

COURSE DELIVERY PLAN - THEORY

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Department of Applied Mathematics Academic year 2022 – 2023	LP: MA22181 Rev. No: 00	
M.Tech: Biotechnology	Regulation: 2022	Date: 08.11.2022
Sub. Code / Sub. Name : MA22181 Mathematics for Biotechn		
Unit : l		

Unit Syllabus: NUMERICAL DIFFERENTIATION AND INTEGRATION

Approximation of derivatives using interpolation polynomials: Lagrange's interpolation - Newton's divided difference interpolation-Newton's forward and backward difference formulae-Numerical integration using Trapezoidal, Simpson's 1/3 rule - Two point and three point Gaussian quadrature formulae – Evaluation of double integrals by Trapezoidal and Simpson's 1/3 rules.

Objective: The Student should be made to find the numerical solution of differentiation and integration.

Session No *	Topics to be covered	Ref	Teaching Aids
1	Introduction for unit syllabus	1-Ch.5; Pg. 320-348	Pen Tablet/ BB
2	Approximation of derivation using interpolation polynomial for equal intervals.	1-Ch.5; Pg. 320-348	Pen Tablet/ BB
3	Approximation of derivation using interpolation polynomial for unequal intervals.	1-Ch.5; Pg. 320-348	Pen Tablet/ BB
4	Tutorial class	1-Ch.5; Pg. 320-348	Pen Tablet/ BB
5	Numerical Integration by Trapezoidal rule and problems	1-Ch.5; Pg. 348-360	Pen Tablet/ BB
6	Numerical Integration by Simpson's 1/3 rule and problems	1-Ch.5; Pg. 348-360	Pen Tablet/ BB
7	Tutorial class	1-Ch.5; Pg. 348-360	Pen Tablet/ BB
8	Two and three point Gaussian quadrature formulas and problems	1 -Ch.5; Pg. 360 – 368	Pen Tablet/ BB
9	More problems based on Two and three point Gaussian quadrature formulas and problems	1 -Ch.5; Pg. 360 – 368	Pen Tablet/ BB
10	Double integration by Trapezoidal method and Problems	1 -Ch.5; Pg. 393 – 402	Pen Tablet/ BB
11	Double integration by Simpson's 1/3rules and Problems	1 -Ch.5; Pg. 393 – 402	Pen Tablet/ BB
12	Tutorial class	1 -Ch.5; Pg. 393 – 402	Pen Tablet/ BB
Content beyond syllabus covered (if any):			

* Session duration: 50 minutes



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Sub. Code / Sub. Name: MA22181 Mathematics for Biotechnologists

Unit : II

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Unit Syllabus: NUMERICAL SOLUTION OF LINEAR SYSTEM OF EQUATIONS AND ORDINARY DIFFERENTIAL EQUATIONS

Solution of linear system of equations – Pivoting techniques - Gauss elimination method - Gauss Jordan method-Solution of initial value problems for ODE: Single Step methods - Taylor's series method - Fourth order Runge-Kutta method for solving first order equations and simultaneous first order equations – Multi step methods - Milne's and Adams- Bash forth predictor corrector methods for solving first order equations.

Objective: The Student should be made to gain knowledge of the numerical solution of algebraic equations and ordinary differential equations.

No *	Topics to be covered	Ref	Teaching Aids
13	Introduction of unit syllabus and Pivoting techniques.	1 -Ch.3; Pg. 115 – 116	Pen Tablet/ BB
14	Solution to linear system of equation by Gauss elimination method	1 -Ch.3; Pg. 116 - 119	Pen Tablet/
15	Solution to linear system of equation by Gauss Jordan method	1 -Ch.3; Pg. 119 – 120	Pen Tablet/
16	Tutorial class	1 -Ch.3; Pg. 142 – 143	Pen Tablet/ BB
17	Taylor's series method and Problems	1 -Ch.6; Pg. 435 – 437	Pen Tablet/ BB
18	Fourth order Runge-Kutta method for solving first order equations	1 -Ch.6; Pg. 438 – 456	Pen Tablet/ BB
19	Fourth order Runge-Kutta method for solving simultaneous first order equations	1 -Ch.6; Pg. 459 – 469	Pen Tablet/ BB
20	Tutorial class	1 -Ch.6; Pg. 477 – 485	Pen Tablet/ BB
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21	Milne's predictor corrector methods for solving first order ordinary differential equations.	1 -Ch.6; Pg. 493 – 498	Pen Tablet/
22	Adams- Bash forth predictor corrector methods for solving first order differential equations.	1 -Ch.6; Pg. 487 – 493	Pen Tablet/
23	More problems based on Milne's and Adams- Bash forth predictor corrector methods.	1 -Ch.6; Pg. 541 – 543	Pen Tablet/ BB
24	Tutorial class	1 -Ch.6; Pg. 541 – 543	Pen Tablet/ BB
Content beyond syllabus covered (if any):			



