Curriculum for Dual Degree

B.Tech in Computer Science and Engineering & M.Tech in Computer Science and Engineering

From The Academic Year 2025

(Approved in Senate 60)



Indian Institute of Information Technology Design and Manufacturing, Kancheepuram

Chennai-600 127

<u> </u>	Semester 1				
Category	Course Name	L	Т	P	С
BSC	Calculus	3	1	0	4
BSC	Physics for Engineers	3	0	2	4
BEC	Basic Electrical Engineering	3	1	0	4
ITC	Problem Solving and Programming	3	0	2	4
DSC	Concepts in Engineering Design	2	0	2	3
BEC	Engineering Skills Lab	0	0	2	1
HMC	Effective Language and Communication Skills	1	0	2	2
HMC	NSO/NCC/SSG/NSS/YOGA	0	0	2	P/F
	Someston 2				22.0
<u> </u>	Semester 2	T .	/m		
Category	Course Name	L	Т	P	С
BSC	Differential Equations	3	1	0	4
SEC	Dept. Specific Science Elective I	3	0	0	3
BEC	Engineering Graphics and Modeling	2	0	2	3
ITC	Data Structures and Algorithms	3	0	2	4
DSC	Design Realization	2	0	2	3
PCC	Discrete Structures for Computer Science	3	1	0	4
HMC	Earth, Environment and Design	1	0	0	P/F
	Semester 3				21.0
Catagagg		Т	Т	Ъ	
Category	Course Name	L		P	C
SEC	Dept. Specific Science Elective II [Linear Algebra]	3	0	0	3
ITC	Introduction to AI with Python	2	0	2	3
PCC	Object Oriented Programming	2	0	4	4
PDC	Digital Systems Design	3	0	2	4
PCC	Design & Analysis of Algorithms	3	0	2	4
PDC	Database Systems Design	3	0	2	4
PCC	Computing Paradigms	2	0	0	2
HMC	Indian Constitution and Essence of Indian Traditional Knowledge	1	0	0	P/F
					24.0
	Semester 4				
Category	Course Name	L	T	P	C
SEC	Dept. Specific Science Elective III [Probability and Statistics]	3	0	0	3
ITC	Applied Data Science	2	0	2	3
PDC	Computer Organization	3	0	2	4
PCC	Machine Learning Algorithms	3	0	2	4
PCC	Operating Systems	3	0	2	4
PCC	Theory of Computation	3	1	0	4
HMC	Human Values and Stress Management	1	0	0	P/F
	1		+	_	22.0

	Semester 5				
Category	Course Name	L	T	P	C
HMC	Entrepreneurship and Management Functions	1	0	2	2
PCC	Computer Networks	3	0	2	4
PDC	Compiler Design	3	0	2	4
PCC	Prompt Engineering	1	0	2	2
PDC	Human Computer Interaction	2	0	2	3
PDC	Computer Architecture	3	0	2	4
PEC	Program Elective 1	3	1	0	4
HMC	Professional Ethics and Organizational Behaviour	1	0	0	P/F
					23.0
	Semester 6				
Category	Course Name	L	T	P	C
PCD	Product Design and Prototyping	0	0	2	1
PDC	Full Stack Development	2	0	2	3
PCC	Software Engineering	3	0	2	4
PCC	Cyber Security	3	0	2	4
PEC	Program Elective 2	3	1	0	4
ELC	Open Elective 1	3	0	0	3
HMC	Professional Communication	1	0	2	2
HMC	Intellectual Property Rights	1	0	0	P/F
					21.0
	Summer				
PCD	Summer Internship MID MAY to MID JULY				P/F
	Semester 7				I
Category	Course Name	L	T	P	C
PCC	Analytics & Systems of Big Data	3	1	0	4
PCC	Advanced Data Structures & Algorithms	3	1	0	4
PCC	Natural Language Processing	2	0	2	3
PCC	Analytics & Systems of Big Data Lab	0	0	4	2
PCC	Advanced Data Structures & Algorithms Lab		0		2
		0	0	4	
PEC	Program Elective 1	3	0	2	4
PEC PEC	Program Elective 1 Program Elective 2				4
		3	0	2	
	Program Elective 2	3	0	2	4
	Program Elective 2 * Total Credits not to Exceed 24	3	0	2	4
PEC	Program Elective 2 * Total Credits not to Exceed 24 Semester 8	3	0	2 2	4 23
PEC Category	Program Elective 2 * Total Credits not to Exceed 24 Semester 8 Course Name	3 3	0 0 T	2 2 P	4 23 C
PEC Category PCC	Program Elective 2 * Total Credits not to Exceed 24 Semester 8 Course Name Generative AI and LLMs	3 3 L 3	0 0 T 0	2 2 P 2	4 23 C 4
PEC Category PCC PCC	Program Elective 2 * Total Credits not to Exceed 24 Semester 8 Course Name Generative AI and LLMs Interactive Computer Graphics	3 3 L 3 3	0 0 T 0	2 2 P 2 2	4 23 C 4
PEC Category PCC PCC PCC	Program Elective 2 * Total Credits not to Exceed 24 Semester 8 Course Name Generative AI and LLMs Interactive Computer Graphics High Performance Computing	3 3 L 3 3 3	0 0 T 0 0	2 2 P 2 2 2	4 23 C 4 4
PEC Category PCC PCC PCC PEC	Program Elective 2 * Total Credits not to Exceed 24 Semester 8 Course Name Generative AI and LLMs Interactive Computer Graphics High Performance Computing Program Elective 3	3 3 1 3 3 3 3	0 0 T 0 0 0	2 2 P 2 2 2 2 2	4 23 C 4 4 4 4
PEC Category PCC PCC PCC PEC PEC	Program Elective 2 * Total Credits not to Exceed 24 Semester 8 Course Name Generative AI and LLMs Interactive Computer Graphics High Performance Computing Program Elective 3 Program Elective 4	3 3 4 3 3 3 3 3	0 0 0 0 0 0 0	2 2 P 2 2 2 2 2 2	4 23 C 4 4 4 4 4
PEC Category PCC PCC PCC PEC PEC	Program Elective 2 * Total Credits not to Exceed 24 Semester 8 Course Name Generative AI and LLMs Interactive Computer Graphics High Performance Computing Program Elective 3 Program Elective 4 Program Elective 5	3 3 4 3 3 3 3 3	0 0 0 0 0 0 0	2 2 P 2 2 2 2 2 2	4 23 C 4 4 4 4 4 4 4
PEC Category PCC PCC PCC PEC PEC	Program Elective 2 * Total Credits not to Exceed 24 Semester 8 Course Name Generative AI and LLMs Interactive Computer Graphics High Performance Computing Program Elective 3 Program Elective 4 Program Elective 5 * Total Credits not to Exceed 24	3 3 4 3 3 3 3 3	0 0 0 0 0 0 0	2 2 P 2 2 2 2 2 2	4 23 C 4 4 4 4 4 4 4

	Semester 9				
Category	Course Name	L	Т	P	C
PCD	Comprehensive Exam				P/F
PCD	M Tech Dissertation (MTD) Phase II	0	0	24	12
					12
	Semester 10	<u> </u>	I		I
Category	Course Name	L	T	P	С
PCD	M Tech Dissertation (MTD) Phase III	0	0	28	14
					210

Semester wise Credit Distribution								Cred	its				
Category	S1	S2	S3	S4	S5	S6	S7	S8	Summer	S9	S10	Total	%
Basic Science Course (BSC)	8	4	0	0	0	0	0	0	0	0	0	12	5.7
Science Elective Course (SEC)	0	3	3	3	0	0	0	0	0	0	0	9	4.3
Basic Engineering Course (BEC)	5	3	0	0	0	0	0	0	0	0	0	8	3.8
Design Course (DSC)	3	3	0	0	0	0	0	0	0	0	0	6	2.9
IT Skill Course (ITC)	4	4	3	3	0	0	0	0	0	0	0	14	6.7
Program Core Course (PCC)	0	4	10	12	6	8	15	12	0	0	0	67	31.9
Program Design Course(PDC)	0	0	8	4	11	3	0	0	0	0	0	26	12.4
Program Elective Course (PEC)	0	0	0	0	0	0	8	12	0	0	0	20	9.5
Open Elective Course (ELC)	0	0	0	0	4	7	0	0	0	0	0	11	5.2
Humanities and Management Course (HMC)	2	0	0	0	2	2	0	0	0	0	0	6	2.9
Professional Career Development (PCD)	0	0	0	0	0	1	0	0	4	12	14	31	14.8
Total	22	21	24	22	23	21	23	24	4	12	14	210	100.0
	22	43	67	89	112	133	156	180	184	196	210	210	

COURSE FORMAT

Course Code		Course Name	Calculu	s						
Offered by the Department	SH-Mathematics	Structure (LTPC)	3	1	0	4				
To be offered for	B Tech	Course type	Core							
Pre-requisite	NIL	Approved In	Senat	e 61						
Learning Objectives		he course will introduce the students to basic concepts in Calculus, such as convergence, ifferentiation & integration, and their applications.								
Contents of the Course	Differentia > Sequences > Definite integral cal > Functions of partial and > Directional	bility, Rolle's Theorem, M	Mean Values See and Contives of congrange of	ue Theorement the continuity, composite multiplie	Geome functers, Op	(5L+2P) (7L+2P) Fundamental theorem of (9L+3P) etric representation of ions (8L+3P)				
Essential Reading	1. Thomas G	B. and Finney R. L., Calc	ulus, Pea	arson Ed	lucatio	n, 2007				
Supplementary Reading	2. Kreyszig E.	J., Differential and Integra ., Advanced Engineering M eir M. D., Giordano F. R.,	Mathema	tics, Wil	ley Eas	stern, 2007.				

