 Applications of graphs

Unit - 3: Differential Equations [15 H]

3.1 First order equations
3.2 Second order linear equations with constant coefficients
3.3 Series solutions
3.4 The Laplace transform method
3.5 Systems of linear differential equations and Applications

Self-Learning topics (Unit wise)

Sub Unit	Topics
1.1	Logic, sets, relations, functions.
2.1	Counting techniques, pigeonhole principle, inclusion-exclusion.
2.4	Graphs
2.5	Basic graph algorithms
2.6	Trees

Online Resources

'Discrete Mathematics' by Prof.Sajith Gopalan,Prof.Benny George K from IIT Guwahati available on the Swayam portal https://nptel.ac.in/courses/106/103/106103205/
'Discrete Mathematics' by Prof. Sourav from Chennai Mathematical Institute available on the Swayam portal https://nptel.ac.in/courses/111/106/111106086/
'Differential equations for engineers' by Prof. Srinivasa Manam from IIT Madras available on the Swayam portal https://nptel.ac.in/courses/111/106/111106100/

US-FDS-103 C++ programming (Total Hours : 45)

Unit-1: Basics of C++ [15H]

1.1 Advantage of Structured Programming, Interpreter and Compiler Program. Advantages of OO Programming.
1.2 Introduction to C++: Origin of C++. A Sample C++ program. Layout of simple C++ program. Compiling and running a C++ program.
1.3 Variables and Assignments: variables, identifiers, variable declarations, Assignment Statements, reference variable, symbolic constant, Input and Output: cin, cout, escape sequences, include directives and Namespaces, Indenting and Comments, Operator precedence, Data types and expressions, Arithmetic operators, Type compatibilities.

Unit-2: Statements, Operators and Functions [15H]

2.1 Compound statements, Iterations or Looping: while, for, do while, nested loops, Decision making: if – else, nested if else, switch, break and continue, Manipulators: endl, setw, size of, Increment and decrement operators, Type Cast Operators, Scope resolution operators.
2.2 Functions: Function Prototypes, built in functions and user defined functions, Function overloading, Call by reference, and Call by value, const member functions. Inline Functions and recursive functions, Math Library Functions.

Unit-3: Arrays, Pointers and Strings [15H]

3.1 Derived Data types (Arrays , pointers , functions) : Introduction to arrays, arrays in functions, 2-D arrays , Multidimensional arrays, Introduction to pointers, void pointers, pointers in function, pointer to constant and constant pointer, generic pointer.

3.2 Strings, Vectors and Structures: String functions: strcmp, strcat, strlen, strcpy. Vector Basics. Introduction to Structures.

Self-Learning topics (Unit wise)

Sub Unit	Topics
	Need to be developed

Online Resources

Not existing

US-DS-104 MS Excel (Total Hours: 45)

Unit-1: Basics of Excel [15H]

1.1 Creating and Navigating worksheets and adding information to worksheets

i) Types of data, entering different types of data such as texts, numbers, dates, functions.

ii) Quick way to add data Auto complete, Autocorrect, Auto fill, Auto fit. Undo and Redo.

iii) Moving data, contiguous and non contiguous selections, Selecting with keyboard. Cut-Copy, Paste. Adding and moving columns or rows. Inserting columns and rows.

iv) Find and replace values. Spell check. v) Formatting cells, Numbers, Date, Times, Font, Colors, Borders, Fills.

1.2 Multiple Spreadsheets:

i). Adding, removing, hiding and renaming worksheets.

ii). Add headers/Footers to a Workbook. Page breaks, preview.

iii). Creating formulas, inserting functions, cell references, Absolute, Relative (within a worksheet, other worksheets and other workbooks).

iv). Creating and using templates.

v). Creating and Linking Multiple Spreadsheets.

vi). Using formulas and logical operators.

vii). Creating and using named ranges.

