	NAGARJUNACOLLEGEOFENGINEERINGAND TECHNOLOGY NAAC Accredited with "A+"grade (An ISO 9001 – 2008 Certified Institution) Affiliated to Visvesvaraya Technological University (VTU) Recognized by Govt. of Karnataka & Approved by A.I.C.T.E. NewDelhi **DEPARTMENTOFELECTRONICS&COMMUNICATION ENGINEERING**	

COURSEPLAN

Course Title: Information Theory and Coding	**Course Code**: **21ECT53**
CourseCredit:3	**Semester:** V
Course Teacher's: Dr. Nagesh K.N, Mr. Manjunath M N	**AcademicYear:**2023-24
Lab. Instructor: NA	**Date of Commencement of Class:30/10/2023**

SUBJECT DESCRIPTION:

ThisCoursecoversthefundamentalprinciplesandtechniquesofInformationTheoryandcoding. The main topics covered are Information Theory, Source Coding, Introduction to Error Control Coding, Binary Cyclic codes and Convolution codes. Information theory is the mathematical theory that deals with the fundamental aspects of communication systems. As such, its primary goal is not to deliver practical solutions to communications problems, but rather to answer the questionwhetherencodinganddecodingschemesexistornotforagivencombinationofasource modelandachannelmodel.Thetwomainoutcomesofsingle-userinformationtheoryarethatany source requires a minimum description rate to represent its output faithfully (source coding theorem) and that any channel is characterized by a maximum transmission rate above which the probability of error cannot be made arbitrarily small (channel coding theorem). The purpose of this course is to develop the fundamental ideas of information theory and to indicate where and how the theory can be applied.

PREREQUISITES:

1. Basic Electronics
2. Analog Communication

LECTUREPLAN:

Topic	Topic Details	Number of Lectures	Prediction	Unit/Chapter Reference	Percentage of Module coverage
ModuleI **Introductionto Error control Coding**	IntroductiontoErrorcontrol Coding	1	**Week 1**	T1 9.1	**20%**
	TypesofErrors,Examples	2		T1 9.1.3	
	Typesofcodes	3		T1 9.1.4	
	LinearBlockCodes	4	**Week 2**	T1 9.2	
	Matrixdescription	5		T1 9.2.1	
	Errordetectionandcorrection	6		T19.2.2	
	EncoderLinearBlockCodes	7	**Week 3**	Ref.2 6.4.8.4	
	Syndromecalculationcircuit Linear Block Codes	8		Ref.2 6.4.9	
	Hamming Weight, Hamming Distance and minimum distanceofLBC,SingleError correcting Hamming code	9		Ref2 6.52	
	Cumulative Coverage				**20%**
ModuleII **BinaryCyclic Codes**	**BinaryCycliccodes**	10	**Week 4**	T1 9.3	**20%**
	AlgebraicStructureofcyclic codes	11		T1 9.3.1	
	Encodingusingan(n-k)bit shift register	12		T1 9.3.2	
	AAT-1	13			
	Encodingusingan(n-k)bit shift register problems	14	**Week 5**	T1 9.3.2	
	Syndromecalculation	15		T1 9.3.3	
	Syndromecalculation Problems	16		T1 9.3.3	
	Syndromecalculation Problems	17	**Week 6**	T1 9.3.3	
	BCH codes	18		R2 6.8.3	
	Reed-Solomon codes, Golay codes,ShortenedCycliccodes, Burst Error Control Coding	19		R2 6.8.4	
	Cumulative Coverage				**40%**
	Convolution codes	20		T2 8.5	**20%**