COURSE FORMAT

Course Code		Course Title	Physics for Engineers						
Dept./ Specialization	SH -Physics	Structure (LTPC)	3	0	2	4			
To be offered for	B. Tech. and DD	Status	Core =		Elec	tive 🔲			
Faculty Proposing the course	SH - Physics	Туре	New _	fication \square					
Pre-requisite	None	Submitted for approve	al		Sena	te-61			
Learning Objectives	 Concepts of grad Theories of election experiments. 	 Transformation of three dimensional coordinate systems for scalar and vector fields Concepts of gradient, divergence and curl in the context of scalar and vector fields. Theories of electrostatics, magnetostatics, magnetism with hands on experience experiments. 							
Learning Outcomes	 At the end of the course, the student should be able to Visualize the three dimensional coordinates transformation of vectors and curved surfaces Describe physical meaning of gradient, divergence and curl for practical purposes Explain knowledge of electrostatics, magnetostatics and magnetism 								
Contents of the course (With approximate break-up of hours for L/T/P)	co-ordinates; Tr integrals, Concept derivative, Equifunctions-gravita Flux, divergence rotational and irr matter, energy, electrostatics. Irr Electrostatics: Echarge distribute Conductors and polarization, Electric system Magneto statics: statics, Diverger current-carrying a magnetic field, deconductivity, Biot Sa Magnetization, Hyster	Lorentz force law, Bio-Sance and curl of B, Magnetic conductors, Magnetization, Magnetic permeability and will cover the experiment dielectric polarization, Elevant law, Magnetic field resis, Faraday's law etc.	ate systems, lids; Gradient of rvative vector camples. theorem, Consider application of the constant of the co	ine, surfice a scalar fields a scalar fields a ntinuity conservations in discrete a charage prosuscepti. Amperedue to urrents, ty, Bountics and tivity, cormeability and scalar fields a scalar field and the scalar fields are a scalar fields.	face, and field; I fi	nd volume Directional r potential (9L) ion; Curl— inciples for tation and (8L) continuous istribution, Dielectric Energy in (12L) in magneto urations of r density in onditions. (13 L) to statics viz. ance, electric limholtz Coil, (28 P)			
Text Book	- 13: 978-933255 2. Bhag Singh Guru Cambridge Unive	ı, <u>Huseyin R. Hiziroglu</u> , E ersity Press, 2009; ISBN-	Electromagnetic	c field T 1116022	heory,	2nd Edition,			
Reference Books	 Cambridge University Press, 2009; ISBN-13: 978-0521116022 W. H. Hayt, J. A. Buck and M. Jaleel Akhtar, Engineering Electromagnetics, McGraw Hill (India) Education Pvt. Ltd, Special Indian Edition 2020. G. B. Arfken, H. J. Weber and F. E. Harris, Mathematical Methods for Physicists, Academic Press, 7th Edition, 2013, ISBN-13: 978-9381269558 								

Course Code		Course Title	Basic Ele	ectrical	Engineer	ring			
Dept./Faculty proposing the	ECE	Structure (LTPC)	L	Т	Р	С			
course		,	3	1	0	4			
To be offered for	B.Tech & DD (All Branches)		Core E lective		/e				
		Status	New _	- 1	Modification 🔳				
Pre-requisite		Submitted for approve	аl		Senate	e 61			
Learning Objectives	 To develop the al engineering applic To introduce study	To impart foundational knowledge on the construction, operation, and analysis of basic electrical and electronic circuits. To develop the ability to systematically analyze DC and AC circuits for practical engineering applications. To introduce students to fundamental electrical machines and their relevance in industrial and consumer contexts.							
Learning Outcomes	 At the end of the course, the students will be able to Represent and interpret basic electrical systems using standard technical conventions. Analyze and solve linear electric circuits (both DC and AC) with single or multiple power sources in the time domain. Understand the fundamentals of electronic components and circuits. Understand the construction, operation, and applications of electrical machines commonly used in industry. 								
Contents of the course (With approximate break-up of hours for L/T/P)	energy, electricity (R,L,C), Overview DC Circuits: Basic land current division independent source. Circuit theorems (Vacuum Source transformate transfer theorem (Machines) and PF, complex positive equivalent circuit, DC Machines - positive characteristics and Machines and Machines - positive equivalent circuit, AC Induction Machines - positive equivalent circuit,	machines commonly used in industry. Basics of Electricity: Systems of units - charge and current, voltage, power and energy, electricity tariff, circuit elements - sources and passive elements (R,L,C), Overview of power system (4L+1T) DC Circuits: Basic laws and circuit analysis - Ohm's law, Kirchhoff's laws, voltage and current division, Wye-Delta transformations, Nodal and Mesh analysis with independent sources (6L+3T). Circuit theorems (with independent sources) - Linearity property, Superposition, source transformation, Thevenin's theorem, Norton's theorem, maximum power transfer theorem (5L+3T) AC Circuits: Sinusoids and phasors - phasor relationships, Impedance and Admittance; sinusoidal steady-state analysis - Nodal and mess analysis, theorems; AC power analysis- Instantaneous and average power, RMS, apparent and PF, complex power (10L+4T) Electrical Machines: Transformers - principle of operation, types, EMF equation, equivalent circuit, Losses and efficiency calculation, Dot convention (4L+1T) DC Machines - principle of operation, emf and torque equation, types, characteristics and speed control of DC motors (4L+1T). AC Induction Machines- operating principles, equivalent circuits, torque-speed characteristics, speed control, efficiency (4L+1T) Electronic Circuits: Operational Amplifiers - Ideal op-amp, inverting and							

	<u>Diodes</u> - V-I characteristics and their applications (2L)
Text Books	 Alexander C. and Sadiku M. N. O., Fundamentals of Electric Circuits, 7th Edition, Tata McGraw-Hill, New Delhi, ISBN: 9781260226409, 2013. A.E. Fitzgerald and Charles Kingsley, 'Electric Machinery', Tata McGraw-Hill Education Publications, 6th Edition, 2002.
Reference Books	 Hughes, 'Electrical and Electronic Technology', Pearson Education India, 10th Edition, 2010. W. H. Hayt and T. E. Kimmerley, Engineering Circuit Analysis, 9th Edition, TMH, ISBN: 9780073545516, 2019. Joseph. A. Edminister, 'Electric Circuits - Schaum's Outline Series', McGraw-Hill Publications, 6th Edition, 2003.

Course Code		Course Title	Problem	Solving	and Pro	gramming			
Dept./Faculty	COL	Constant (LTDC)	L	Т	P	С			
proposing the course	CSE	Structure (LTPC)	3	0	2	4			
T. 1. 62. 1.6	D.T. 1 DD	Туре	Core		Electiv	e 🗆			
To be offered for	B.Tech, DD	Status	New		Modification				
Pre-requisite		Submitted for approval	roval Senate 61						
Learning Objectives	representations, base convers selection, iterative statements with case studies. The practic concepts using appropriate cas	The course focuses on problem solving skills / techniques Students shall be exposed to data representations, base conversions, arithmetic in fixed and floating point representations. Sequence, selection, iterative statements and various other programming constructs in C,Python shall be discussed with case studies. The practice component of this course shall equip the students to test drive the theory concepts using appropriate case studies. • The teaching and assessment shall ensure that given a computational problem students can use							
Learning Outcomes	 The teaching and assessment shall ensure that given a computational problem, students can use computers as a tool to solve the problem. Developing pseudo codes and programs using various programming constructs are expected out of the students. Students will be able to develop simple applications using the various programming constructs. 								
Contents of the course (With approximate break-up of hours for L/T/P)	• Students will be able to develop simple applications using the various programming constructs. Evolution of Computing Machines - Number Representation - Fixed & Floating Point - Base Conversions: Binary, Decimal, Octal, Hexa-decimal number systems and conversions. Introduction to algorithms and flow chart, Data types in C - Input and output statements - Formatted input/output - Phases of program development - Applications involving sequence statements (8L) Operators - Arithmetic, logical, relational, shift, unary operators - Precedence and Associativity - Selection Statements: IF-ELSE, SWITCH-CASE - Programs involving sequence & selection - GOTO statements - break statement - Nested IF (6 L) Repetition Statements - FOR, WHILE, DO WHILE - Programs involving sequence, selection & repetition - continue statement - Nested loops - Introduction to Arrays and Strings - Array manipulation - string manipulation - string operations - multi-dimensional arrays (10 L) Functions in C - Function declaration, definition - scope -storage class-Built-in and user defined functions								
Text Books	 Deitel P J and Deitel H M Deitel P J and Deitel H M 								
Reference Books	 Deitel P J and Deitel H M, Python for Programmers, Pearson Education, 2019, 978-0135224335. Kernighan, Ritchie D, The C Programming Language, Prentice Hall, 2nd Edition, 2015, 978-9332549449 Byron S. Gottfried, Programming with C, TMH Publishers, 4th Edition, 2018, 978-9353160272 Donald E. Knuth, The Art of Computer Programming, 3rd Edition, 2022, 978-0137935109. Yashavant Kanetkar, Understanding Pointers in C& C++, BPB Publications, 5th Edition, 2019, 978-9388176378. 								

Course Code		Course Title	Concepts in Engineering Design						
Dept./Faculty	SIDI	Structure (LTPC)	L	T	P	С			
proposing the course	5151	, , , ,	2	0	2	3			
To be offered for	B Tech/DD	Type	Core	=	Electiv				
D		Status Submitted for approva	New 1		Modification Senate 61				
Pre-requisite	None								
Learning Objectives	market influences oTo transform custor benchmarking.								
Learning Outcomes	 Students will formulate engineering problems by translating customer requirements into technical specifications, generate and evaluate innovative design concepts using creative thinking methodologies. 								
Contents of the course (With approximate break-up of hours for L/T/P)	 Introduction - Importance of engineering design- types of design- the design process-total life cycle- regulatory and social issues-product design- types of products- phases of product development process- product and process cycles-organization for product development-markets and marketing-technological innovation (5L+5P) Problem definition & need identification - Identifying customer needs- gathering information- classifying customer requirements- establishing engineering characteristics- competitive benchmarking- quality function deployment- product design specification (6L+6P) Conceptual design - Creativity in design- creativity and problem solving- creative thinking methods- conceptual decomposition- morphological methods-TRIZ (Theory of Inventive Problem Solving)- Decision making and concept selection-decision theories-concept screening and concept scoring (6L+6P) Embodiment design - Product architecture- steps in developing product architecture-configuration design-industrial design- human factors design- prototyping and testing (6L+6P) Product Economics and related issues - Risk, reliability and safety- failure mode & effects analysis- concept of total quality- robust design- economic decision making-time value of money-profitability of investment- cost estimation-design to cost (5L+5P) 								
Text Books	Edition 5, 2013, ISE 2. Anita Goyal, Karl T	Linda C.Schmidt, Engir 3N-10 : 9355322259, I Ulrich, Steven D Eppi Education, 4th Edition,	SBN-13: nger, Prod	978 - 93 uct Des	5532225 ign and E	8 Development ,			
Reference Books	 Kevin Otto, Kristin Wood, Product Design, Pearson Education, Indian Reprint, 2004, ISBN-10: 0130212717, ISBN-13: 978-0130212719 Yousef Haik, T.M.M. Shahin, Engineering Design Process, Cengage Learning, 2nd Edition Reprint, 2010, ISBN-10: 0495668141, ISBN-13: 978-0495668145 Clive L. Dym, Patrick Little, Engineering Design: A Project-based Introduction, John Wiley & Sons, 3rd Edition, 2009, ISBN-10: 0470225963, ISBN-13: 978-0470225967 								

