VISVESVARAYA TECHNOLOGICAL UNIVERSITY, BELAGAVI
Fourth Semester B.E Mathematics Syllabus
for All Branches Except CS & ME Allied Branches
Complex Analysis, Probability and Statistical Methods- 21MAT41
(Effective from the academic year 2022-23)

Topics	Topics to be covered	Hours
MODULE- 1 (Complex Analysis)		
Complex Analysis: Review of a function of a complex variable, limits, continuity and differentiability. Analytic functions: Cauchy-Riemann equations in Cartesian and polar forms and consequences. Construction of analytic functions by Milne-Thomson method, Problems.	Discussion restricted to problems in Articles No. 20.1, 20.2, 20.3, 20.4, 20.5 & 20.6 of Textbook 1.	**2L**
Complex integration: Line integral of a complex function, Cauchy's theorem and Cauchy's integral formula and problems.	Discussion of statements and proofs of the theorems and problems in Articles No 20.12, 20.13 & 20.14 of Textbook 1.	**2L**
Tutorials	i) Involvement of faculty and students in identifying the problems & solutions. ii) **PPT presentations by the faculty about the applications of the module** iii) Guidance to the students for self-study topics through illustrative examples.	**4T**
Self-Study: Conformal transformations: Discussion of transformations: $w = z^2, w = e^z, w = z + 1/z$. Bilinear transformations-Problems.	**Articles No. 20.8 and 20.9 of Textbook 1.** **1. No Question is to be set for SEE.** **2. 20% weightage shall be given to CIE from self-study topics.**	
RBT Levels : L1, L2 & L3	**Total**	**8 hours**
MODULE-2 (Special functions)		
Series solution of Bessel's differential equation leading to $J_n(x)$ Bessel's function of the first kind, Properties, Orthogonality of Bessel's functions.	Discussion restricted to problems in Articles No.16.5, 16.8 $[J_{1/2}(x) \ and \ J_{-1/2}(x)only]$ and 16.11 of Textbook 1.	**3L**
Series solution of Legendre's differential equation leading to $P_n(x)$-Legendre polynomials. Rodrigues's formula (without proof), problems.	Discussion of Problems in Articles No.16.13 & 16.14 of Textbook 1	**1L**
Tutorials	i) Involvement of faculty and students in identifying the problems & solutions. ii) **PPT presentations by the faculty about the applications of the module.** iii)Guidance to the students for self-study topics through illustrative examples.	**4T**
Self-Study: Recurrence Relations.	**Articles No. 16.6 and 16.16 of Textbook 1.** 1. **No Question is to be set for SEE** 2. **20% weightage shall be given to CIE from self-study topics**	
(RBTLevels:L1,L2&L3)	**Total**	**8hours**
MODULE-3: Statistical Methods		

Correlation and regression-Karl Pearson's coefficient of correlation and rank correlation, problems. Regression analysis, lines of regression, problems.	Discussion is restricted to problems in Articles 25.12, 25.13, 25.14, & 25.16 of Textbook 1	**2L**
Curve Fitting: Curve fitting by the method of least squares, fitting the curves of the forms $y = ax + b$, $y = ax^b$ and $y = ax^2 + bx + c$.	Discussion is restricted to problems in Articles No. 24.4, 24.5 & 24.6(1) of Textbook 1	**2L**
Tutorials	i) Involvement of faculty and students in identifying the problems & solutions. ii) **PPT presentations by the faculty about the applications of the module** iii) Guidance to the students for self-study topics through illustrative examples.	**4T**
Self-Study: Angle between two regression lines, problems.	**Article No. 25.14 of Textbook 1.** 1. **No Question is to be set for SEE** 2. **20% weightage shall be given to CIE from self-study topics**	
RBT Levels: L1, L2 & L3	**Total**	**8hours**
MODULE-4: Probability Distributions		
Review of basic probability theory. Random variables (discrete and continuous), probability mass and density functions. Mathematical expectation, mean and variance.	Discussion of Problems in Article No 26.7, 26.8, 26.9, 26.10(1)&(2) of Textbook 1	**2L**
Binomial, Poisson and normal distributions- problems (derivations for mean and standard deviation for Binomial and Poisson distributions only)- Illustrative example	Discussion of Problems in Article No 26.14, 26.15 & 26.16 of Textbook 1	**2L**
Tutorials	i) Involvement of faculty and students in identifying the problems & solutions. ii) **PPT presentations by the faculty about the applications of the module.** iii)Guidance to the students for self-study topics through illustrative examples.	**4T**
Self-Study: Exponential distribution.	**Article No. 26.19(6) of Textbook 1.** 1. **No Question is to be set for SEE** 2. **20% weightage shall be given to CIE from self-study topics.**	
RBT Levels:L1, L2 & L3	**Total**	**8hours**
MODULE-5: Joint probability distribution:		
Joint Probability distribution for two discrete random variables, expectation, covariance and correlation	Discussion and problems restricted to Article No. 20.1 of Reference Book 1	**3L**
Sampling Theory: Introduction to sampling distributions, standard error, Type-I and Type-II errors. Test of hypothesis for means, student's t-distribution, and Chi-square distribution as a test of goodness of fit.	Discussion and problems restricted to Articles No. 27.1 to 27.5, 27.14, 27.17, 27.18 Textbook 2	**1L**

Tutorials	i) Involvementoffacultyandstudentsinidentifyingtheproblems&solutions. ii) **PPT presentations by the faculty about the applications of the Module-Finding approximate solutions of ODE related to civil engineering problems.** iii)Guidance to the students for self-study topics through illustrative examples.	**4T**
Self-Study: Point estimation and interval estimation.	**Article No. 32.10 of Textbook 1.** 1. **No Question is to be set for SEE** 2. **20%weightageshallbegivento CIE from self-study topics**	
RBT Levels: L1, L2 & L3	**Total**	**8 hours**

Textbooks:
1. **B. S. Grewal:** "Higher Engineering Mathematics", Khanna Publishers,43rdEd., 2015.
2. **E. Kreyszig:** "Advanced Engineering Mathematics", John Wiley& Sons, 10th Ed. (Reprint),2016.

Reference Books:
1. **V. Ramana:** "Higher Engineering Mathematics" McGraw-Hill Education, 11th Ed., 2017
2. **Srimanta Pal & Subodh C. Bhunia**: "Engineering Mathematics" Oxford University Press, 3rd Ed., 2016.
3. **N.P Bali and Manish Goyal**: "A Textbook of Engineering Mathematics" Laxmi Publications, 10th Ed., 2022.
4. **C. Ray Wylie, Louis C. Barrett:** "Advanced Engineering Mathematics" McGraw – Hill Book Co., New York, 6th Ed., 2017.
5. **Gupta C.B, Sing S.R and Mukesh Kumar:** "Engineering Mathematic for Semester I and II", Mc-Graw Hill Education(India) Pvt. Ltd 2015.
6. **H. K. Dass and Er. Rajnish Verma:** "Higher Engineering Mathematics" S. Chand Publication, 3rd Ed., 2014.
7. **James Stewart: "**Calculus" Cengage Publications, 7[th]Ed., 2019.

Web links and Video Lectures:
1. http://nptel.ac.in/courses.php.disciplineID=111
2. http://www.class-central.com/subject/math(MOOCs)
3. http://academicearth.org/
4. VTUEDUSATPROGRAMME -20