SWARNANDHRA
COLLEGE OF ENGINEERING & TECHNOLOGY
(Autonomous)
Accredited by NBA, AICTE, NEW DELHI • Accredited by NAAC with "A" Grade – 3.32/4.00 CGPA
Recognized by UGC Under Sections 2(f) & 12 (B) of UGC Act 1956
Approved by AICTE, New Delhi, Permanent Affiliated to JNTU K, Kakinada
Seetharampuram, NARSAPUR-534 280, W.G-Dist., Andhra Pradesh

DEPARTMENT OF S & H

TEACHING PLAN

Course Code	Course Title	Year/ Semester	Branch	Contact Periods/ Week	Academic Year	Date of Commencement of Semester
23BS3T02	COMPLEX VARIABLES & RANDOM PROCESS	II/III	ECE	60/6	2024-25	30-07-2024

Course Outcomes: ***After successful completion of this course, students should be able to:***

1	**CO1:** apply Cauchy-Riemann equations to complex functions in order to determine whether a given continuous function is analytic (K3)
2	**CO2:** evaluate the Taylor's and Laurent's expansions of simple functions, determine the nature of the singularities and calculate residues to evaluate certain integrals (K3)
3	**CO3:** Apply different types of distribution functions like Binomial, Poisson, Uniform, Normal (K3)
4	**CO4** : apply Marginal, Conditional and Joint Probability Distributions (K3)
5	**CO5**: Apply Stochastic process (K3)

Unit	Outcome/ Bloom's Level	Topics No.	Topics/Activity	Text Book/ Reference	Contact Hour		Delivery Method
1	CO1:Students are able to apply Cauchy-Riemann equations to complex functions in order to determine whether a given continuous function is analytic (K3)	**UNIT I: Functions of a complex variable and Complex integration**					
		1.1	Introduction	T_1,R_1,R_2	1	12	PPT,BB
		1.2	Continuity, limit	T_1,R_1,R_2	1		PPT,BB
		1.3	Differentiability	T_1,R_1,R_2	1		PPT,BB
		1.4	Analyticity	T_1,R_1,R_2	1		PPT,BB
		1.5	Cauchy – Riemann Equations in Cartesian Co-Ordinates ,related problems	T_1,R_1,R_2	1		PPT,BB
		1.6	Cauchy – Riemann Equations in Polar Co-Ordinates, related problems	T_1,R_1,R_2	1		PPT,BB
		1.7	Harmonic functions and Conjugate harmonic functions	T_1,R_1,R_2	1		PPT,BB
		1.8	Milne- Thompson Method, related problems	T_1,R_1,R_2	1		PPT,BB
		1.9	Complex integration: Line integral	T_1,R_1,R_2	1		PPT,BB
		1.10	Cauchy's Integral Theorem (without proof) ,related problems	T_1,R_1,R_2	1		PPT,BB
		1.11	Cauchy's integral formula (without proof), related problems	T_1,R_1,R_2	1		PPT,BB
		1.12	Generalized integral formula(without proof), related problems	T_1,R_1,R_2	1		PPT,BB
2	**CO2:** Students	**UNIT II: Series expansions and Residue Theorem**					

	are able to evaluate the Taylor's and Laurent's expansions of simple functions, determine the nature of the singularities and calculate residues to evaluate certain integrals (K3)	2.1	Radius of convergence	T_1,R_1,R_2	1	12	PPT,BB
		2.2	Expansion in Taylor's series , related problems	T_1,R_1,R_2	1		PPT,BB
		2.3	Problems on Taylor's series	T_1,R_1,R_2	1		PPT,BB
		2.4	Maclaurin's series, related problems	T_1,R_1,R_2	1		PPT,BB
		2.5	Laurent's series, related problems	T_1,R_1,R_2	1		PPT,BB
		2.6	Problems on Residue theorem	T_1,R_1,R_2	1		PPT,BB
		2.7	Types of Singularities: Isolated , Essential singularities	T_1,R_1,R_2	1		PPT,BB
		2.8	Pole of order m, Residues, related problems	T_1,R_1,R_2	1		PPT,BB
		2.9	Residue theorem (without proof), related problems	T_1,R_1,R_2	1		PPT,BB
		2.10	Problems on Residue theorem	T_1,R_1,R_2	1		PPT,BB
		2.11	Evaluation of real integral of the type $\int_0^\infty f(x)\,dx$,related problems	T_1,R_1,R_2	1		PPT,BB
		2.12	Evaluation of real integral of the type $\int_0^{2\pi} f(cos\theta, sin\theta)\,d\theta$. related problems	T_1,R_1,R_2	1		PPT,BB
3	**CO3:** Apply different types of distribution functions like Binomial, Poisson, Uniform, Normal (K3)	**UNIT III: Probability & Random Variables**					
		3.1	Probability through sets and relative frequency: Experiments and Sample Spaces, Discrete and Continuous Sample Spaces	T_1,R_1,R_2	1	12	PPT,BB
		3.2	Events, probability definitions and Axioms	T_1,R_1,R_2	1		PPT,BB
		3.3	Joint Probability, Conditional Probability, Total Probability	T_1,R_1,R_2	1		PPT,BB
		3.4	Independent Events, Bayes' Theorem, related problems	T_1,R_1,R_2	1		PPT,BB
		3.5	Random variables (discrete and continuous)	T_1,R_1,R_2	1		PPT,BB
		3.6	Probability density functions, properties	T_1,R_1,R_2	1		PPT,BB
		3.7	Mathematical expectation	T_1,R_1,R_2	1		PPT,BB
		3.8	Mixed random variable, distribution and density functions, Properties	T_1,R_1,R_2	1		PPT,BB
		3.9	Binomial distribution, related problems	T_1,R_1,R_2	1		PPT,BB
		3.10	Poisson distribution, related problems	T_1,R_1,R_2	1		PPT,BB
		3.11	Uniform distribution, related problems	T_1,R_1,R_2	1		PPT,BB
		3.12	Gaussian distribution, related problems	T_1,R_1,R_2	1		PPT,BB
	CO4:Students are able to apply Marginal, conditional and Joint probability distributions (K3)	**UNIT IV: Operations on Random variables**					
		4.1	Introduction	T_2,R_2,R_3	1	12	PPT,BB
		4.2	Moments about the origin related problems	T_2,R_2,R_3	1		PPT,BB
		4.3	Central Moments, Variance,related problems	T_2,R_2,R_3	1		PPT,BB
		4.4	Chebyshev's inequality, related problems	T_2,R_2,R_3	1		PPT,BB

