Section A:								
Course Code	MAT385							
Course Title	Statistical Inference							
Course Credits	4	**No. of Contact Hours/week**	**L:**	3	**T:**	1	**P:**	0
School	Natural Sciences							
Offered By	Mathematics							
Method of Instruction:	In Person	**Offered in:**	Spring Semester	Full Semster				
Check each box, when applicable, if the course covers one or more of the below listed attributes								
☒	**REALS**	☐	**VELS**	☒	**DISE**			
Prerequisites	Mat285 Probability And Distributions							
Mat184								
Fill this, if applicable: A Similar Course Was Offered With Code ..... In Year								

NOTE:

Section B:This course is offered as (use checkbox) for which Programs			
☒	Major Core for:	B.Sc. Mathematics	Not required
☐	Major Elective for:	Enter The Name Of the Program(S) For Which This Is a Major Elective	Instructor's Approval
☒	UWE for:	All	Not required
☐	Project /UG Thesis / Internship	Any Other Information	Instructor's Approval
☐	CCC for:	Choose a Category	Instructor's Approval
☐	Specialization (If applicable)	Mention The Specialization	Instructor's Approval
☒	Minor (If applicable)	Mathematics	Not required
Estimated No. of Seats:	60	Estimated Number of Sections	1

Section C: State the Program Learning Goals of the Major Degree Program mapped to the Core Course (Applicable to Major Core courses only)
PLG1
PLG2
PLG3, PLG4

Section D: State the Course Objectives / Aim (Specific details of what the course intends to achieve in terms of student knowledge and ability. Items should begin with phrases such as "To provide students with …", "To enable students to …", "To develop students' skills in …" and so on.)
•To develop rigorous foundations in estimation theory and hypothesis testing. •To introduce key properties of estimators, including unbiasedness, consistency, efficiency,and sufficiency. •To explore and compare different estimation techniques such as method of moments andMLE. •To prepare students to formulate and test statistical hypotheses using classical tests. •To introduce non-parametric inference and its applications where assumptions ofparametric tests fail.

Section E: State the Learning Outcomes (A list of what students will know or be able to do as a result of successfully completing the course. Should be expressed as knowledge, skills, or attitudes.)
On successful completion of the course, students will be able to:
•Evaluate Estimators Based On Properties Such As Unbiasness, Efficiency, And Sufficiency. •Apply The Rao-Blackwell And Lehmann-Scheffé Theorems To Derive Mvues. •Perform Estimation Using Method Of Moments And Maximum Likelihood Techniques. •Construct And Interpret Confidence Intervals For Population Parameters. •Formulate Statistical Hypotheses And Apply Relevant Tests. •Understand And Apply Non-Parametric Tests In One And Two-Sample Problems.

Section F: State if course contributes to any skill development
Inferential Analysis Data Analysis

Section G: Module-wise Curriculum Content (Syllabus, Lab work, Project, Term paper, Group work, etc.)

Module 1: Estimation Concepts and Properties (10 hours)
•Concepts of point estimation
•Properties of estimators: unbiasedness, consistency, efficiency, sufficiency
•Factorization theorem
•Rao-Blackwell theorem
•Lehmann–Scheffé theorem
•Minimum Variance Unbiased Estimator (MVUE)
•Rao-Cramér Lower Bound
Module 2: Methods of Estimation (8 hours)
•Method of Moments
•Maximum Likelihood Estimation (MLE): theory and applications
•Properties of MLEs
•Minimum Chi-square method
•Interval estimation: confidence intervals and confidence coefficient (normal case)
Module 3: Statistical Hypothesis (9 hours)
•Concepts: null and alternative hypotheses (simple and composite), Type I and IIerrors, level of significance, power
•Most Powerful and Uniformly Most Powerful tests
•Neyman–Pearson Lemma (statement only)
•Likelihood Ratio Test (LRT): formulation and properties (without proof)
Module 4: Testing of Significance (6 hours)
•z-test, t-test, chi-square test, F-test
•Applications in one and two-sample problems (mean, proportion, variance)
Module 5: Non-Parametric Inference (6 hours)
•Sign test, Signed-rank test, Run test, Kolmogorov-Smirnov test
•Wilcoxon signed-rank test, Mann-Whitney U test
•Comparison with parametric counterparts