1.3 Functions:

i). Database Functions LOOKUP, VLOOKUP, HLOOKUP

ii). Conditional Logic functions IF, COUNTIF, SUMIF

iii). String functions LEFT, RIGHT, MID, LEN, UPPER, LOWER, PROPER, TRIM.

iv). Date functions TODAY, NOW, DATE, TIME, DAY, MONTH, YEAR, WEEKDAY, DAYS360

Unit-2: Intermediate Excel [15H]

2.1 Advance Functions:

a) What- if-Analysis: Scenario Manager, Goal Seek, Data Table

b) Financial functions: FV, PV, PMT, PPMT, IPMT, NPER, RATE, NPV, IRR.

c) Mathematical and Statistical functions. ROUND, ROUNDDOWN, ROUNDUP, CEILING, FLOOR, INT, MAX, MIN, MOD, SQRT, ABS, AVERAGE.

d) Data Analysis

i). Filter with customized condition.

ii). The Graphical representation of data(All types of Graphs, Diagrams etc) .

iii). Sorting, Subtotal.

iv). Pivot Tables- Building Pivot Tables, Pivot Table regions, Rearranging Pivot Table.

Unit-3: Statistical Computations [15H]

3.1 Some Probability Distributions: Plotting of pmf/pdf, cdf, computation of probabilities of Binomial, Poisson, Normal, Exponential

3.2 Operations Research Techniques:

Concept and Mathematical Formulation of Linear Programming Problem, Transportation Problems and Assignment Problems. Numerical problems of all above using Solver.

3.3 Concept and Numerical Problems with **Excel** add-in **MegaStat** and/or **Data Analysis ToolPak**.based on

3.4 options

Self-Learning topics (Unit wise)

Sub Unit	Topics
	Need to be developed

Online Resources

Not existing

US-FDS-105 Introduction to Cyber Security (Total Hours : 45)

Unit- 1: Social Media Security [15 H]

1.1 Introduction to Cyber Space: History of Internet, Cyber Crime, Information Security, Computer Ethics and Security Policies

1.2 Choosing the Best Browser according to the requirement and email security: Guidelines to choose web browsers, Securing web browser, Antivirus, Email security

1.3 Guidelines for secure password and wi-fi security

1.4 Guidelines for setting up a Secure password

1.5 Two-steps authentication

1.6 Password Manager

1.7 Wi-Fi Security

1.8 Guidelines for social media and basic Windows security

1.9 Guidelines for social media security

1.10 Tips and best practices for safer Social Networking

1.11 Basic Security for Windows

1.12 User Account Password

Unit- 2: Security Guidelines [15 H]

2.1 Smartphone security guidelines: Introduction to mobile phones, Smartphone Security, Android Security, IOS Security

2.2 Cyber Security Initiatives in India: Counter Cyber Security Initiatives in India, Cyber Security Exercise, Cyber Security Incident Handling, Cyber Security Assurance

2.3 Online Banking, Credit Card and UPI Security: Online Banking Security, Mobile Banking Security, Security of Debit and Credit Card, UPI Security, Micro ATM, e-wallet and POS Security, Security of Micro ATMs.

2.4 e-wallet Security Guidelines

2.5 Security Guidelines for Point of Sales(POS)

Unit- 3: Social Engineering and IT Security [15H]

3.1 Social Engineering: Social Engineering, Types of Social Engineering, How Cyber Criminal Works, How to prevent for being a victim of Cyber Crime.

3.2 Cyber Security Threat Landscape and Techniques: Cyber Security Threat Landscape, Emerging Cyber Security Threats, Cyber Security Techniques.

3.3 IT Security Act and Misc. Topics: IT Act, Hackers-Attacker-Countermeasures, Web Application Security, Digital Infrastructure Security, Defensive Programming

3.4 Information Destroying and Recovery Tools

3.5 Recovering from Information Loss

3.6 Destroying Sensitive Information

3.7 CCleaner for Windows

Self-Learning topics (Unit wise)