COURSE FORMAT

Course Code		Course Title	Engineering Skill Practice						
Dept./Faculty proposing the course	Mechanical Engineering	Structure (LTPC)	L 0	T 0	P 2	C 1			
To be offered	All UG & DD	Туре	Core •		Electiv	lective 🖂			
for	All OO G DD	Status	New [Modification				
Pre-requisite	NIL	Submitted for appro	oval		Senate	61			
Learning Objectives	followed in the domain engineering. The exerc	The objective of this course is to give an exposure on the basic practices followed in the domain of mechanical, electrical, electronics and communication engineering. The exercises will train the students to acquire skills which are very essential for the engineers through hands-on sessions.							
Learning Outcomes	At the end of the course, the students will be able to choose suitable process/method among the mechanical, electrical, electronics, and communication engineering concepts that can full fill the functional outcomes of the parts/prototypes/products.								
Contents of the course (With approximate break-up of hours for L/T/P)	Basic manufacturing joining processes, Printing. (10P) Familiarization of power supplies, further assembling of sime emergency lampedemodulation. (6P) Domestic wiring printing assembling and Estimation power consumption	Experiments will be framed to train the students in following common engineering practices: Basic manufacturing processes: Fitting, Drilling & tapping, Material joining processes, Carpentry, Sheet-metal work, Arc Welding, 3D							
Text Books	 Uppal S. L., "Election 2003. Chapman. W. A. J. 	J., Workshop Techno	ology, Pai	rt 1 & 2	., Taylor	& Francis.			
Reference Books	 Chapman. W. A. J., Workshop Technology, Part 1 & 2, Taylor & Francis. Clyde F. Coombs, "Printed circuits hand book", 6Edn, McGraw Hill, 2007 John H. Watt, Terrell Croft, "American Electricians' Handbook: A Reference Book for the Practical Electrical Man", Tata McGraw Hill, 2002. 								

Course Code		Course Name	Effective Commun	Language			
Offered by Department	SH-English	Structure(LTPC)	1 0	2	2		
To be offered for	B.Tech	Course Type	Core				
Prerequisite	NIL	Approved In	Senate 61				
Learning Objectives	 Hone LSRW and practice critical thi Enable students to speak and write g Train students in technical commun Cultivate interest to learn language a Develop an interest in updating their Connecting personal growth with imp 	rammatically acceptable ication and to build the confider · language skills through provement in their profic	nce to comm continuous ciency in En	s learning glish			
Learning Outcomes	Able to communicate effectively with grammatically acceptable constructions and appropriate words in formal and informal situations Can extract information effectively and able to think critically Able to present technical content confidently						
Course Contents(with approximatebreakup of hours forlecture/ tutorial/ be donepractice)	 Introduction: Language, effective com Phonetics – sounds, pronunciation of P4) Sentence structure, concord, punctua Reading and comprehension (L2, P5) Different types of reading, analy Critical thinking- thesis statemed consistency, tautology, conclusion Exercises for vocabulary enrichment Speaking (L2, P5) Barriers to effective communskills, self-introduction, Requests, enquiry, suggestice event, grouppresentation – Writing (L3, P8) Writing formal letters, email, réports, productions The language of content strategory textanalysis tools Plagiarism – the importance of decent strategory book & movie review Life lessons through stories and active 	words, stress, intonation tion, stylistic errors, come vzing the organization of ent, argument, hypothese on (for daily practice) unication, technical prese on in formal and informate debate sumé, duct description/require y - voice and tone strate locumentation, different ews/writing for social me	n, listening, nmon errors f the text is, order, re entation and al situation ments/ tech gy - the lang methods of	Varieties s (L3, P4) ason, evid l presenta s, reportir unical instr	of English (L3, dence, tion ag an fuctions, ficalization_		
Essential & Supplementary Reading	 Tebeaux, Elizabeth, and Sam D. 2018. Rizvi, M Ashraf. Effective Techn. Hancock, Mark. English Pronun Use. CUP, 2012. Cottrell, Stella. Critical Thinkin Palgrave, 2005. Gower, Roger. Grammar in Pra. Paterson, Ken. Oxford Living G. Sabin, William A. The Gregg ReandFormatting. McGraw-Hill, S. Fitikides, T. J. Common Mistake 	nical Communication. Monciation in Use: Intermed g Skills: Developing Effectice. CUP, 2005. rammar. OUP, 2014. ference Manual:A Manu	cGraw-Hill, diate Self-st ective Argu al of Style,	2017 udy and C ment and Grammar	lassroom Analysis. , Usage,		

- Leech, Geoffrey and Jan Svartvik. A Communicative Grammar of English. Routledge, 2013.
- 9. Astley, Peter and Lewis Lansford. Oxford English for Careers: Engineering. OUP, 2013.
- 10. Savage, Alice and Patricia Mayer. Effective Academic Writing. OUP, 2013
- 11. Harari, Yuval Noah. Sapiens: A Brief History of Humankind. Vintage, 2014.
- 12. https://www.ted.com/
- $13. \ https://www.bbc.co.uk/learningenglish/features/pronunciation/tims-pronunciation-workshop-ep-13$
- 14. https://learnenglish.britishcouncil.org/skills/listening
- 15. https://www.nationalgeographic.com/podcasts/overheard
- 16. https://www.youtube.com/user/NatureVideoChannel
- 17. https://www.youtube.com/watch?v=Aj-EnsvU5Q0&list=PLcetZ6gSk969oGvAl0e4_PgVnlGbm64b p
- 18. https://www.merriam-webster.com/word-of-the-day 19. https://www.newyorker.com/tag/book-reviews

COURSE FORMAT

Course Code		Course Name	Differential Equations			ations	
Offered by the Department	SH-Mathematics	Structure (LTPC)	3	1	0	4	
To be offered for	B. Tech	Course Type	Core				
Pre-requisite	NIL	Approved In	Senate 61				
Learning Objectives	To provide an exposure to the theory of ODEs & PDEs and the solution techniques.						
Contents of the course	 Linear ordinary differential equations with constant coefficients, method of variation of parameters, Linear systems of ordinary differential equations (10L +3F) Power series solution of ordinary differential equations, Singular Points, Frobenius series solutions, Bessel and Legendre differential equations, Properties of Bessel functions and Legendre Polynomials (12L+4P) Fourier series (6L+2P) Laplace transforms: Elementary properties of Laplace transforms, inversion by partial fractions, convolution theorem, and its applications to ordinary differential equations (6L+2P) Introduction to partial differential equations, wave equation, heat equation, and 						
Essential	diffusion equation	i ifferential Equations, Τε	ta M	cGraw.	-Hill 9	(8L+3P)	
Readings		nced Engineering Mathe					
Supplementary Reading	 William E. Boyce and R. C. Diprima, Elementary Differential Equations and Boundary Value Problems, John Wiley, 8th Edition, 2004. Sneddon I., Elements of Partial Differential Equations, Tata McGraw-Hill, 1972 Ross L. S., Differential Equations, Wiley, 2007. Trench W., Elementary Differential Equations, http://digitalcommons.trinity.edu/mono 						
	4. Trenen W., Dienie	many Differential Equa	.10110,	, поср.//	aigitai	Sommonosermey securitions	

Course Code		Course Title	Engineering Graphics and Modeling			d Modeling	
Dept./Faculty proposing the	Mechanical Engineering	Structure (LTPC)	L	Т	P	С	
course	Department		1	1	2	3	
To be offered for	B Tec h. programs of CSE, ECE and Physics	Туре	Core		Elective		
	·	Status	New		Modifi	cation =	
Pre-requisite	Nil	Submitted for approva	ıl		Senate 6	51	
Learning Objectives	 To introduce the basic concepts and techniques of technical drawing To learn 2D and 3D representation of various shapes/objects and its engineering applications 						
Learning Outcomes	Students will acquire visualization skills and will be able to prepare technical drawings and 3D models using computer aided tools						
Contents of the course (With approximate break-up of hours for L/T/P)	 Role of technical drawing in product development process, Basics of technical drawing, Standards, Dimensioning principles (L2+P2) Computer aided drafting (L2 + P2) Principles of orthographic projection. 3D drawings of objects to orthographic projection (L4+P4) Principles of isometric projections. 2D orthographic to isometric drawings (L4+P4) Introduction to 3D modelling of shapes and objects (L2+P2) Solid Modelling – part modelling & assembly modelling; Surface modelling; NURBS modelling (L6+P6) 3D modelling from physical objects (L2+P2) Modelling of engineering applications including electrical CAD (L2+P2) 						
Text Books	 Venugopal K and Prabhu Raja V, Engineering Drawing + AutoCAD, New Age International (P) Limited. 7th Edition, 2024 (ISBN: 9360749222) Narayana. K.L, and Kannaiah. P, Engineering Drawing, Scitech Publications (India) Pvt. Ltd, 3rd Edition, 2021 (ISBN: 9789385983177) 				9222) Publications		
Reference Books	 Bertoline G.R, Wiebe E.N, Hartman N, Ross W, Technical Graphics Communication, Mcgraw-Hill College, 2008, IRWIN Graphic Series, 2008 (9780077221300) Varghese P.I, Engineering Graphics, McGraw Hill Education, 2017 (ISBN: 1259081001) Bhatt. N.D, Engineering Drawing – Plane and Solid Geometry, Charotar Publishing House Pvt. Ltd., 54th Edition, 2023 (ISBN: 9789385039706) 						