Add additional sheet(s), if required

Section H: Text Book(s), Reference book(s) and any other study material

1.Hogg, Tennis, Rao. Probability and Statistical Inference, 7 edition, Pearson publication, 2016
2.Rohatgi, Vijay K., and AK Md Ehsanes Saleh. An introduction to probability and statistics. JohnWiley & Sons, 2015.
3.Mukhopadhyay, Nitis. Introductory statistical inference. Crc Press, 2006.
4.Miller, Irwin and Miller, Marylees (2006): John E. Freund's Mathematical Statistics withApplications, (7th Edn.), Pearson Education, Asia.
5.https://nptel.ac.in – NPTEL courses on "Statistical Inference"
6.https://ocw.mit.edu – MIT OpenCourseWare Statistics

Section I: Please fill in all the rows for the applicable rows. For evaluation component not included in the list, use the last two rows and mention the evaluation component in the corresponding last column. Please see the NOTE below this box for the prorate policy.

	Component	Weightage %	Missed Graded Component Policy	Use of Gen AI policy	Any Other Information
☒	Mid Sem Exam	30.00	Assign marks on a Prorated basi	Prohibited: No Gen AI allowed	prorating only with appropriate permission
☒	End Sem Exam	40.00	I grade awarded on approval fro	Prohibited: No Gen AI allowed	other info
☒	Quiz(s)	10.00	Choose the best n from m comp	Prohibited: No Gen AI allowed	other info
☒	Assignment(s)	10.00	Assign marks on a Prorated basi	Conditional: Access allowed on	other info
☒	Lab	10.00	Retake of Graded Component	Prohibited: No Gen AI allowed	other info
☐	Project	0.00	Please Select	Please Select	other info
☐	Case Studies	0.00	Please Select	Please Select	other info
☐	Group Discussion	0.00	Please Select	Please Select	other info
☐	Any Other Component	0.00	Please Select	Please Select	other info
☐	Any Other Component	0.00	Please Select	Please Select	other info
	Total **Weightage** (%)	100.00			

Note:
a) While you may mark multiple evaluation components for pro-rate. However, if a particular student misses multiple evaluations, *not more than 20% of the evaluation can be prorated for that student*.
b) The best n out of m: Please make sure that n < m.
c) Award of 'I' grade is applicable only in the case of the End-term Exam. Additionally, end-term exams or final assessments cannot be prorated or waived.
d) Individual faculty can decide the prorate policy for each component.
e) 'None' as an option can only be used in exceptional cases, for example lab evaluated by an external expert

<table>
<tr><td colspan="3">Section J: Grading Policy (Tick the one You intend to follow)</td><td colspan="2"></td></tr>
<tr><td>☒</td><td>Relative Grading</td><td colspan="2">Students Scoring Above 90 Will Be Awarded An 'A' Grade. For All Other Scores, Relative Grading Will Be Applied.</td><td>None</td></tr>
<tr><td rowspan="11">☐</td><td rowspan="11">Absolute Grading</td><td>Grade</td><td>Range (replace M's appropriately)</td><td></td></tr>
<tr><td>A</td><td>M1 <= marks <= M2</td><td rowspan="10">Please Mention The Rounding Off Policy And Any Other Information</td></tr>
<tr><td>A-</td><td>M1 <= marks <= M2</td></tr>
<tr><td>B</td><td>M1 <= marks <= M2</td></tr>
<tr><td>B-</td><td>M1 <= marks <= M2</td></tr>
<tr><td>C</td><td>M1 <= marks <= M2</td></tr>
<tr><td>C-</td><td>M1 <= marks <= M2</td></tr>
<tr><td>D</td><td>M1 <= marks <= M2</td></tr>
<tr><td>E</td><td>M1 <= marks <= M2</td></tr>
<tr><td>F</td><td>M1 <= marks <= M2</td></tr>
</table>

Section K: Details about instructors teaching this course. For multiple instructors in a course, mention each name once after the other					
Name of the Instructor(s):	Please Enter Your Full Name Prof XYZ Prof ABC			**Section(s)**	List Sections L1, L2, L3
Office Location	Office K 120 L 325	**Tel. Extension***	999	**Email:**	.....@snu.edu.in abc@snu.edu.in xyz@snu.edu.in
About the Instructor(s): Click Here To Enter About 250 Words about each instructor teaching the course`					

***** - Optional

Section L: Office Hours
Please let the students know the day(s) and time slot(s) for any consultation. You may update this at the start of the semester.

Section M: Any other information
Programming software R/Python will be used for lab component.