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Sub. Code / Sub. Name: MA22181 Mathematics for Biotechnologists

Unit : III

Unit Syllabus: TESTING OF HYPOTHESIS

Sampling distributions and Standard error– Type I and Type II errors – Critical region– Tests based on Normal, t, χ^2 and F distributions- Non-parametric test (concept only).

Objective: The Student should be made to select the appropriate statistical procedure and apply relevant statistical tests depending on the data provided.

Session No *	Topics to be covered	Ref	Teaching Aids
25	Introduction and Concept of sampling, Standard error- Type I2-Ch.6;Penand Type II errors - Critical region.Pg. 193-209BB		Pen Tablet/ BB
26	Large sample test: Testing of hypothesis for difference between population mean and sample mean	2-Ch.7; Pg. 215-240	Pen Tablet/ BB
27	Large sample test: Testing of hypothesis for difference between two sample means	2-Ch.7; Pg. 241-262	Pen Tablet/ BB
28	Large sample test: Testing of hypothesis for difference between population proportion and sample proportion.	2-Ch.9; Pg. 280-287	Pen Tablet/ BB
29	Large sample test: Testing of hypothesis for difference between two sample proportions.	2-Ch.9; Pg. 287-290	Pen Tablet/ BB
30	Tutorial class	2-Ch.7; Pg. 260-263	Pen Tablet/ BB
31	Small sample test: Student –t-test(population mean and sample mean)	2-Ch.7; Pg. 250-253	Pen Tablet/ BB
32	Small sample test: Student -t-test (two sample means)	2-Ch.7; Pg. 250-253	Pen Tablet/ BB
33	Tutorial class	2-Ch.7; Pg. 260-263	Pen Tablet/ BB
34	Small sample test: F-test between variances	2-Ch.8; Pg. 270-278	Pen Tablet/ BB
35	Small sample test: Chi-square distribution and Chi-square test(goodness of fit)	2-Ch.9; Pg. 288-294	Pen Tablet/ BB
36	Small sample test: Chi-square distribution and Chi-square test(goodness of fit) and Non-parametric test (concept only).	3-Ch.9; Pg. 294-297	Pen Tablet/ BB
	CAT - II		
Content beyond syllabus covered (if any):			

* Session duration: 50 mins



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Sub. Code / Sub. Name: MA22181 Mathematics for Biotechnologists

Unit : IV

Unit Syllabus: CURVE FITTING

Correlation coefficient, properties-problems-Regression equations and problems- curve fitting by the method of least squares-fitting curves of the form y = ax + b, $y = ax^2 + bx + cy$, $y = ab^x$ and $y = ax^b$ - Bivariate correlation application to biological problems.

Objective: The Student should be made to acquire knowledge of statistical principles/methods in topics such as Correlation coefficient, Regression equations, and curve fitting.

Session No *	Topics to be covered	Ref	Teaching Aids
37	Introduction to Correlation coefficient and its properties	2-Ch.11; Pg. 363-367	Pen Tablet/ BB
38	Problems based on Correlation coefficient.	2-Ch.11; Pg. 363-367	Pen Tablet/ BB
39	Tutorial class	2-Ch.11; Pg. 363-367	Pen Tablet/ BB
40	Regression equations problems	2-Ch.11; Pg. 346-377	Pen Tablet/ BB
41	Problems based on that Regression equations	2-Ch.11; Pg. 346-377	Pen Tablet/ BB
42	Tutorial class	2-Ch.11; Pg. 339-341	Pen Tablet/ BB
43	Curve fitting by the method of least squares-fitting curves of the form $y = ay + b$	2-Ch.11;	Pen Tablet/
	the isin $y = ax + b$	Fg. 324-331	a da
44	Fitting curves of the form $y = ax^2 + bx + c$	Pg. 324-331 2-Ch.11; Pg. 324-331	Pen Tablet/ BB
44	Fitting curves of the form $y = ax^2 + bx + c$ Fitting curves of the form $y = ab^x$	Pg. 324-331 2-Ch.11; Pg. 324-331 2-Ch.11; Pg. 324-331	Pen Tablet/ BB Pen Tablet/ BB
44 45 46	Fitting curves of the form $y = ax^2 + bx + c$ Fitting curves of the form $y = ab^x$ Fitting curves of the form $y = ax^b$	Pg. 324-331 2-Ch.11; Pg. 324-331 2-Ch.11; Pg. 324-331 2-Ch.11; Pg. 324-331	Pen Tablet/ BB Pen Tablet/ BB Pen Tablet/ BB
44 45 46 47	Fitting curves of the form $y = ax^2 + bx + c$ Fitting curves of the form $y = ab^x$ Fitting curves of the form $y = ax^b$ Tutorial class	Pg. 324-331 2-Ch.11; Pg. 324-331	Pen Tablet/ BB Pen Tablet/ BB Pen Tablet/ BB Pen Tablet/ BB
44 45 46 47 48	Fitting curves of the form $y = ax^2 + bx + c$ Fitting curves of the form $y = ab^x$ Fitting curves of the form $y = ax^b$ Tutorial class Bivariate correlation application to biological problems	Pg. 324-331 2-Ch.11; Pg. 339-341 2-Ch.11; Pg. 324-377	Pen Tablet/ BB Pen Tablet/ BB Pen Tablet/ BB Pen Tablet/ BB