Course Code		Course Title	Data Structures and Algorithms					
Dept./Faculty	CSE	Structure (LTPC)	L	Т	P	С		
proposing the course	COL		3	0	2	4		
T. 1. CC. 1.C	D.T. I. DD	Туре	Core		Elective	e 🗆		
To be offered for	B.Tech, DD	Status	New		Modific	eation 🖃		
Pre-requisite		Submitted for approval	<u>I</u>		Senate	61		
Learning Objectives	Given a computational problem, the focus is on design and implementation of algorithms using suitable data structures. The notion of time and space complexity, design of efficient algorithms and data structures shall also be explored. The course also focuses on exploring role of data structure for solving problems efficiently.							
Learning Outcomes	Students are expected to design	n efficient algorithms and	data structu	ires for co	omputatio	onal problems		
Contents of the course (With approximate break-up of hours for L/T/P)		algorithms - Incremental Conquer- quicksort, mer attorn traversal, Introduct and other tree parameters (of the trees, balanced binary sed closed hashing, proper (5L) rings, Lists, Tuples, Diction and Adjacency List), but and Adjacency List), but ary Data Structures, In Binary Trees—Traversal sions—computing collisions and Heaps and its apetice component to be done	unds – big the relations al Design ge sort– co ing – disc tion to exp depth, heig arch trees ties of goo mary – Exa tasic traver aplementati –Computat the Open vis plications, the using Pyt	oh, little s through - insertion of the inner of S s closed I Graph	oh, omega guess m on sort, n/ non-con n inputs rees: traveres (5L) functions. 5L) as BFS, se studies tructural hashing,	decremental Design - mparison based sorting with best/worst case ersal vs post/pre/infix es etc.) (5L) Priority queue ADT: DFS with complexity, s involving algorithms parameters, Hashing— Sorting and Searching s—BFS, DFS and its		
Text Books		l M, Python for Programn	ners, Pearso	on Educat	tion, 2019	9, 978-0135224335		
Reference Books	 Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, Introduction to Algorithms, Prentice Hall of India, 4th Edition, 2022, 978-0262046305. Anany Levitin, Introduction to the Design and Analysis of Algorithms, Pearson, 3rd edition, 2017, 978-9332585485. Horowitz, Sahni and Anderson-Freed, Fundamentals of Data Structures in C, Silicon Press, 2nd Edition, 2008, 978-8173716058 Michael T. Goodrich, Roberto Tamassia, Michael H. Goldwasser, Data Structures and Algorithms in Python, 1st edition, 2013, 978-1118290279. 							

Course Code		Course Title	Design Realisation					
Dept./Faculty proposing the course	SIDI	Structure (LTPC)	L 2	T 0	P 2	C 3		
		Туре	Core		Elective	_		
To be offered for	B.Tech/DD	Status	New	-	Modific			
Pre-requisite	Concepts in Engineering Design	Submitted for appro	oval		Senate 6	1		
Learning Objectives	 To understand the user-centric design principles to identify and prioritize customer needs accurately. To generate creative design solutions using Morphological tools, SCAMPER, and TRIZ methodologies. To assess product concepts systematically through Pugh charts and concept scoring techniques. To learn visualization skills by producing freehand sketches and models for product development. 							
Learning Outcomes	 Analyze customer needs through structured methods like interviews and Quality Function Deployment (QFD). Create innovative design concepts using tools like Morphological tool, SCAMPER, and TRIZ. Evaluate design concepts using Pugh charts for effective concept screening and scoring Design product architecture by applying configuration and industrial design principles. 							
Contents of the course (With approximate break-up of hours for L/T/P)	Practical case studies u Customer need analy House of quality (5L Tools for conceptual SCAMPER, TRIZ (6) Embodiment design architecture-configur Concept screening - 0 Realisation using free	rsis, Indoor Customer +5P) design - creative thir 5L+6P) - Product architecture ration design-industriconcept scoring – Pug	nking metle - steps in al design gh chart (5	nods - Mor n developin (6L+6P) 5L+5P)	phological	l tool,		
Text Books	1. George E.Dieter & Li Edition 5, 2013, ISBN					International		
Reference Books	McGraw-Hill Educati 978-0070146792 2. Kevin Otto, Kristin W	ion, 4th Edition, 2009 ood, Product Design	ich, Steven D Eppinger, Product Design and Development, Tata n, 4th Edition, 2009, ISBN-10: 0070146799, ISBN-13: od, Product Design, Pearson Education, Indian Reprint, 2004, ISBN-13: 978-0130212719					

Course Code		Course Title	Discrete Structures for Computer Science				
Dept./Faculty proposing the course	CSE	Structure (LTPC)	L 3	T	P 0	C 4	
		Туре	Core		Electiv	e \square	
To be offered for					Modifi	cation =	
Pre-requisite		Submitted for approval			Senate	61	
Learning Objectives	To introduce students to logical reasoning, inferences, relations, functions, counting principles, proof techniques and graph theory.						
Learning Outcomes		Students will learn to write concepts formally and various proof techniques. They shall also be able to prove the correctness of algorithms and learn counting techniques.					
Contents of the course (With approximate break-up of hours for L/T/P)	infinite sets, countable and uncountable sets.(7L+2T)						
Text Books	K. H. Rosen, Discrete Ma 9390727353.	athematics and its Appli	cations, 1	McGraw	Hill, 8th	Edition, 2021, 978-	
Reference Books	 D. F. Stanat and D. F. McAllister, Discrete Mathematics in Computer Science, Prentice Hall, 1977, 978-0132161503. C. L. Liu, Elements of Discrete Mathematics, Fourth Edition, Tata Mcgraw Hill, 3rd Edition, 2017, 978-1259006395. Busby, Kolman and Ross, Discrete Mathematical Structures, Pearson Education, 6th Edition, 2015, 978-9332549593. R. L. Graham, D. E. Knuth, and O. Patashnik, Concrete Mathematics, 2nd Edition, Addison Wesley, 1994, 978-0201558029. 						

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Course Code		Course Title	Introduction to AI with Python				
Dept./Faculty proposing the course	Computer Science and Engineering	Structure (LTPC)	L	Т	P	С	
proposing the course	Engineering		2	0	2	3	
To be offered for	Common to All B.Tech, DD	Туре	Core	1	Elective	e 🗆	
To be offered for	Common to All B. Tech, DD	Status	New		Modifie	cation	
Pre-requisite		Submitted for approval	val Senate 62				
Learning Objectives	 The course focuses on imparting knowledge about the principles of search and logic with practical examples. To develop a basic understanding of problem solving, knowledge representation, reasoning and learning methods of AI. 						
Learning Outcomes	 The student will gain knowledge about space search and search algorithms, logic based knowledge representation, and the shortcomings in in reasoning methods. Ability to decide on the suitable representation for a domain model. Ability to choose appropriate algorithms for AI reasoning in that domain 						
Contents of the course (With approximate break-up of hours for L/T/P)	Overview of Python and AI: Data types, Control Structures in Python, Philosophy of AI, Need, Use of Agents, Intelligent Agents – Rationality, Structure and Environments. (L5) Search Strategies: Uniformed Search-BFS, DFS, Iterative Deepening DFS, Informed Search – Best First, A* Search, Iterative Deepening A*, Depth First Branch Bound, Heuristic Functions, Local Search-Hill Climbing and Simulated Annealing, Limitations, Random walk/Restart (L10) Adversarial Search and Constraint Satisfaction Problem: Min Max Algorithm, Alpha Beta pruning, Backtracking for CSP, Arc Consistency (L5) Logic in AI: Knowledge Based Agents, Propositional logic, agent for wumpus world, Knowledge base.						
Essential Reading	 S Russell & P Norvig, Ar 9789332543515. Nils J Nilsson, "Artificial I 	-					
Supplementary Reading	 Nils J Nilsson, "Artificial Intelligence: A New Synthesis", Morgan Kaufmann Publications, 2000. Deepak Khemani, A First Course in Artificial Intelligence, McGraw Hill, 2013, ISBN 9783827370891 P Norvig, Paradigms of AI Programming, Morgan Kauffmann, 1991, ISBN 9781558601918 Dean, Allen & Aloimonos, AI Theory & Practice, Addison Wesley, 1995, ISBN 9780805325478 						

Course Code		Course Title	Object Oriented Programming				
Dept./Faculty proposing the course	Computer Science & Engineering	Structure (LTPC)	L 2	T 0	P 4	C 4	
To be offered for	B.Tech (CSE,AI), DD CSE	Туре	Core Elective				
		Status New Modification Submitted for approval Senate 62					
Pre-requisite Learning Objectives	The course introduces students to the object oriented programming paradigm and its benefits in application development. Students would be exposed to major benefits of the OO Paradgim, in terms of data security, reusability etc. Both C++ and Java would be used as implementation platforms for the various object oriented features.						
Learning Outcomes	 To understand Object Oriented Concepts for Software Design To analyse various aspects of Software Design in a reusable and secure fashion To create applications supporting a command line & graphical user interface in Object Oriented fashion. 						
Contents of the course (With approximate break-up of hours for L/T/P)	• To create applications supporting a command line & graphical user interface in Object Oriented fashion. Object oriented programming - Encapsulation - Constructors - Destructors - Composition - Friend functions/classes - this pointer - Dynamic memory management (L6) Operator overloading Reusability - Inheritance - Base & derived classes - Protected members - Constructors - Destructors in derived classes - public/private/protected inheritance - Polymorphism (L8) Virtual functions - Templates - Function & Class templates - Streams - Stream input Output Stream format states - Manipulators - Exception handling - Re-throwing exceptions - specifications- and exception handling - Inheritance - STL (L7) Event Handling, Applets, - Frames, Buttons, Menu - Visual design layout, Multithreading, Networking, Database connectivity support (L7) Practice Component: Exercises on Data Encapsulation / Data Abstraction based on the concept of Interface v/s Implementation Separation using constructors, destructors etc features. Package Creation using Operator Overloading feature eg. Rational number arithmetic package, etc., Input and Output operator overloading, Unary Operator overloading etc shall be built. Power of Inheritance in OOPs and packages using inheritance such as Shape Class, Employee class etc. shall be test driven including polymorphic / run time binding behavior will be tested. Class Templates and STL support to create applications utilizing built in data structures etc shall also be test driven. Support for exception handling - try throw catch for user defined / built in class support. Application development using Java Platform - applets, basic interface						
Text Books	1, Deitel P J and Deitel H M, C 2. Deitel P J and Deitel H M, Ja	ava: How To Program, Pre	entice Hall,	, 9 th Edn, 1	2016, ISE	BN 9332563292	
Reference Books	 David Flanagan, Java in a Nutshell, 5th Edition, O'Rielly, 2005, ISBN 9780596007737 Herbert Schildt, Java: A Beginners Guide, 13th Edition, McGraw Hill, 2024, ISBN 9355326475 HerbetSchildt, Teach Yourself C++, 4th Edition, Tata McGraw Hill, 2017, ISBN 978-0070532465 						