Sub Unit	Topics
	Need to be developed

Online Resources

Not meeting to the standards of the paper

Part -4 Detailed Scheme Practicals

Code Practical: US-FDS-1P1

Title of Paper: Practicals of US-FDS-101, US-FDS-102, US-FDS-103, US-FDS-104

Unit	Content	No. of Lectures
I	1. Creating and Navigating worksheets and adding information to worksheets. 2. Multiple Spreadsheets 3. Data Analysis: Sort, Filter, Frequency Tables, Subtotal and Pivot Tables. 4. Functions: Mathematical, Statistical and Financial Functions 5. Advance Functions 6. Descriptive Statistics 7. Distributions 8. Analysis ToolPak 9. Decision Theory	3 hours per Batch per Practical
II	1. Write a C++ program for finding greatest of three number. 2. Write a C++ program for solving the quadratic equation. 3. Write a C++ program to print all the prime numbers in a given range. 4. Write a C++ program for displaying the Fibonacci series. 5. Write a C++ program for converting number to words. (switch,break,continue) 6. Write a C++ function for swapping two numbers without using third variable. 7. Write a recursive function for factorial of given number.	03 hours per Batch per Practical
III	**1.** Write your own function for string reverse , string palindrome , string comparision **2.** Write a program for sorting the number in ascending and descending order **3.** Write a program for Matrix addition and multiplication. **4.** Write a program for implementing the concept of structures. **5.** Write a program for finding the greatest and smallest number using vector.	03 hours per Batch per Practical

	6. Write a program for implementing the concept of call by value and call by reference. 7. Write a program for generating the report card.	

Part 5- The Scheme of Teaching and Examination is as under:

First Year Semester – II Summary

Sr. No.	Choice Based Credit System			Subject Code	Remarks
1	Core Course (Business Statistics – II, Applied Linear Algebra, R programming, (Practicals of US-FDS-201, US-FDS-202, US-FDS-203, US-FDS-204, US-FDS-205)			US-FDS-201, US-FDS-202, US-FDS-203, US-FDS-2P2	
2	Elective Course	Discipline Specific Elective (DSE) Course			
		2.1	Interdisciplinary Specific Elective (IDSE) Course (Database Management System with SQL)	US-FDS-204	
		2.2	Dissertation/Project		
		2.3	Generic Elective (GE) Course		
3	Ability Enhancement Courses (AEC) (Business Analytics)			US-FDS-205	
	Skill Enhancement Courses (SEC)				

First Year Semester -II Internal and External Detailed Evaluation Scheme

Sr. No.	Subject Code	Subject Title	Periods Per Week						Seasonal Evaluation Scheme				Tot al Marks
			Units	S. L.	L	T	P	Credit	S. L. E	CT	TA	SEE	
1	US-FDS-201	Business Statistics- II	3	1/5	3	0	0	3	10	20	10	60	100
2	US-FDS-202	Applied Linear Algebra	3	1/5	3	0	0	3	10	20	10	60	100
3	US-FDS-203	R programming	3	1/5	3	0	0	2	10	20	10	60	100
4	US-FDS-204	Database Management System with SQL	3	1/5	3	0	0	2	10	20	10	60	100
5	US-FDS-205	Business Analytics	3	1/5	3	0	0	2	10	20	10	60	100
6	US-FDS-	Practicals of US-FDS-201,	3 Practical	0	0	0	15	6	0	0	0	50 marks per	150

	2P2	US-FDS-202, US-FDS-203, US-FDS-204, US-FDS-205	per batch									practical	
	Total Hours / Credit							20	Total Marks				650

*** Three hours per week to be taken for CONTINUOUS self -learning Evaluation.**

First Year Semester – II Units – Topics – Teaching Hours

Sr. No.	Subject Code	Subject Title	Periods Per Week						Seasonal Evaluation Scheme				Tot al Marks
			Units	S. L.	L	T	P	Credit	S. L. E	CT	TA	SEE	
1	US-FDS-201	Business Statistics- II	3	1/5	3	0	0	3	10	20	10	60	100
2	US-FDS-202	Applied Linear Algebra	3	1/5	3	0	0	3	10	20	10	60	100
3	US-FDS-203	R programming	3	1/5	3	0	0	2	10	20	10	60	100
4	US-FDS-204	Database Management System with SQL	3	1/5	3	0	0	2	10	20	10	60	100
5	US-FDS-205	Business Analytics	3	1/5	3	0	0	2	10	20	10	60	100
6	US-FDS-2P2	Practicals of US-FDS-201, US-FDS-202, US-FDS-203, US-FDS-204, US-FDS-205	3 Practical per batch	0	0	0	15	6	0	0	0	50 marks per practical	150
	Total Hours / Credit							20	Total Marks				650