* Session duration: 50 mins



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Sub. Code / Sub. Name: MA22181 Mathematics for Biotechnologists

Unit : V

Unit Syllabus: ANALYSIS OF VARIANCE

Basic principles of experimentation-Analysis of variance-One-way classification – Completely Randomised design - Two-way classifications - Randomised block design-multiple comparison- Latin square design-problems.

Objective: The Student should be made to analyze the various designs of experiments.

Session No *	Topics to be covered	Ref	Teaching Aids
49	Introduction to the design of experiments and Basic principles of experimentation	2 -Ch.12; Pg.384-386	Pen Tablet/ BB
50	ANOVA One way classification	2 -Ch.12; Pg.387-403	Pen Tablet/ BB
51	ANOVA Two way classification	2 -Ch.12; Pg.404-411	Pen Tablet/ BB
52	Completely randomized design	2 -Ch.12; Pg.387-403	Pen Tablet/ BB
53	More problems in Completely randomized design	2 -Ch.12; Pg.387-403	Pen Tablet/ BB
54	Tutorial class	2 -Ch.12; Pg.415418	Pen Tablet/ BB
55	Randomized block design	2 -Ch.12; Pg.404-411	Pen Tablet/ BB
56	More problems in Randomized block design	2 -Ch.12; Pg.404-411	Pen Tablet/ BB
57	Tutorial class	2 -Ch.12; Pg.415424	Pen Tablet/ BB
58	Latin square design	2 -Ch.12; Pg.415424	Pen Tablet/ BB
59	More problems in Latin square design	2 -Ch.12; Pg.425426	Pen Tablet/ BB
60	Tutorial class	2 -Ch.12; Pg.425426	Pen Tablet/ BB
	CAT - III		
Content beyond syllabus covered (if any):			

* Session duration: 50 mins



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TEXT BOOKS:

1. Jain M.K., Iyengar, S.R.K. and Jain R.K. "Numerical Methods for Scientific and Engineering

Computation", 6th Edition, New Age International Pvt. Ltd., Delhi, 2015.

2. Richard A. Johnson, "Miller and Freund's Probability and Statistics for Engineers, Pearson Education, Asia, 8rd Edition, 2013.

REFERENCES:

- 3. Gupta S.K., "Numerical Methods for Engineers", 3rd Edition, New Age international Publishers, 2015.
- 4. Saumyen Guha and Rajesh Srivastava, "Numerical methods for Engineering and Science", Oxford Higher Education, New Delhi, 2015.
- 5. Gupta S.C. and Kapoor V.K.," Fundamentals of Mathematical Statistics",11th Edition, Sultan Chand and Sons, New Delhi, 2005.
- 6. Ross, S. M., "Introduction to Probability and Statistics for Engineers and Scientists", 3rd Edition, Elsevier, 2005.

WEB LINKS:

- 1. https://nptel.ac.in/courses/111/107/111107105/
- 2. https://nptel.ac.in/courses/103/106/103106112/

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Date	08.11.2022	08.11.2022	
Remarks *: The same Lesson Plan may be used for MA22181 Mathematics for Biotechnologists in the subsequent semester (Regulation 2022)			

Remarks *:

* If the same lesson plan is followed in the subsequent semester/year it should be mentioned and signed by the Faculty and the HOD