Course Code		Course Title	Digital Systems Design					
Dept./Faculty proposing the	Computer Science &	Structure (LTPC)	L	Т	P	С		
course	Engineering	Structure (LTFC)	3	0	2	4		
To be offered for	B.Tech (CSE,AI), DD CSE	Туре	Core					
		Status	New Modification					
Pre-requisite		Submitted for appro	oval		Senate 6	52		
Learning Objectives	To introduce the basic understanding of digital representation, Boolean algebra and the operation of the logic components, combinational and sequential circuits.							
Learning Outcomes	Students will be able to understand Digital Number systems, fixed and floating point representation and arithmetic operations. They shall also be able: • To use Boolean Algebra and Switching theory for Logic minimization. • To implement Combinational Circuits using Primitive gates and logic functions • To implement sequential circuit elements and finite state machines.							
Contents of the course (With approximate break-up of hours for L/T/P)	Digital Circuits: Number Representation- Fixed point and floating point, 1's and 2's complement. Switching Theory - Boolean algebra, switching functions, Truth Tables and Algebraic forms, Simplification of Boolean expressions – Algebraic methods, canonical forms and Minimization of functions using K-Maps (L8) Binary Codes: BCD, Gary, Excess 3, Alpha Numeric codes and conversion circuits. (L4) Arithmetic circuits: Half Adder, Full Adder/subtractor, 4-bit adders and subtractors, look-ahead carry adder (L4) Synthesis of combinational logic functions using MSIs: Mux/Demux, decoders/encoders, Priority encoders, Comparators, seven segment display (L6) Sequential Circuits: Clock - Latches and Flip-Flops - SR, JK, D, T - Excitation tables. (L6) Sequential circuits Design: Shift Registers, Counters, Random Access Memory. Finite State Machines- Mealy & Moore types Basic design steps- Design of counters, sequence generators, and sequence detectors - Design of simple synchronous machines – state minimization. (L10) Introduction to HDL- Introduction to Hardware Description Languages (HDL) - Basic syntax and structure of HDL (Verilog) -Simple design examples (L4) Practice: Design and implementation of logic functions, combinational circuits (code converters, half & full adders, comparator, ripple carry adder, priority encoder, Decoders, Seven segment display, multiplexer), Design of sequential Circuits using hardware kit, Design of 4-bit ALU (Adder,							
Text Books	Mano, M. M., Kime, C. R., & Pearson, 2015, ISBN-13: 978	3-0-13-376063-7.	•	J				
Reference Books	 Samir Palnitkar, Verilog HDL, 2nd Edition, Pearson, 2003, ISBN: 978-8177589184. S. Franco, "Design with Operational Amplifiers and Analog Integrated Circuits," McGraw-Hill Series in Electrical and Computer Engineering, 4th Edition, 2015, ISBN-13: 978-0072320848. R. J. Tocci, N. S. Widmer, and G. L. Moss, "Digital Systems Principles and applications," Pearson Prentice Hall,10th Edition, 2010, ISBN-13: 978-0135103821. Morris Mano M, Digital Logic and Computer Design, Pearson, 2nd Edition, 2017. ISBN: 9789332586048. 							

Course Code		Course Title	Design and Analysis of Algorithms				
Dept./Faculty	Computer Science &	Structure (LTPC)	L	Т	P	С	
proposing the course	Engineering		3	0	2	4	
		Туре	Core		Elective	e 🗆	
To be offered for	B.Tech (CSE,AI), DD CSE	Status	New		Modifie	cation	
Pre-requisite		Submitted for approval	Senate 62				
Learning Objectives	 To design time or space efficient algorithms using well known paradigms. To understand the limitations of computing machines. To explore tractable vs intractable problems. 						
Learning Outcomes	Students will be able to design efficient algorithms using paradigms such as divide and conquer, dynamic programming, greedy methods etc. Students will be able to differentiate easy vs hard problems. Students will get sufficient skills to design polynomial-time algorithms along with a proof of correctness.						
Contents of the course (With approximate break-up of hours for L/T/P)	 Detailed discussion on asymptotic analysis – recurrence relations – recurrence tree method – Master theorem (L6) Incremental and Decremental strategies – divide and conquer – case studies – merge sort, quick sort with detailed analysis – lower bounds for sorting (L6) Greedy Method – Container loading – knapsack – scheduling – coin change – proof of correctness (L8) Dynamic programming – matrix chain, optimal binary search tree, travelling salesman, LCS, knapsack, greedy vs dynamic programming – Principle of optimality, overlapping subproblems – Dynamic programming vs Divide and Conquer (L8) Graph algorithms – Applications of DES and BES – Topological sort – Shortest path algorithms – 						
Text Books	Prentice Hall India, 4 2. E. Horowitz, S. Sahr Publications, 2007. IS		78-0-262-0 Computer)4630-5 Algorithi	ms", 2 no	d Edition, Galgotia	
Reference Books	 Aho, Hopcroft, and Ullmann, "Data Structures & Algorithms", Addison Wesley, 1983. ISBN-13: 978-0201000238 Eva Tardos and Kleinberg, "Algorithm Design", Pearson, 2006, ISBN-13: 978-0321295354 SanjoyDasgupta, Christos Papadimitriou, UmeshVazirani, "Algorithms", McGraw-Hill, 2006, 978-0073523408 						

Course Code		Course Title	Databas	Database Systems Design			
Dept./Faculty Proposing the	Computer Science & Engineering	Structure	L	Т	P	С	
course		(LTPC)	3	0	2	4	
		Status	Core	1	Elect	tive	
To be offered for	B.Tech (CSE,AI), DD CSE	Туре	New Modification				
Pre-requisite	Nil	Submitted for app	proval Senate 62				
Learning Objectives	Students will be exposed to understand database design principles, architecture, and relational models. They shall learn the fundamentals of SQL programming, design databases using ER diagrams, schema mapping, and normalization.						
Learning Outcomes	Students will be able to design and implement databases with formal analysis and design thinking. They shall also be able students would be equipped with skills required for basic application development involving database connectivity.						
Contents of the course(With approximate break-up of hours for L/T/P)	Introduction to Database systems: Overview of databases, Data models, Schemas, Instances, Three schema architecture, Database Architecture (L3) Conceptual Data Modelling: Entity – Relationship (ER) Model, Database Design Process, ER Diagrams -Entities, Attributes, Relationships, Constraints, keys (L6) Relational Data Model: Relational Model concepts, Constraints, Keys, Relational Schemas, Conversion of ER to Relational model. Relational Algebra: Expressive power of relational databases. (L6) SQL: Basics of SQL, DDL, DML, Constraints - CHECK, Three-Valued Logic, Retrieval Queries: Nested queries, Set operations, Aggregate functions, Grouping, Assertions, View in SQL. (L6) Normalization: Functional Dependencies: Inference Rules, Equivalence, Minimal Cover. Database Decomposition: Lossless joins, Normal Forms (First to Third, BCNF) (L9)						
Text Books		-	-	_			
Reference Books	R. Elmasri and S.B. Navathe, "Fundamentals of Database Systems", Pearson, 7 th Edition, 2016, ISBN 9789332582705 1. J Ullman, J Widom, A First Course in Database Systems, Pearson, 3 rd Edition, 2007, ISBN:9780136006374 2. A. Silberschatz, H.F. Korth and S. Sudharshan, Database System Concepts, Tata McGraw Hill, 7 th Edition, 2021, ISBN: 9390727502 3. C.J. Date, A. Kannan, and S. Swamynathan, "An Introduction to Database Systems", Pearson, 8 th Edition, 2006, ISE N: 978-0321197849						

Course Code		Course Title	Computing Paradigms			
Dept./Faculty	Computer Science &	Structure	L	Т	P	С
proposing the course	Engineering	(LTPC)	2	0	0	2
To be offered for	B.Tech (CSE,AI), DD CSE	Туре	Core		Elective	
		Status	New		Modific	ation 🗆
Pre-requisite		Submitted for	approval		Senate 6	2
Learning Objectives	The course focuses on exposing students to the evolution of various computing paradigms on a breadth perspective. The course shall focus on the following: • Facilitate comparison between legacy and emerging approaches like cloud, edge, fog, and serverless computing. • Architectural and functional differences across paradigms.					
Learning Outcomes	By the end of the course students will develop a clear understanding of how computing paradigms have evolved, from traditional systems to emerging technologies and gain the ability to distinguish and compare various computing approaches such as centralized, distributed, parallel, cloud, edge, fog, and serverless computing.					
Contents of the course (With approximate break-up of hours for L/T/P)	Introduction to Computing Paradigms: Introduction and motivation for computing paradigm evolution, Centralized, decentralized, distributed and parallel computing, Limitations of traditional models (monolithic systems, scalability issues), Concepts of resource sharing, fault tolerance, and elasticity (L4) Cluster and Grid Computing: Introduction to clusters; types – load-balancing, HA, HPC; architecture and components. Grid computing – evolution, motivation, architecture layers (fabric to application), resource discovery and allocation. (L7) Cloud, Edge, and Fog Computing: Cloud, Edge, and Fog Computing fundamentals: Essential characteristics. Architectural Influences. Tachnological Influences, and Operational Influences.					
Text Books	paradigm; latest trends in new cor Kai Hwang, Geoffrey C. Fox and Parallel Processing to the Intern 9780123858801.	d Jack J. Donga	arra, "Distr			
Reference Books	 Mahmood, Zaigham, ed. Fog computing: concepts, frameworks and technologies. Springer, 2018.ISBN: 978-3030069322 Rajalakshmi Krishnamurthi, Adarsh Kumar, Sukhpal Singh Gill, Rajkumar Buyya, eds. Serverless Computing: Principles and Paradigms. Springer International Publishing, 2023.ISBN: 978-3031266324. Bernhardt, Chris. Quantum computing for everyone. MIT Press, 2019.ISBN: 9780262539531. 					