- **Lecture Duration =1 Hour.**
- **One Credit =15 hours**

L: Lecture: Tutorials P: Practical Ct-Core Theory, Cp-Core Practical, SLE- Self learning evaluation CT-Commutative Test, SEE- Semester End Examination , PA- Project Assessment, AT- Attendance

Part -6 - Detailed Scheme Theory

Curriculum Topics along with Self-Learning topics - to be covered, through self-learning mode along with the respective Unit. Evaluation of self-learning topics to be undertaken before the concluding lecture instructions of the respective UNIT

US-FDS-201 :Business Statistics- II

Unit	Content	No. of Lectures
1	**Estimation** 1.1 Concept of Parameter, statistic, estimator and estimate. 1.2 Properties of good estimator (Only names), unbiasedness and standard error of an estimator. 1.3 Central Limit theorem (statement only). 1.4 Sampling distribution of sample means and sample proportion (For large sample only).	15

1.5 Standard errors of sample mean and sample proportion.

1.6 Point and Interval estimate of single mean, single proportion, Difference between two population mean and Difference between two population proportions from sample of large size.

1.7 Concept of hypothesis, Simple Hypothesis and composite hypothesis, Null and alternate hypothesis, Types of errors, Critical region, Level of significance.

2 **Statistical Tests**

2.1 Large sample tests (using central limit theorem, if necessary)

a) For testing specified value of population mean
b) For testing specified value in difference of two means
c) For testing specified value of population proportion
d) For testing specified value of difference of population proportion. (Development of critical region is not expected.)

2.2 Applications of t: Test procedure of

a) Test of significance for specified value of mean of Normal population.
b) Test of significance for difference between means of (i) two independent Normal populations with equal variances (ii) Dependent samples (Paired t test)
c) Confidence intervals for (i) Mean of Normal population, (ii) difference between means of two independent Normal populations having the same variance

15

2.3 Applications of Chi-Square: Test procedures of

a) Test of significance for specified value of variance of a Normal population
b) Test for goodness of fit
c) Test Procedure for independence of attributes. (i) r **x** c contingency table, (ii) 2 **x** 2 contingency table.
d) Confidence interval for the variance of a Normal population when (i) mean is known, (ii) mean is unknown.
e) Applications of F: Test procedure for testing equality of variances of two independent Normal populations i. Mean is known ii. Mean is unknown. Confidence interval for ratio of variances of two independent Normal populations.

3 **Analysis of Variance**

Introduction, Uses, Cochran's Theorem (Statement only). One way classification with equal & unequal observations per class, Two way classification with one observation per cell & k observations per cell. Mathematical Model, Assumptions, F-test, Analysis of variance table. Statement of estimators of the parameters, Variance of the estimators, Estimators of treatment contrasts, Standard Error and Confidence

15

limits for elementary treatment contrasts.

Self-Learning topics (Unit wise)

Sub Unit	Topics
1.3	Central Limit theorem (statement only).
1.4	Sampling distribution of sample means and sample proportion (For large sample only).
1.5	Standard errors of sample mean and sample proportion.
1.6	Point and Interval estimate of single mean, single proportion,
1.7	Concept of hypothesis, Simple Hypothesis and composite hypothesis, Null and alternate hypothesis, Types of errors, Critical region, Level of significance.
2.1.3	For testing specified value of population proportion

Online Resources

1. 'Probability and Statistics' by Prof. Somesh Kumar from IIT Kharagpur available on the Swayam portal https://nptel.ac.in/courses/111/105/111105090/
2. 'Statistics for Business Economics' by Dr. Patel from University School of Sciences available on the Swayam portal http://ugcmoocs.inflibnet.ac.in/ugcmoocs/view_module_ug.php/227
3. 'Business Statistics' by Dr Mukesh Kumar Barua from IIT Roorkee available on the Swayam portal https://nptel.ac.in/courses/110/107/110107114/ for unit I and unit II.

