OFFICE OF THE REGISTRAR : DIBRUGARH UNIVERSITY : DIBRUGARH

Ref. No. DU/JR-A/6-1/22/252 Date: 22.03.2022

NOTIFICATION

As recommended by the Board of Studies in Mathematics, Dibrugarh University, the 124th Meeting of the Under Graduate Board, Dibrugarh University held on 10.02.2022 vide Resolution No (09) has approved the following partially modified Course Structure & Syllabi of the B.A./B.Sc. Programme in Mathematics (CBCS) .

a) *A portion of the Paper **C3.3 PDE & System of ODE** is omitted to avoid repetition in paper **C4.1 Numerical Method (in UG 3rd Semester).***

b) *The content of the Paper **DSE1.3: Financial Mathematics** of B.A./B.C. Programme is revised **(in UG 5th Semester)***

The Course Structure & Syllabi approved as above are enclosed herewith **Annexure - A.**

Issued with due approval.

(Dr. B.C. Borah)
Joint Registrar (Academic)
Dibrugarh University.

Copy to:

1. The Vice-Chancellor, Dibrugarh University for favour of information.
2. The Deans, Dibrugarh University, for favour of information.
3. The Registrar, Dibrugarh University for favour of information.
4. The Head, Department of Mathematics, Dibrugarh University for kind of information.
5. The Controller of Examinations, Dibrugarh University. The Copies of the syllabuses are enclosed herewith.
6. The Inspector of Colleges i/c, Dibrugarh University, for information.
7. All Principals / Directors of the Colleges / Institutions affiliated to / permitted by the Dibrugarh University, for information.
8. The Academic Officer, Dibrugarh University, for information.
9. The Programmer, Dibrugarh University for kind information and with a request to upload the Notification in the University website.
10. File.

(Dr. B.C. Borah)
Joint Registrar (Academic)
Dibrugarh University.

C3.3 PDE and Systems of ODE
Total Marks: 100, Theory: 60, IA: 20, Practical: 20
Credit: 4+2=6;
(L=4, P=4, T=0)

Objectives: After going through this course the students will be able to

- make mathematical formulations and their solutions of various physical problems;
- design mathematical models used in heat, wave.
- Describe the Laplace equation and their solutions.

Unit-1

Marks: 25, Contact hrs: 25

Partial Differential Equations – Basic concepts and Definitions, Mathematical Problems. First- Order Equations: Classification, Construction and Geometrical Interpretation. Method of Characteristics for obtaining General Solution of Quasi Linear Equations. Non-linear partial differential equations, Charpit's method & Jacobi's method Canonical Forms of First-order Linear Equations. Method of Separation of Variables for solving first order partial differential equations.

Unit-2

Marks: 12, Contact hrs: 10

Classifications of second order linear equations as hyperbolic, parabolic or elliptic. Derivations of Heat equation, Wave equation and Laplace equation and their solutions Reduction of second order Linear Equations to canonical forms.

Unit-3

Marks: 8, Contact hrs: 10

Method of separation of variables, Solving the Vibrating String Problem, Solving the Heat Conduction problem

Unit-4

Marks: 15, Contact hrs: 15

Systems of linear differential equations, types of linear systems, differential operators, an operator method for linear systems with constant coefficients, Basic Theory of linear systems in normal form, homogeneous linear systems with constant coefficients: Two Equations in two unknown functions.The method of successive approximations.

List of Practicals (using any software) **Marks: 20** Contact hrs. 30

(i) Solution of Cauchy problem for first order PDE.
(ii) Finding the characteristics for the first order PDE
(iii) Plot the integral surfaces of a given first order PDE with initial data.

(iv) Solution of wave equation $\frac{\partial^2 u}{\partial t^2} - c^2 \frac{\partial^2 u}{\partial x^2} = 0$ for the following associate conditions

(a) $u(x,0) = \varphi(x)$, $u_t(x,0) = \psi(x)$, $x \in R, t \to 0$

(b) $u(x,0) = \varphi(x)$, $u_t(x,0) = \psi(x)$, $u(0,t) = 0$, $x \in (0,\infty), t > 0$

(c) $u(x,0) = \phi(x)$, $u_t(x,0) = \psi(x)$, $u(x,0) = 0$, $x \in (0,\infty), t > 0$;