Course Code		Course Title	Applied Data Science					
Dept./Faculty	Computer Science &	Structure (LTPC)	L	Т	P	С		
proposing the course	Engineering	Structure (LTFC)	2	0	2	3		
T. 1		Туре	Core		Elective			
To be offered for	B.Tech (CSE,AI), DD CSE	Status	New		Modification			
Pre-requisite		Submitted for approval	I		62			
Learning Objectives	This course covers the basic concepts of Data Science to help the student to learn, understand and practice data analytics encompassing concepts from descriptive, inferential statistics and predictive techniques and big data concepts.							
Learning Outcomes	 Ability to identify the characteristics of datasets; Ability to select and implement machine learning techniques suitable for the respective application; Ability to solve problems associated with big data characteristics such as high dimensionality; Ability to integrate machine learning libraries and mathematical and statistical tools 							
Contents of the course (With approximate break-up of hours for L/T/P)	Big Data Characteristics – Map Reduce –Distributed Storage, Implementation using Hadoop / Pyspark							
Text Books	J Han, M Kamber, Data Mining	g Concepts & Techniques,	Elsevier, 4	th Edition	n, 2022, I	SBN 9780128117606		
Reference Books	 Joel Grus, Data Science from Scratch, Orielly, 2nd Edn, 2019, ISBN 9781492041139 Leskovec, Anand Rajaraman, Ullmann, Mining of Massive Data Sets, Cambridge University Press, Open Source free version, ISBN 9781107015357 P Bruce, A Bruce and P Gedeck, Practical Statistics for Data Scientists, O'Reilly, 2020, ISBN 978-1492072942 							

Course Code		Course Title	Computer	r Organiz	ation				
Dept./Faculty	Computer Science &	Staniotrano (LTDC)	L	Т	P	С			
proposing the course	Engineering	Structure (LTPC)	2	0	2	3			
To be offered for	B.Tech (CSE,AI),DD CSE	Туре	Core	1	Elective				
To be offered for	B. Iecii (CSE,AI),DD CSE	Status	New		Modific	ation			
Pre-requisite	None	Submitted for approval			Senate 6				
Learning Objectives	offs and optimizations used modern computers.	d to build high-perforn	nance and c	cost-effect	ive syste	ms, as seen in			
Learning Outcomes	The students will learn paractice.	digms of computer syste	ms design a	nd implen	nent a sub	oset of them in			
Contents of the course (With approximate break-up of hours for L/T/P)	computer, performance of a and RISC Instruction Set. Le of instructions in a RISC proposed instructions in a RISC proposed instructions in a RISC proposed instructions. Converger performance integer and flow Pipelining: Introduction to processor that supports ADI single issue, in-order five-sprocessor. (L12) Memory Organization Semi-conductor RAM mandal DRAMs. Cache Memories: Introduction Algorithms, Multi-level Cache Penalty. (L6) Virtual Memories: Need physical memory, Page-wall physical memory, Page-wall physical mechanisms — Program I/O interfaces — Serial port, page-wall processions: Implementation of multi-lemplementation of floating page implementation of instruction in the process of the pro	The students will learn paradigms of computer systems design and implement a subset of them in practice. Introduction to a computing system: Functions and structure of a computer, components of a a computer, performance of a computer - Speed, Throughput, Instruction Set Architecture: CISC and RISC Instruction Set. Load-Store Architecture. Advantages of Load-Store Architecture. Types of instructions in a RISC processor. Addressing modes (L6) Processor Organization Register File: IR, PC, MAR, MBR, Register File, Decode Unit: Decoding RISC instructions. Micro-instructions. Converting an instruction into micro-instructions, ALU Design: High performance integer and floating point adders and multipliers (L12) Pipelining: Introduction to pipelining. Performance analysis of pipelining. Building a single stage processor that supports ADD/BE/LW/SW instructions. Converting the single stage processor into a single issue, in-order five-stage pipelined processor. Pipelining Hazards. Dual Issue pipelined processor. (L12) Memory Organization Semi-conductor RAM memories: Static memories, Asynchronous DRAMs. Synchronous DRAMs. Cache Memories: Introduction to Cache Memory. Cache Mapping functions, Cache Replacement Algorithms, Multi-level Cache Memories. Performance analysis of cache memories: Hit Rate, Miss							
Text Books	The Hardware Software Into USA. 2017ISBN:978-0-12-8	erface, 1 st ed, Morgan K 312275-4	aufmann Pu	blishers I	nc., San I	Francisco, CA,			
Reference Books	C. Carl Hamacher, Zvonko McGraw-Hill, Inc., USA. 20		•	Computer	r Organiz	ation, 5th. Ed,			

Course Code		Course Title	Machine Learning Algorithms						
Dept./Faculty	Computer Science and	Structure (LTPC)	L	Т	P	С			
proposing the course	Engineering		3	0	2	4			
To be offered for	B.Tech (CSE,AI), DD CSE	Туре	Core	2000000	Electiv	e 🗆			
	, , , , ,	Status	New		Modification -				
Pre-requisite		Submitted for approval	1.		Senate	62			
Learning Objectives	The goal of this course is to reinforcement learning. The algorithms, to explore practical frameworks like PyTorch, Ten	course also helps the stu al applications, and to dev sorFlow, Scikit-learn.	idents to welop skills	understan in ML p	d and in	ing using Python and			
Learning Outcomes	design/train deep learning for unsupervised learning, dimer address interpretability, fairnes	address interpretability, fairness, scalability with tools.							
Contents of the course (With approximate break-up of hours for L/T/P)	unsupervised learning, dimensionality reduction, implement RL for sequential decision-making, and								
Text Books	 Christopher Bishop. Pa 9780387310732. Aurélien Géron, Hands-O ISBN: 9789355421982. 	n Machine Learning with	Scikit-lea	rn, Keras	, Tensorl	Flow, O'Reilly, 2022,			
Reference Books/Articles	 ISBN: 9789355421982. Trevor Hastie, Robert Tibshirani, and Jerome Friedman. The Elements of Statistical Learning, Springer, 2008, ISBN: 9780387848570. Tom M. Mitchell. Machine Learning, Mc Grew Hill, 2017, ISBN: 9781259096952. 								

Course Code		Course Title	Operating Systems					
Dept./Faculty Proposing the	Computer Science Engineering	Structure (LTPC)	L 3	T 0	P 2	С		
course				10		4		
To be offered for	B.Tech (CSE,AI), DD CSE	Status	Core	Ĺ	Elective			
		Type	New Modification					
Pre-requisite		Submitted for app						
Learning Objectives	The course focusses on the structure and functions of an operating system. Students will be exposed to operating systems abstraction, mechanisms and their implementation support for concurrency (threads) and synchronization, resource management, scheduling strategies.							
Learning Outcomes	 Students will gain a sound understanding of basic concepts relating to the design and implementation of an operating system. They will be equipped with skills relating to: Scheduling, multithreading, synchronization, deadlock management and the structure of the operating system (Linux), at the concept and the source code level. Kernel API support to implement various features to be supported by an OS 							
Contents of the course(With approximate break-up of hours for L/T/P)								
Text Book	10 th Edition, 2021, ISBN 978111980 2. William Stallings, Operating System	Baer Galvin, Greg Gagne, Operating System Concepts, John Wiley,						
Reference Books	ISBN: 978-0134670959 1. Robert Love, Linux Systems Programming, O Reilly Media, 2 nd Edition, 2013, ISBN 9781449339531. 2. D Butlar, J Farrell, B Nichols, Pthreads Programming, O Reilly Media, 1996, ISBN 9781565921153							

Course Code		Course Title	Theory	y of Com	putation		
Dept./Faculty	Computer Science &	Structure (LTPC)	L	Т	P	С	
proposing the course	Engineering		3	1	0	4	
To be offered for	B.Tech (CSE,AI), DD CSE	Туре	Core	-	Elective	e 🗆	
To be offered for	B. Teeli (CSE,AI), DD CSE	Status	New		Modifie	cation =	
Pre-requisite		Submitted for approval			Senate		
Learning Objectives	This course aims to provide fundamentals of computing models such as finite state automata, pushdown automata, linear bounded automata and Turing machine. Powers and limitations of the models will also be discussed. Solvability and Tractability will be introduced through Turing machine Students shall develop sufficient mathematical skills to design various computing models such as						
Learning Outcomes	FSA, PDA, LBA and TM.Further, one will have the understanding of the relation among digital computer, algorithms and Turing Machines. Further students will also gain necessary skills to comment on the solvability/unsolvability aspect of computational problems.						
Contents of the course (With approximate break-up of hours for L/T/P)	Finite Automata & Regular Languages-Languages vs. Problems. Finite State Automata, Regular Languages, Closure properties. Non-determinism, Regular Grammar and Regular Expressions, Equivalence of NFA and DFA.NFA and NFA with ε-transitions. (L10, T3) Limitations of Finite Automata, Pumping Lemma, Myhill-Nerode relations, Quotient Construction, Minimization Algorithm.(L8,T3) Push Down Automata & Context-free Languages (CFLs)- Grammars and Chomsky Hierarchy, CFLs, Chomsky Normal Form, Pumping Lemma for CFLs, Inherent Ambiguity of Context-Free Languages, Pushdown Automata (PDA), PDA vs CFLs. Non-equivalence of Deterministic and non- deterministic versions of PDA.Deterministic CFLs.—Closure properties (L12,T4) Linear Bounded Automata, Turing Machines & Computability -Introduction to Linear Bounded Automata (LBA), Turing Machines — Accepting vs Computing TMs, TM for addition, subtraction, and multiplication, Primality test. (L6, T2) Recursive and Recursively enumerable languages — Theory of Undecidability, Diagonalization						
Text Books	 language, Universal Turing machine, Halting Problem. (L6,T2) Hopcroft, Motwani, and Ullman, , Introduction to Automata Theory, Languages and Computation, Pearson Publishers, New International Edition (reprint of 3rd Edition), 2013, ISBN: 9781292039053. Peter Linz and Susan H. Rodger, An Introduction to Formal Languages and Automata, Jones & Bartlett Learning, Seventh Edition, 2023, 9781284231601, 2023. 						
Reference Books	 H. R. Lewis and C. H. Papadimitriou , Elements of the Theory of Computation, , Prentice Hall Publishers, Second Edition, 1997, ISBN: 9780132624787 John C. Martin, Introduction to Languages and the Theory of Computation, McGraw Hill Higher Education, Fourth Edition, 2011, ISBN: 9780073191461, 						

