th March, 2022

A. Course Handout (Version 1.2) | Last updated on 28

Institute/School/College	Name Chitkara University Institute of Engineering & Technology		
Department/Centre	Department of Applied Sciences		
Programme Name	Bachelor of Engineering- Computer Science & Engineering		
Course Name	Calculus and Statistical Analys	Session	20
Course Code	AM121	Semester/Batch	2nd/2021
Lecture/Tutorial (Per Week)	4-1-0	Course Cre	
Course Coordinator Name	Dr. Krishan Dutt Sharma		

1. Scope & Objective of the Course:

• To provide the ability to apply mathematics for the solution of complex engineering and real lifeproblems.
• To Identify, formulate and analyse the engineering problems.
• To arrive at substantiated conclusions using principles of mathematics are covered. **The main**

objectives of the courses are:

• To design matrices for mathematical problems related to real life and find their solutions. • To analyse functions of two or more variables and compute their derivatives for finding extreme values of surfaces.
• To apply techniques of evaluating double and triple integral to solve various engineering problems. • To implement various hypothesis testing techniques for small and large sample data and calculatecoefficient of correlation, line of regression to describe relation between independent variable anddependent variable.

2. Course Learning Outcome:

CLO01: Students will be able to introduce and form matrices to present mathematical solutions inaconcise and informative manner. Use matrices to solve the problems of systemof linear equations and solve various live problems using matrices.

CLO02: Students will be able to find local extreme values of functions of several variables, test for saddle points, examine the conditions for the existence of absolute extreme values. Solveconstraint problems using Lagrange multipliers and solve related application problems.

CLO03: Students will be able to apply the principles of Integral Calculus to solve a variety of practical problems in Engineering and applied Sciences.

CLO04: Students will be able to interpret statistical inference tasks with the help of probability&distributions and hypothesis testing for means, variances and proportions of large as well assmall data and employ appropriate regression models in determining statistical relationships.

Course Learning Outcomes	**PO1**							**PO6 PO7**			**PO1**	**PO11**
CLO1		H		H	H							
CLO2		H		H								

CLO3		H		M								H
CLO4		H		H								M

PO12

3. Recommended Books (Reference Books/Text Books):

B01: Advanced Engineering Mathematics, Erwin Kreyszig, Wiley India Pvt. Ltd.
B02: Engineering Mathematics, Srimanta Pal &Subodh C. Bhunia, Edition 2015, Oxford University Press.

B03: The Engineering Mathematics, 2nd Edition, Chitkara University Publication, Vol. I. B04: Higher Engineering Mathematics, B.V. Ramana, Tata McGraw-Hill Education. B05: Advanced Engineering Mathematics, R.K. Jain and S.R.K. Iyengar, Alpha Science International Ltd.
B06: Higher Engineering Mathematics, B.S. Grewal, Khanna Publications.
B07: A text book of Engineering Mathematics, N. P. Bali and Manish Goyal, Laxmi Publications. B08: Calculus, by Howard Anton, Irl Bivens Stephens Davis.
B09: Advanced Engineering Mathematics, H.C. Taneja, I.K. International, Vol I.

th edition, SheldonM.

B10: Introduction to Probability and Statistics for Engineers and Scientists 4 Ross, Academic Press, Elsevier.

4. Other readings & relevant websites:

S.N.	Link of Jou
1.	http://www.npte
2.	http://www.npte
3.	http://www.npte
4.	http://mathinsig
5.	http://www.study ir-applications
6.	www.intmath.co
7.	http://nptel.ac.ir

5. Course Plan:

a. Lecture Plan

Lect.	Topics
1	**Prerequisite** Differentiation: definite (integra formulae sine a
2	**Matrices**: Revie Elementaryoper
3	Solu
4	Ch
5	Diagonalization,
6	**Introduction to** variables,Limit a
7	