(d) $u(x,0) = \phi(x)$, $u_t(x,0) = \psi(x)$, $u(0,t) = 0$, $u(1,t) = 0$, $0 < x < l, l > 0$

(v) Solution of wave equation $\frac{\partial u}{\partial t} - k^2 \frac{\partial^2 u}{\partial x^2} = 0$ for the following associate conditions

(a) $u(x,0) = \varphi(x)$, $u(0,t) = a$, $u(l,t) = b$, $0 < x < l, t > 0$

(b) $u(x,0) = \varphi(x)$, $x \in R, T > t > 0$

(c) $u(x,0) = \varphi(x)$, $u(0,t) = a$, $x \in (0,\infty), t \geq 0$;

Text Books:

1. S.L. Ross, *Differential equations,* 3rd Ed., John Wiley and Sons, India,2004.
2. I. N. Sneddon, Elements of Partial Differential Equations, Dover Publications, 2006.

Reference Books:

1. T. Myint-U and L. Debnath, *Linear Partial Differential Equations for Scientists and Engineers,* 4th edition, Springer, Indian reprint,2006.
2. M. L Abell, J. P Braselton, *Differential equations with MATHEMATICA,* 3rd Ed., Elsevier Academic Press,2004.

Guideline:

Unit 1 [2] Chapter 2
Unit 2 [1] Chapter 14.1,14.3
Unit 4 [1] Chapter 7.1 –7.4; 8.3, 8.4

DSE 1.3 Financial Mathematics
Total Marks: 100, Theory:80. IA: 20
Credit: 5+1=6
(L=5, P=0, T=1)

Objectives: After going through this course the students will be able to

- Apply models to financial market
- Ability to use mathematical tools to market economy.

Unit 1:

Contact Hrs:10 hours, Marks:10

Mathematical models in economics: Introduction, A model of the market, Market equilibrium, Excise tax. The elements of finance: Interest and capital growth, Income generation, The Interval of compounding.
[1] Chapters1(1.1-1.4), 4

Unit 2:

Contact Hrs: 10 hours Marks :8

The Cobweb model: How stable is market equilibrium? An example, The general linear case, Economic interpretation.
[1] Chapter5

Unit 3:

Contact Hrs: 10 hours Marks :8

Introduction to optimization: Profit maximization, Critical points, Optimization in an interval.
[1] Chapter 8(8.1-8.3)

Unit 4:

Contact Hrs: 12 hours Marks :12

The derivative in economics: Elasticity of demand, profit maximization, Competition versus monopoly, The efficient small firm, startup and breakeven points.
[1] Chapters 9,10

Unit 5:

Contact Hrs: 10 hours Marks :10

Optimization in two variables: Profit maximization, How prices are related to quantities? Critical points, Maxima, Minima and saddle points, classification of critical points.
[1] Chapter 13

Unit 6:

Contact Hrs: 13 hours Marks :12

Matrix algebra: How to make money with matrices. Linear equations: A two-industry economy. The input-output model: An economy with many industries, the technology matrix.
[1] Chapters15(15.3), 16(16.1), 19(19.1,19.2)

Unit 7:

Contact Hrs: 10 hours Marks :6

Introduction to investment Science: Cash flow, investment and markets, comparison principle, arbitrage, risk aversion. Typical investment problems: Pricing, Hedging, pure investment.
[2] Chapter 1(1.1-1.3)

Unit 8:

Contact Hrs: 15 hours, Marks :14

Basic theory of interest: Principal and interest,compound interest, compounding at various intervals, continuous compounding, present value, present and future values of streams, internal rate of return, Evaluation criteria. The market for future cash: Savings deposits, money market instruments, various bonds, Bond details, Yield, duration, Macaulay duration.

[2] Chapters 2(2.1-2.5), 3(3.1,3.3-3.5)

Text books:

[1] Mathematics for Economics and Finance: Methods and Modelling.
Martin Anthony and Norman Biggs: Cambridge University Press: Reprinted 2009:
ISBN 978- 0 -521 -683197
[2] Investment Science: David G. Luenberger: Stanford University: 1998
ISBN 0 -19-510809 -4

Reference books:

1. An elementary Introduction to Mathematical Finance, S. Ross, 2nd Edition, Cambridge University Press, USA, 2003.