US-FDS- 202: Applied Linear Algebra

Unit	Content	No. of Lectures
1	**Matrices** Matrices: Definition, Properties, Basic operations , Determinants of Matrices and applications of determinants for 3rd and Higher order, Inverse of matrix ,Trace of matrix, Partition of matrix, Rank of matrix, echelon forms, canonical form, generalized inverse, Solving linear equations, Characteristic roots and characteristic vectors, properties of characteristics roots , Idempotent matrix, Quadratic forms, positive and Positive semi definite matrix	15
2	**Vector Spaces** 2.1 Definitions and Examples. 2.2 Vector Subspaces. 2.3 Linear Independence. 2.4 Basis and Dimensions of a Vector Space. 2.5 Row and Column Spaces of a matrix. Row rank and Column rank	15
3	**Linear Transformations** 3.1 Definitions and Examples. 3.2 Representation by a matrix. 3.3 Kernel and Image of a Linear Transformation. 3.4 Rank-Nullity theorem.	15

3.5 Linear Isomorphism.
3.6 L (V, W) is a vector space. Dimension of L(V,W) (Statement only)

Self-Learning topics (Unit wise)

Sub Unit	Topics
1	Matrices: Definition, Properties, Basic operations , Determinants of Matrices and applications of determinants for 3rd and Higher order, Inverse of matrix ,Trace of matrix, Partition of matrix, Rank of matrix, echelon forms, canonical form, generalized inverse, Solving linear equations

Online Resources

1. 'Basic Linear Algebra' by Prof. I. K. Rana from IIT Bombay available on the Swayam portal https://nptel.ac.in/courses/111/101/111101115/ for unit 1.
2. 'Linear Algebra' by Prof. Pranav Haridas from Kerala School of Mathematics available on the Swayam portal https://nptel.ac.in/courses/111/106/111106135/
3. 'Introduction to Abstract and Linear Algebra' by Prof. Sourav Mukhopadhyay from IIT Kharagpur available on the Swayam portal https://nptel.ac.in/courses/111/105/111105112/

US-FDS-203: R programming

Unit	Content	No. of Lectures
1	**Fundamentals of R** 1.1 Introduction to R features of R, installation of R, Starting and ending R session, getting help in R , 1.2 Value assigning to variables. 1.3 Basic Operations: +, -, *, ÷, ^, sqrt. 1.4 Numerical functions: log 10, log , sort, max, unique, range, length, var, prod, sum, summary, dim, sort, five num etc. 1.5 Reading and writing data: From and to CSV files and HTML. 1.6 Data Type: Vector, list, matrices, array and data frame 1.7 Variable Type: logical, numeric, integer, complex, character and factor. 1.8 Operations on matrices. 1.9 Control statements: if, if-else, if-else-if, while loop, for loop. 1.10 Defining functions and Printing outputs.	15
2	**Data Handling** 2.1 Data Manipulation: Selecting random N rows, removing duplicate row(s), dropping a variable(s), Renaming variable(s),	15

sub setting data, creating a new variable(s), selecting of random fraction of row(s), appending of row(s) and column(s), simulation of variables.

2.2 Data Processing: Data import and export, setting working directory, checking structure of Data :Str(), Class(),, Changing type of variable (for eg as.factor, as.numeric)

2.3 Introduction to dplyr and data.table packages

2.4 Data Visualisation using simple functions and ggplot: Simple bar diagram, subdivided bar diagram, multiple bar diagram, pie diagram, Box plot for one and more variables, histogram, frequency polygon, scatter plot eg plot(), correlation plot.

3 **Statistical Computing**

3.1 Descriptive Statistics: Averages, Positional Averages, Dispersion, Skewness , Kurtosis, Correlation Curve Fitting and Regression

3.2 Some Probability Distributions: Plotting of pmf/pdf, cdf, computation of probabilities of Binomial, Poisson, Normal, Exponential

3.3 Statistical Tests for t, Chi-square, F and ANOVA

3.4 Operations Research Techniques:

a. Concept and Mathematical Formulation of Linear Programming Problem, Transportation Problems and Assignment Problems. Numerical problems of all above using lpSolve.