8	Tangent an Implicit Functions
9	Total de
10	Jacobians wi Series(one & two var
11	Appl andvariables

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12	Lagrange's method of Undetermined Multipliers	B4
13	Sketch some standard Cartesian and Polar curves usingtracing - Cardiod, Leminscate, Folium of Descartes, Three/FourLeaved Rose, Limacon Cissoid,	B4 Curve
14-15	**Multiple Integration and its Applications:** Reduction formulas, Introduction to Double Integration using Cartesian &coordinate	B4 polar
	Formative Assessment-2(Syllabus covered from 10	
16-17	Change of order in double integration, IntroductionIntegration	to TripleB4
18	Change of variables in Polar, Cylindrical and Spherical Coordinates	B4
19-20	Applications of multiple integral to find Area enclosedcurves	by PlaneB4
21-22	Applications of multiple integral to find Volume,Moment of Inertia,Centroid, Centre of Gravity	B4
23	Improper integrals of first and second kind, Special Functions:and Gamma functions	BetaB4
	ST-2 (Syllabus covered from Lecture 10 to 23)	
24	**Probability and Statistical Methods:** Random and continuous), Binomial, Poisson	variable(discret eB5
25	Normal, exponential distribution.	B5
26-27	Hypothesis Testing (General concepts, Testing a Statisticalhypothesis, one and two tailed tests, Critical region, Confidenceinterval estimation, Single and two sample tests on pro mean and variance	B5
28-29	Sampling Distribution of means and variance, t-distribution	andB5

	F-distribution,	
30	Correlation ,lines of regression(two variable only)	B5
	END TERM – FULL SYLLABUS	

Calculus & Statistical Analysis/AM121

6. Delivery/Instructional Resources:

Lecture No.	Topics	PPT *(link of pptson theserver)*			
			1	Prerequisite Differentiation: Geometricalinterpretation of derivative, Indefinite and definite(integration by substitution,by parts, by partia fraction),Reduction formulaec (with limit 0	https://docs.g oogle.com /presentati on/d/ 1vrZY0sHDOg 7ylrsnt7PZzQS

		WQNZbDSDU/ sine and edit – π/2)

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1-5	Matrices: Review and determinants, Elementary operations, rank,Inverse of matrix, Normalform Solution of a systemequations rankCharacteristics equationsC Hamiltontheorem(without pro values and vectorsDiagonalizat Quadraticform & Canonical for	https://docs.g of matrices oogle.com /presentati on/d/ 1vrZY0sHD Og7ylrsnt7 PZzQS WQNZbDSDU/ c edit ,	NA	https://n ptel.ac.in /cours es/122/104/ 122104018/	https://npt el.ac.in/ courses/ 122/1 04/122104 018/
6-12	Introduction to Derivatives: Function several variables, Limit andcontinuity Partial Differentiation, Euler'sTheoren Tangent and Normal, PartialDe CompositeFunctions, Implicit FunctionsTotal derivatives, Erro &Approximation. Jacobianswit properties, Taylor'sSeries Expa Maclaurin'sSeries (one & two v Application: Maxima Minima of functions of twoand three variablesLagrange's methodUndetermined Multipl	https://do cs.google.c om/pr of esentation/ d/1vrZY0sH DOg7ylrsnt 7PZzQS WQNZbDSDU/ edit and of	NA	https://np l.ac.in/cours es/111/107/ 111107108/	https://npt el.ac.in/ courses/ 111/1 07/111107 108/

13	Sketch some standa Cartesian and Polar curvesusin tracing - Cardiod, Leminscate, Descartes, Three/Four Leaved Limacon Cissoid,	https://do cs.google.c om/pr esentation /d/1vrZY0s HDOg of 7ylrsnt7PZzQS bDSDU/ edit	NA	https://w w.youtube.c om/watch?v =OAEjSiFG d hQ	https:// www.yo utube.co m/watc h?v=IAb 98ZgSJN w
14-23	Multiple Integration Applications: Reductionformulas, Introduction Double Integration usingCa polar coordinateChange of doubleintegration, Introductio Triple Integration. Changevaria in Polar, Cylindricaland Spheric Coordinates.Applications of multipleintegral to find Areaby curvesApplications of multipleintegral to find Volume Moment of Inertia, Centroid,C of Gravity. Improper	https://docs.g and its oogle.com/pr esentation / d / t d 1vrZY0sHD Og7ylrsnt7 PZzQSWQN ZbDSDU/ed it to of enclosed	NA	https://npt l.ac.in/cours es/111/107/ 111107108/	https://npt el.ac.in/ courses/ 111/1 07/111107 108/