4		4.5	Moment generating function	T_2,R_2,R_3	1	13	PPT,BB
		4.6	Characteristic function	T_2,R_2,R_3	1		PPT,BB
		4.7	**Multiple Random Variables:** Vector Random Variables	T_2,R_2,R_3	1		PPT,BB
		4.8	Joint Distribution Function, Properties of Joint Distribution	T_2,R_2,R_3	1		PPT,BB
		4.9	Marginal Distribution Functions	T_2,R_2,R_3	1		PPT,BB
		4.10	Conditional Distribution and Density—Point Conditioning	T_2,R_2,R_3	1		PPT,BB
		4.11	Interval conditioning, related problems	T_2,R_2,R_3	1		PPT,BB
		4.12	Statistical Independence, related problems	T_2,R_2,R_3	1		PPT,BB
5	CO5:Students are able to apply Stochastic process (K3)	**UNIT V: Stochastic Processes-Spectral Characteristics**					
		5.1	Introduction to stochastic process	T_2,R_2,R_3	1	12	PPT,BB
		5.2	The Power Spectrum and its Properties	T_2,R_2,R_3	1		PPT,BB
		5.3	Properties of power spectrum	T_2,R_2,R_3	1		PPT,BB
		5.4	Auto correlation function	T_2,R_2,R_3	1		PPT,BB
		5.5	Relation between Power Spectrum and Auto correlation function	T_2,R_2,R_3	1		PPT,BB
		5.6	The Cross-Power Density Spectrum	T_2,R_2,R_3	1		PPT,BB
		5.7	Properties of Cross-Power Density Spectrum	T_2,R_2,R_3	1		PPT,BB
		5.8	Cross-Correlation Function	T_2,R_2,R_3	1		PPT,BB
		5.9	Relationship between Cross-Power Spectrum and Cross-Correlation Function.	T_2,R_2,R_3	1		PPT,BB
		5.10	Introduction to Spectral characteristics of system response	T_2,R_2,R_3	1		PPT,BB
		5.11	power density spectrum of response	T_2,R_2,R_3	1		PPT,BB
		5.12	cross power spectral density of input and output of a linear system	T_2,R_2,R_3	1		PPT,BB
Cumulative Proposed Periods					**60**		

Text Books:

S. No.	Authors, Book Title, Edition, Publisher, Year of Publication
1	B. S. Grewal, Higher Engineering Mathematics, 44/e, Khanna Publishers, 2012.
2	Peyton Z peebles , Probability, Random variables & Random Signal Principles, TMH, 4th Edition 2001.

Reference Books:

S. No	Authors, Book Title, Edition, Publisher, Year of Publication
1	Bruce Hajck - Random Processes for Engineers, Cambridge unipress, 2015
2	Athanasios Papoulis and S. Unnikrishna Pillai - Probability, Random Variables and Stochastic Processes, 4th Ed., PHI, 2002.
3	B.P. Lathi - Signals, Systems & Communications, B.S. Publications, 2003.
4	S.P Eugene Xavier -Statistical Theory of Communication, New Age Publications, 2003.

Web Details			
1	https://en.wikibooks.org/wiki/Calculus/Complex_analysis (Functions of a Complex Variable)		
2	https://youtu.be/60ReaZWsvCA (complex power series)		
3	https://www.probability and random variables (Probability and Random variables)		
4	https://youtu.be/8URfl2yfrBY (Moment generating functions)		
5	https://uotechnology.edu.stochastic process (Stochastic Process)		
		Name	Signature with Date
i.	Faculty I	P.SUJATHA (ECE-A, ECE-B, ECE- C, ECE-D)	P. Sujatha
ii.	Course Coordinator	P. SUJATHA	P. Sujatha
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iv.	HOD of S & H	Dr. V. SWAMINADHAM.	V. Iwami

Principal