15

Self-Learning topics (Unit wise)

Sub Unit	Topics
1.1	Introduction to R features of R, installation of R, Starting and ending R session, getting help in R
1.8	Operations on matrices.
2.4	Data Visualisation using simple functions and ggplot: Simple bar diagram, subdivided bar diagram, multiple bar diagram, pie diagram, Box plot for one and more variables, histogram, frequency polygon, scatter plot eg plot(), correlation plot.
3.1	Descriptive Statistics: Averages, Positional Averages, Dispersion, Skewness , Kurtosis, Correlation Curve Fitting and Regression

Online Resources

1. 'Introduction to R Software' by Prof. Shalabh from IIT Kanpur available on the Swayam portal https://nptel.ac.in/courses/111/104/111104100/
2. 'Descriptive Statistics with R Software' by Prof. Shalabh from IIT Kanpur available on the Swayam portal https://nptel.ac.in/courses/111/104/111104120/ for unit I, unit II and unit III.
3. 'Introduction to R' by Santu Ghosh from Rajiv Gandhi University of Health Sciences available on the Swayam portal

http://ugcmoocs.inflibnet.ac.in/ugcmoocs/view_module_pg.php/1851

US-FDS-204: Database Management System with SQL

Unit	Content	No. of Lectures
1	**Introduction & DBMS Architecture** 1.1 Data, Database, Database management system 1.2 Characteristics of the Database Approach 1.3 Advantages and Disadvantages of DBMS 1.4 Data Models, Categories of Data models, Schemas, Instance and Database states 1.5 Data Independence 1.6 The Three schema architecture 1.7 DBMS language and interface 1.8 Classifications of Database Management Systems	15
2	**Basics of MySQL** 2.1 Introduction of **MySQL** as a DBMS 2.2 Relational Database 2.3 Creating a Database, CREATE Table statement 2.4 SELECT Statement 2.5 COUNT, DISTINCT, LIMIT Statements 2.6 INSERT Statement 2.7 UPDATE and DELETE Statements 2.8 DROP Statement	15
3	**Advanced SQL** 3.1 Using String Patterns, Ranges 3.2 Sorting and Grouping 3.3 Built-in Database Functions 3.4 Date and Time Built-in Functions 3.5 Numeric Built-in Functions 3.6 String Built-in Functions 3.7 Sub-Queries and Nested Selects 3.8 Working with Multiple Tables 3.9 WHERE and HAVING Clause 3.10 LIKE Clause 3.11 Transactions: ROLLBACK and COMMIT	15

Self-Learning topics (Unit wise)

Sub Unit	Topics
1.1	Data, Database, Database management system
1.2	Characteristics of the Database Approach
1.4	Data Models, Categories of Data models, Schemas, Instance and Database states
2.1	Introduction of **MySQL** as a DBMS
2.2	Creating a Database, CREATE Table statement

2.3	SELECT Statement

Online Resources

1. 'Database Management System' by Prof. Partha Pratim Das from IIT Kharagpur available on the Swayam portal https://nptel.ac.in/courses/106/105/106105175/ for unit I and Unit II.
2. 'Fundamentals of database systems' by Prof. Arnab Bhattacharya from IIT Kanpur available on the Swayam portal https://nptel.ac.in/courses/106/104/106104135/
3. 'Introduction to Database Systems' by Prof. Sreenivasa Kumar from IIT Madras University of Health Sciences available on the Swayam portal https://nptel.ac.in/courses/106/106/106106220/

US-FDS-205: Business Analytics

Unit	Content	No. of Lectures
1	**Business Analytics Landscape** 1.1 Overview of Startup Landscape 1.2 Product Lifecycle Management 1.3 Details of Business Analytics 1.4 Competing on Analytics 1.5 Getting started with Business Analytics	15
2	**Introduction to Data Mining** 2.1 Introduction: Basic concept of Data mining, need, challenges and application of Data mining. 2.2 Discussion of Some case studies of data mining. 2.3 On-line Analytical Processing. 2.4 Major Issues in data mining. 2.5 Getting to know your data: data objects and attribute types, basic statistical descriptions of Data, Data Visualization, Measuring Data Similarity and dissimilarity.	15
3	**Data Preparation & Basic Mining tools** 3.1 Data Pre-processing: An Overview, Data Cleaning, Data Integration, Data Reduction, Data transformation and data discretization, Normalization and Smoothing of data. Associations and Correlations: Basic Concepts and methods. 3.2 Classification: Basic concepts decision Tree **3.3** Induction, Rule-Based Classification, Model Evaluation and Selection.	15

Self-Learning topics (Unit wise)

Sub Unit	Topics

2.1	Data Pre-processing: An Overview, Data Cleaning, Data Integration, Data Reduction, Data transformation and data discretization, Normalization and Smoothing of data. Associations and Correlations: Basic Concepts and methods.
2.2	Classification: Basic concepts decision Tree