Module III ConvolutionCodes	Timedomain approach	21	**Week 7**	T2 8.5.1	
	Timedomainapproach Problems	22	**Week 8**	T2 8.5.1	
	Transformdomainapproach Problems	23		T2 8.5.2	
	Transformdomainapproach Problems	24		T2 8.52	
	treediagram	25	**Week 9**	T2 8.5.3	
	treediagram	26		R2 8.1	
	CodeTree,TrellisandState Diagram.	27		R2 8.2	
	AAT-2				
	Cumulative Coverage				**60%**
Module IV SourceCoding	**SourceEncoding** Encodingof thesourceoutput	28	**Week 10**	T1 4.3	**20%**
	Shannon'sencodingalgorithm problems	29		T1 4.3.1	
	Shannon'sencodingalgorithm problems	30	**Week 11**	T14.3.1	
	Shannon'sFanoencoding algorithm	31		T1 4.3.1	
	Shannon'sFanoencoding algorithm	32		T1 4.3.1	
	Huffmancoding (binary)	33	**Week 12**	T2 2.3	
	Huffmancoding (ternary)	34		T2 2.3	
	Introduction to Communicationchannels	35		T1 4.4	
	Shannon's – Fano Ternary Code,HuffmanTernaryand Quaternary code	36		T1 4.4	
	Cumulative Coverage				**80%**
Module V Informationtheory	**AAT3**	37			
	IntroductionInformation theory	38	**Week 13**	T1 4.1	**20%**
	Measureof information	39		T1 4.2	
	Averageinformation	40	**Week 14**	T1 4.2.2	
	Contentofsymbolsinlong independent sequences	41		T1 4.2.3	
	Markoffstatisticalmodelfor information source	42		T1 4.2.4	

	Markoffstatisticalmodelfor informationsource problems	43	**Week 15**	T14.2.4	
	Entropyandinformationrate of mark-off source	44		T1 4.2.5	
	CommunicationChannels, Discrete Communication Channels.	45		T1 4.2.6	
	Cumulative Coverage				**100 %**

TEXTBOOKSANDREFERENCEBOOKS:

Book Type	**Code**	**Title&Author**	**PublicationInformation**		
			Edition	**Publisher**	**Year**
Text Books	**T1**	DigitalandAnalogCommunication Systems by K. Sam Shanmugam	1st	wiley	2014
	T2	DigitalCommunicationbySimon Haykin	1st	wiley	2014
Reference Books	**R1**	ConceptsofInformationTheory& Coding Dr. P. S. Satyanarayana	1st	Medtech	2016
	R2	DigitalCommunicationsFundamentals and Applications Bernard Sklar,	3rd	Pearson	2021
	R2	Error Control coding : Fundamentals andApplicationsbyShuLin,Costello	2nd	Pearson	2005

COURSEOUTCOMES:

Attheendof thecoursethestudent willbe ableto:

CO1	Applytheerrorcontrolcodingmethodinlinearblockcodesforencodercircuitand syndrome calculation circuit.
CO2	Evaluatethecycliccodesforencodercircuitandsyndromecalculation circuit.
CO3	DesignanddevelopconvolutionalcodesinTimedomainapproachandTransformdomain approach
CO4	Evaluatetheperformanceofsourceencodingtechniques.
CO5	Determinethe averageinformation,entropyand informationrateof asourcecode.

CO-PO MAPPING:

POS / COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
C103.1	3	3	2	1	2				1	1		1
C103.2	3	3	2	1	1				1	1	1	1
C103.3	3	2	2	1		1			1		1	1
C103.4	3	1	1	1		1				1	1	2
C103.5	3	2	3	1	1	3	1	1	1	1	2	2

EVALUATION SCHEME:

Component		**Weightage(%)**	
CIE's	CIE 15th week	20	60
	CIE 210th week	20	
	CIE 315th week	20	
AAT's	AAT1	10	40
	AAT2	10	
	AAT3	20	
ContinuousInternalEvaluationTotalMarks:100.Reducedto50Marks TheminimumpassingmarkfortheCIEis40%ofthemaximummarks(20marksoutof50)			
SemesterEndExamination(SEE)TotalMarks:100.Reducedto50Marks TheminimumpassingmarkfortheSEEis35%ofthemaximummarks(18marksoutof50)			

Signatureof theCourse Co-Ordinator **Signatureof theHOD**

Date:

Note:

1. TheCourseplan isan attempt to ensure**continuous improvement**in theTLP of thecourse.
2. TheproposedCoursePlanis submittedto**DAC**beforethecommencementofthe semester.
3. Attheendofthesemester,thefacultyshallsubmitthe**actualimplemented plan**.
4. CalendarofEventsincluded.