Course Code		Course Title	Computer Networks						
Dept./Faculty proposing	Computer Science &	Structure (LTPC)	L	Т	P	С			
the course	Engineering	Structure (ETF e)	3	0	2	4			
To be offered for	B.Tech (CSE,AI), DD CSE	Туре	Core Elective						
		Status	New [Modific	eation			
Pre-requisite		Submitted for approva	oroval Senate 62						
Learning Objectives	To introduce the basics of computer networking, error detection and correction techniques, and flow control techniques. Also an exposure to IP addressing and routing and its associated protocols would be given. A highlight of various application layer protocols and its relevance in modern networking world would be discussed.								
Learning Outcomes		To design a local area network and analyse the network using performance metrics. To appreciate the importance of subnetting, masking, and nuances involved in setting up a campus network							
Contents of the course (With approximate break-up of hours for L/T/P)	Foundation of Networks: No Reference models- The OSI I TCP/IP, Implementing Networks: No Reference models- The OSI I TCP/IP, Implementing Networks: No Reference models- The OSI I TCP/IP, Implementing Networks: No Reference models and the Network International Controls and the Network International Composition of the Network International Composition of the Network International Composition of the Network International International Composition of the Network International I	Reference Model- the Tork Software. (L5) Types of transmission memedia, Performance IT, effective bandwidth. Byte-Oriented Protocol sision-Stop-and-Wait AI es, virtual circuit switch of IEEE 802.3, 802. It) Let Protocol, Fragmentate Distance vector, Link stopsing, Network Address It, Remote Procedure Callocation, Queuing Distance of Service, Presentate It. Let DNS, SMTP, HT overlay Networks. Introduce the Programming. File to gramming - Simulation IT, Modelling of ACK, Modelling of ACK, Modelling window protocough simulation of IEEPNET simulator, Course	edia, Encode evaluation (L5) s, Bit-Orien RQ, Sliding hing and adstate, Metrics are Translation Formation Formation Formation Formation Formation Formation Formation Stop and NACK drops of with ACK grant Formation	ing-NRZ, n of a ted Protoc Window- dressing, the ted Protoc Window- dressing, the ted Protoc on, Multic t for Real- CP Conget ting, Mul Email, Metwork see Ping, If g TCP. Ec Wait Protoc the test of the test of the test of the test the test of	Manches network cols, Error HDLC, Fl schemes. I Medium A IPV4, IPV main rout cast, Mult -Time (R) estion Cor timedia I Multimedia I Aultimedia I Config, cho, Chat otocol -Sin odelling an drops, fra orks - Imp	ter, Differential c: propagation r Detection and low control and Ethernet, Token Access Control- 76, ARP,DHCP, ing, subnetting, iprotocol Label TP), Congestion atrol, Advanced Data - Lossless a Applications, 8) barameters such Traceroute, NS between two or nulation of Stop and simulation of me drops etc., olementation of			
Text Books Reference Books	 Bruce S. Davie and Larry L. Peterson, Computer Networks: A Systems Approach, 6th Edition - January 2021, Morgan Kaufmann, ISBN: 9780128237151 Andrew S. Tanenbaum, Nick Feamster and David J. Wetherall, Computer Networks, 7th Edition, July 2021, Pearson Education India, ISBN:9781292374062. James F. Kurose and Keith W. Ross, "Computer Networking - A top-down approach", 8th Edition, June 2021, Pearson Education India, ISBN:9781292405469. Behrouz A. Forouzan, Data Communications and Networking with TCP/IP Protocol Suit, 6th 								
	3. Behrouz A. Forouzan, Da edition, August 2022, Ta				∠1/11 F10l	ocoi buit, u			

Course Code		Course Title	Compiler	Design	l			
Dept./ Specialization	Computer Science & Engineering	Structure (LTPC)	3	0	2	4		
To be offered for	B.Tech (CSE,AI), DD CSE	Status	Core		Elect	ive		
Faculty Proposing the course	CSE Faculty	Туре	New			1		
Pre-requisite		Submitted for app	oproval Senate 62					
Learning Objectives	The objective of this course is to train students to design various phases of a compiler such as Lexical analyser, syntax analyser, semantic analyser, intermediate code generator, code optimizer and code generator. Students are also exposed to design compiler construction tools such as Lexical Analyser generator and parser generator. Applications of finite state machine and pushdown automation in compiler design are also taught in this course.							
Learning Outcomes	At the end of the course, students will have necessary understanding of the phases in compiler design, and will be able to design a programming language along with the associated compiler.							
Contents of the course(With approximate break-up of hours for L/T/P)	Need of compilers—source vs. cross Cord Design using DFAs—regular express Analyser from regular expressions—Cexpressions—Efficient Lexical analyser Context free grammar and its application descent—Predictive—Shift reduce—Opers Semantic analysis—Intermediate code expressions—looping and branching state Back patching and procedure calls cord Code Optimization: Basic blocks—Flow Directed acyclic graph representation Introduction to code optimization (L1 Storage optimization and allocation stracyclic graph (L5) Practice component: Lexical analymplementation using standard tools—for an expression grammar—Implementation that generates the three address code for which takes the three address code (or instructions—Implementation of peeph studies using online tools such as yacc,	construction of NI using Minimization ons –Types of parsistator precedence–SI generation: Declar tements (L7) ode generator design was graphs–Next use on of basic block (0) attegies–Assembly (1) was a simple mentation of a calculator a simple languaguatput of previous et ole optimization,	plications—A FA without n of automa ling — Top do LR, Canonica ration—Assig gn issues—R information as — Peeph Code Genera con in C/C parser and cor—Front end e—Back end e—Back end exercise) and	Automati epsilon ta (L10 own and la LR, La gnment suntime sultantion, syntation, syntati	moves bottom ALR statements storage generate mization ntax tre on—Les sers - i entation entation in asse	gn of L s from r up-Recu (L10) ents-Boo manage or case s on techr ee and Di exical an implement in of a con moly lan	exical egular ursive llean ment—tudy — nique—trected malyser ntation mpiler mguage	
Textbook	Alfred Aho, Ravi Sethi and Jeffrey D U Education, 2003. ISBN: 978032149169	5.	•					
Reference books	 Levine J.R, Mason T, Brown D, Le Allen I. Holub, Compiler Design in 	•					002.	

Course Code		Course Title	Prompt Engineering						
Dept./Faculty proposing the course	Computer Science & Enginering	Structure (LTPC)	L	Т	P	С			
Course	Lingmering		1	0	2	2			
To be offered for	B.Tech, DD	Туре	Core		Elective				
	,	Status	New	eses à	Modification				
Pre-requisite		Submitted for approval			Senate 62				
Learning Objectives	2. Teach zero-shot/few	iples of effective prompting -shot prompting, chain-of-th of prompting in creative wr	ought reasor	ning, and p	persona-ba	sed templates.			
Learning Outcomes	ChatGPT/Claude. 2. Implement chain-of- 3. Test prompts via A/I	2. Implement chain-of-thought prompts to debug code or interpret complex datasets.3. Test prompts via A/B testing, achieving ≥85% task success in image-text analysis.							
Contents of the course (With approximate break-up of hours for L/T/P)	Introduction to Prompt Engineering: Definition, scope, and importance of prompt engineering in AI system, Fundamentals of Effective Prompting: Components of good prompts, clarity, specificity, and context. (L3) Core Techniques and Patterns: Zero-Shot and Few-Shot Prompting, Chain-of-Thought and Advanced Reasoning, Systematic approach to prompt patterns (persona, template, cognitive verifier), Contextual Prompting and Information Integration: Managing context windows, information retrieval, and knowledge integration. (L5 hours) Prompts for creative writing, marketing, and content creation, code generation, data analysis, and technical documentation prompts, Multimodal and Advanced Applications: Image analysis, vision-language models, and multimodal prompting (L4) Prompt Optimization and Performance Measurement: Metrics for prompt effectiveness, A/B testing, and optimization strategies. (L2) Practice: Setup AI environments and master prompt creation across platforms like ChatGPT, Claude, and Gemini. Use zero-shot, few-shot, chain-of-thought, and persona-based prompting for tasks from code review to creative content and image analysis. Test and refine prompts systematically to improve model outputs, consistency, and cross-modal generation. Develop skills for analyzing responses, synthesizing multi-source data, and measuring prompt								
Text Books	1, John Berryman, Albert Ziegler. Prompt Engineering for LLMs: The Art and Scien Building Large Language Model–Based Applications, , 1st Edition, O'Reilly Media, 2 9781098156152 2. Richard Davies. Prompt Engineering in Practice, , 1st Edition , Manning Publication ISBN: 9781617299693					2024, ISBN:			
Reference Books	ChatGPT, Bard, DALL Edition (2024), Wiley 2. <u>DAIR.AI</u> Communi	E, and Midjourney – An In India.	neering: Generative AI Tips and Tricks for Indian Adaptation, ISBN: 978-9356666491, 1st Guide, 2025, GitHub Repository Guide)						

Course Code		Course Title	Human Computer Interaction					
Dept./Faculty proposing the course	Computer Science & Engineering	Structure (LTPC)	L	Т	P	С		
proposing the course	Engineering		3	0	2	4		
		Type	Core		Elective			
To be offered for	B.Tech (CSE,AI), DD CSE	Status	New		Modifie	cation		
Pre-requisite		Submitted for approval			Senate			
Learning Objectives	evaluation of interactive development of usable in	The course focuses on fundamental principles relating to the design, implementation and evaluation of interactive applications. User centric design approaches that contribute to the development of usable interface and interaction are focused.						
Learning Outcomes		Students gain a sound understanding of the interdisciplinary nature of HCI and are equipped with skill sets required for the creation of used, useful and usable applications.						
Contents of the course (With approximate break-up of hours for L/T/P)	with skill sets required for the creation of used, useful and usable applications. Introduction - user interface design - Concept of usability - Usability Principles - HCI and software engineering - GUI design and aesthetics - Psychological theories of human behavior - Design rules for enhanced usability [L8] HCI Framework, Introduction to different types of models - KLM, GOMS - Fitts' law and Hick Hyman's law - Shneiderman's eight golden rules - Norman's seven principles - Gestalt Laws of Design - Norman's model ofinteraction- Nielsen's ten heuristics with example of its use - User Data Gathering Techniques [L9] Usability Engineering - Life cycle model - Needs analysis - Systems analysis- User profiling - Rapid prototyping and interactive design - Formative evaluation techniques, including usability testing - Using standards and guideline [L9] Interaction Design Paradigms - CLI, WIMP -Form Fillins - Menus - DMI -Navigation Design - Dialog notations and design [L8] Evaluation Techniques - Universal Design - User Support Systems - Web Usability Guidelines, Recent trends in VR and AR Design guidelines [L8] Practice Component: Assignments covering various aspects of the course to test drive cognitive principles, various design laws such as 80-20, digit span etc would be test driven. Exercises would also involve form designs, interaction design paradigms, navigation design, usability and universal design guidelines & OO pseudocode for front end design. Course							
Text Books	Alan Dix, J Finlay, G D Al 9780130461094	bowd, R Beale Human (Computer	Interact	ion,Pren	tice Hall, 2003,		
	1. Jakob Nielsen, Usability	Engineering, Morgan F	Kauffman	, 1994,	978-012	5184069		
	2. Samit Bhattacharya, Hur	man Computer Interaction	n, McGrav	w Hill, 20	019, 978	9353168049		
Reference Books	3. Donald Norman, Desig	gn of Everyday Things,	Basic Bo	oks, 201	13, 9780	465050659		
	4. Articles from Nielsen N	Norman Group relating	to Usabili	ty and U	JserExpe	erience		