	integrals of first andkind, Spec Functions: Betaand Gamma functions.	second			
23-	30 Probability and StatisticalMethods: Random variable(discrete andcontinuou Binomial, Poisson Normal, exponential distribution. Hypothesis Testing (Generalco Testing a Statisticalhypothesis, andtailed tests, Critical region,Confidence interval esti Single andsample tests on prop mean and varianceSampling Distributionmeans and varianc t-distribution and F- distributio Correlation ,lines ofregression(variable	https://do cs.google.c om/presen tation/d/ 1vrZY0sH DOg 7ylrsnt7PZz QSWQNZb DSDU/edit two two of only)	NA	https://np l.ac.in/cours es/111/105/ 111105041/	https://npt el.ac.in/ courses/ 111/1 05/111105 041/

7. Action plan for different types of learners:

Slow Learners	
Extra Class on Saturday.	

* Out of 2 ST's the ERP system automatically picks the best 01 ST mark for evaluation.
Out of 2 FA's the ERP system automatically picks the best 01 FA marks for evaluation. **Details of Evaluation Components:

Evaluation Component	Description	C
Component 01		

8. Evaluation Scheme & Components:

Evaluation Component	Type of Component
Component	1 Formative Assessments(F **of**
Component	2 Sessional Tests
Component	3 End Term
	Total

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Component 02		Upto	40% 25th Marc	2022 30%
		41%	- 80% 16th April 202	
Component 03	End Term Examina		26th April 2022	60%
Total				100%

*As per Academic Guidelines minimum 75% attendance is required to become eligible for appearinginthe End Semester Examination.

Evaluation Components of Sessional Test and End Term Examination

Type Assessment	Time of Condu of	Marks	
Sessional Tes	1-9 Lecture	40	
Sessional Tes	10-23 Lectur	4	
	End Term Ex		

9. Syllabus of the Course:

Contents
Unit 1Matrices: Review of matrices and determinants, Elemer Inverse of matrix, Normal form, Cayley Hamilton theorem(wit system of linear equations by using rank, Characteristicsequat vectors, Diagonalization, Canonical form,Quadratic form.

Unit 2 Partial Differentiation & its Applications: Introduction to several variables, Limit and continuityDifferentiation, Euler's Th Error & Approximation, Tangent and Normal. Partial Derivative ImplicitFunctions, Jacobians(with properties), Taylor's Series Ex (one and two variables).Application: Maxima and Minima of fu variables, Lagrange's method of Undetermined Multipliers.

Unit 3 Multiple Integration and its Applications:**CurveTracing:**c Cissoid, cardiod, Lemniscate, Folium of Descartes, Three/Four L to Double IntegrationCartesian & polar coordinate, Change of c integration,Introduction to Triple Integration ,Change of variabl andSpherical Coordinates , Applications of multiple integral to f ,Applications of multiple integral to find Volume, MomentInerti Improper integrals of first and secondkind , Special Functions: E

Unit 4 Probability and Statistical Methods: Random variable (discretecontinuous), Binomial, Poisson, Normal, exponential distribution. SamplingDistribution of mea variance, t-distribution anddistribution,Hypothesis Testing (General concepts, Test Statisticalhypothesis, one and two tailed tests, Critical region, Confidenceestimati Single and two sample tests on proportion), mean andvariance .correlation ,lines regression(two variable only)	**7**	

This Document is approved by:

Designation	**Name**	**Signature**
Course Coordinator	Dr. Krishan Dutt Sharma	
Pr	Dr. Reetu Malhothra	
Dean	Dr. Mohit Kumar Kakkar	
DD/MM/YYYY	28/03/2023	