Online Resources

'Data Mining' by Prof. Pabitra Mitra from IIT Kharagpur available on the Swayam portal https://nptel.ac.in/courses/106/105/106105174/ for unit II.
'Data Mining' by Mr. L. Abraham David from St.John's College, Palayamkottai Tirunelveli available on the Swayam portal http://ugcmoocs.inflibnet.ac.in/ugcmoocs/view_module_ug.php/31
'Business Analytics and Data Mining Modelling using R' by Dr. Gaurav Dixit from IIT Roorkee available on the Swayam portal https://nptel.ac.in/courses/110/107/110107092/
'Business Analytics and Data Mining Modelling using R Part II' by Dr. Gaurav Dixit from IIT Roorkee available on the Swayam portal https://nptel.ac.in/courses/110/107/110107095/

Part – 7- Detailed Scheme Practicals

Practical : US-FDS-2P2
Title of Paper: Practicals of US-FDS-201, US-FDS-202, US-FDS-203, US-FDS-204, US-FDS-205

Unit	Content	No. of Lectures
I	1. Introduction to R Software 2. Descriptive Statistics-I 3. Descriptive Statistics-II 4. Correlation, Curve Fitting and Regression 5. Distributions 6. Statistical Tests 7. ANOVA 8. Operations Research Technique	03 Lectures per Batch per Practical
II	Practicals based on Applied Linear Algebra & Business Analytics	
III	Practicals based on MySQL	

US-FDS-101 Business Statistics- I

References:

1. Medhi J.: Statistical Methods, An Introductory Text, Second Edition, New Age InternationalLtd.
2. Agarwal B.L.: Basic Statistics, New Age InternationalLtd.
3. Spiegel M.R.: Theory and Problems of Statistics, Schaum's Publications series. TataMcGraw-Hill.
4. Kothari C.R.: Research Methodology, Wiley EasternLimited.
5. David S.: Elementary Probability, Cambridge UniversityPress.
6. Hoel P.G.: Introduction to Mathematical Statistics, Asia PublishingHouse.
7. Hogg R.V. and Tannis E.P.: Probability and Statistical Inference. McMillanPublishing Co. Inc.
8. Pitan Jim: Probability, Narosa PublishingHouse.
9. Goon A.M., Gupta M.K., Dasgupta B.: Fundamentals of Statistics, Volume II: The World Press Private Limited,Calcutta.
10. Gupta and Kapoor: Fundamentals of Applied Statistics, S. Chand
11. Gupta and Kapoor: Fundamentals of Mathematical Statistics, S. Chand
12. Sharma S. D.: Operations Research, Kedar Nath Ram Nath
13. Taha Hamdy A.: Operations Research-An Introduction, Tenth Edition, Pearson

US-FDS-102 Mathematical Foundation-I

References:

1. Coddington, E. A. (1989). An introduction to ordinary differential equations. New York: Dover.
2. Raisinghania, M. (2013, Fifteenth Edition). Ordinary and Partial Differential Equations. S. Chand.
3. Rosen, K. (2012, Seventh Edition). Discrete Mathematics and its Applications. Mc Graw Hill.

US-FDS-103 C++ programming

References:

1. Problem Solving with C++ , Walter Savitch, Sixth Edition, Pearson Education
2. J.R.Hubbard, Schaum's outlines "Programming with C++", Second Edition, Tata McGraw-Hill
3. Y.P.Kanetkar, "Let us C++" , seventh edition, BPB publication
4. Object Oriented programming with C++, E Balagurusamy, Third Edition, Tata McGraw Hill.
5. Pure C++ programming, Amir Afzal, Pearson Education.
6. Computer Science – A structured Approach using C++ by B. Forouzan, R. F. Gilberg, Cengage Publication.

US-DS-104 MS Excel

References:

1. Excel Statistics-A Quick Guide, Nel J. Salkind, Sage Publications.

US-FDS-105 Introduction to Cyber Security

References:

1. Introduction to Cyber Security available at http://uou.ac.in/foundation-course
2. Fundamentals of Information Security http://uou.ac.in/progdetail?pid=CEGCS-17
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