Course Code		Course Title	Computer Architecture					
Dept./Faculty proposing	Computer Science &	Structure (LTPC)	L	Т	P	С		
the course	Engineering	Structure (LTFC)	3	0	2	4		
To be offered for	B.Tech (CSE,AI), DD CSE	Type Core Elective 3. Tech (CSE,AI), DD CSE			e			
		Status	New		Modifie	cation		
Pre-requisite		Submitted for appr	roval		Senate 62	2		
Learning Objectives	The course aims to expose students to the concepts involved in the design of computer systems covering aspects such as instruction sets, pipelining, caches, physical memory, virtual memory, superscalar and out-of-order instruction execution, vector processor and multithreading.							
Learning Outcomes	Students will have the ability level, data level and thread le		r system ac	ddressing	issues re	lated to Instruction		
level, data level and thread level parallelisms. Fundamentals of Quantitative, Design and Analysis Computers, Memory Hierarchy Design: Optimizations of Cache Performance, Memory Technology and Optimizations, Virtual Memory and Virtual Machines. (L10) Instruction-Level Parallelism and Its Exploitation: ILP Concepts and Challenges, Overcoming Data Hazards with Static and Dynamic Scheduling, Reducing Branch Costs with Advanced Branch Prediction, Static and Dynamic Scheduling, Hardware- Based Speculation, Studies of the Limitations of ILP. (L10) Multi-Threading: Exploiting Thread-Level Parallelism to Improve Uni-processor Throughput (L7) Data-Level Parallelism in Vector, SIMD, and GPU Architectures: Vector Architecture, Detecting and Enhancing Loop-Level Parallelism. (L5) Thread-Level Parallelism: Centralized Shared-Memory Architectures, Performance of Symmetric Shared-Memory Multiprocessors, Distributed Shared-Memory and Directory- Based Coherence, Synchronization, Models of Memory Consistency, Multicore Processors and Their Performance. (L5) Warehouse-Scale Computers to Exploit Request-Level and Data-Level Parallelism: Programming Models and Workloads for Warehouse-Scale Computers, Computer Architecture of Warehouse-Scale Computers, Physical Infrastructure and Costs of Warehouse-Scale Computers, Cloud Computing: The Return of Utility Computing. (L5) Practice Component: Pipelined arithmetic circuits, Five Stage Pipelined Processor, ILP Concepts. Simulation of Branch Prediction, Static Scheduling and Dynamic Scheduling, Cache Mapping Schemes, Cache Coherence Algorithms. [P28]								
Text Books	Hennessy, John L., David A Quantitative Approach. 7th ed	l., Morgan Kaufmann	/Elsevier,	2025. ISE	3N 978-0	443154065.		
Reference Books	 John P. Shen and Mikko H. Lipasti, Modern Processor Design: Fundamentals of Superscalar Processors, 1st Edition, Waveland Press, 2013, ISBN-13: 978- 1478607830. D.M. Harris and S.L. Harris. Digital Design and Computer Architecture, 2nd Edition. Morgan Kaufmann, 2012, ISBN-13: 978-0123944245. 							

Course Code		Course Title	Full Stack Development						
Dept./Faculty Proposing the	Computer Science & Engineering	Structure	L	Т	P	С			
course	Computer Science & Engineering	(LTPC)	2	0	2	3			
		Status	Core	200000	Elec	ctive			
To be offered for	B.Tech (CSE,AI), DD CSE	Туре	New		Mod	Modification			
Pre-requisite		Submitted for	approval		Sen	ate 62			
Learning Objectives	The course is designed to provide st web development fundamentals.								
Learning Outcomes	By the end of the course, students will have a strong understanding of the core concepts and tools required to develop and deploy web applications. They shall be able to: Recognize and understand the components that make up a website. Gain an understanding of the current technologies used for building interactive websites. Learn to analyze logs to understand errors and their causes. HTML and styling: Introduction to HTML. Basic structure of an HTML document, mark up								
Contents of the course(With approximate break-up of hours for L/T/P)									
Text Books	 Deitel, Deitel and Nieto, Interne 2018, 9789352868599 Bai and Ekedhi, The Web Warri 9780619064587. 	or Guide to We	eb Progran	nming,	3rd Ed	ition, Thomson, 2008,			
Reference Books	 Brad Dayley, Brendan Dayley, and Caleb Dayley, Node.Js, Mongodb and Angular Web Development: The Definitive Guide to Using the Mean Stack to Build Web Applications, 2nd Edition, Pearson Education, 2018, 978 0134655536 Robert W. Sebesta, Programming World Wide Web, 8th Edition, Pearson Education, 2020, 9788131764583 								

Course Code		Course Title	Software	Engine	ering			
Dept./Faculty Proposing the	Computer Science & Engineering	Structure	L	Т	P	С		
course		(LTPC)	3	0	2	4		
T. 1 . CC . 1.C	D.E. 1 (COE AD DD COE	Status	Core	00000	Electi	ive		
To be offered for	B.Tech (CSE,AI), DD CSE	Туре	New		Modi	ficatio	n 🔲	
Pre-requisite	Nil	Submitted for app			Senat			
Learning Objectives	The course focuses on skills required for Students will be exposed to the concomponents and software engineering in By the end of the courses, students will	ncepts involved in general and softwa	the develore testing.	pment o	of softv	vare p	roducts,	
Learning Outcomes	Prepare SRS document for a project. The Apply software design and developed Apply verification and validati Implement testing methods for	Prepare SRS document for a project. They shall also be able to: Apply software design and development techniques. Apply verification and validation methods in a software engineering project. Implement testing methods for software.						
Contents of the course(With approximate break-up of hours for L/T/P)	Introduction: Rol of Software Engin Software Crisis - E ergence of software Software Development Process Mod Development, Extreme Programf ing, Sequirement Engineering Process - Functional requirements - Formal Specification and requirements - Formal Specification - Software Design - Design Concepts - It - Data Flow Diagram, Co text dagram Relationships - Unified Modeling Landactivity, State chart, Introduction to Desoftware Testing - Unit Testing - Integ Cases - Black-box Testing: Equivations combinatorial test design, White-box Tecoverage, path coverage, data flow and Practice Component: Specification of and design, Software Development Life and Activity Diagram - Implementation Black box testing - Use of appropriate of	re engineering- softwelels - Waterfall Morum and Agile Pro- Elicitation and Anal Ification - SRS Document - SRS Document - SRS Document - Computer - Compu	ware myths - Odel, Protot S esses. (L6 ysis- Docum ment Revie esign, c mpo oupling, Coh object O ient IL diagrams ceptance Tes tioning, bon verage, bran 10) ion oriented iented langu ftware Engin	Quality y ing, S of one of the conference of Designs: Use casting - Regundary checkens of the coverage and neering to the coverage of the cove	Attribution of the string of t	ttes (Loodel, and Van, user coriented cepts a ass, Interpretation Test special ltiple of the correction of the correctio	Iterative and n ^O n- lidatio - interface ad Desig and Class deraction, ing- Test al value, condition I analysis tate chart box and	
Text Books	 Rajib Mall, Fundamentals of S Pvt.Ltd,2014. 978-8120³ 4898 Ian Sommerville, Software Eng Grady Bo^och, James Rambaug Pearson Education,2008, 978- 	1 gineering 9 th Editio gh, Ivar Jacobson,Th 8177583724	n, Addison-V ne unified mo	Wesley, 2 odeling l	2016, 97 angua ^g e	789258 e user g	3543539 guide,	
Reference Books	 Roger Pressman, Software En Hill, 2020, 9258543539 Pankaj Jalote, A Concise Introd 1848003019 R. Fairley, Software Engineering 	duction to Software	Engineering	, Springe	er, 2008	, 978-		

Course Code		Course Title	Cyber Security				
Dept./Faculty Proposing the	· ·		L	T	P	С	
course			3	0	2	4	
		Status	Core		Elec	tive 🔲	
To be offered for	B.Tech (CSE,AI), DD CSE	Type	New Modification			ification	
Pre-requisite		Submitted for appro					
Learning Objectives	The course focusses on cybersecurity principles and their relevance to identify cyber threats, attacks, and vulnerabilities. It shall expose students: To cryptographic methods for secure communication. To network security and secure system design. To Cyber forensics and incident response.						
Learning Outcomes	Students will able to understand core concepts of cybersecurity, cryptography, and secure system design. They shall also be able to: Identify, analyze, and mitigate cyber threats and vulnerabilities Gain a holistic view of new and evolving security techniques Apply cyber forensic techniques to investigate security incidents. Manage cybersecurity incidents through effective incident response strategies.						
Contents of the course(With approximate break-up of hours for L/T/P)	Introduction to Cyber Security: Overview of cybersecurity principles, understanding cyber threats, vulnerabilities, Risk, attack surface, attack vectors, attack trees, and basic threat modeling, Analysis of case studies related to cyber warfare and cyber terrorism (L11) Core Security Mechanisms and Practices: Authentication, Authorization, Cryptography, Firewalls, Scanning, Intrusion Detection and Prevention Systems (IDS/IPS), and Security Policies (L10) Security Models, Frameworks, and Architectures: Defense in depth, and fail-safe defaults, Bell-LaPadula Model, the Biba Model, and the Clark-Wilson Model (L6) Evolving Security Techniques, Cyber Forensics & Incident Management: IoT security, Cyber-physical system security, Adversarial ML, blockchain-based security models, basics of cyber forensics, evidence collection, chain of custody, incident detection, response, and recovery techniques (L10) Emerging Trends and Future Directions in Cyber Security: Zero Trust Architecture, SecureMulti-Party Computation, AI for Cyber Defense, Future Challenges and Research Directions (L5) Practice Sessions: Password Policy Testing, Linux Commands for Networking & Security - Network traffic analysis using Wireshark, Malware Analysis, Nmap and tcpdump- Basic Penetration Testing - Honeypot Tool: Cowrie and T-Pot - TCP Socket Programming – DdoS & Flood Attack Simulators and network-based attack generation - Adversarial attack generators (For ML Security) - Open-source IDS tools: Fail2Ban, Wazuh, Kismet, Zeek, Ntopng, Suricata, and Argus - Digital Forensics Basics: Autopsy and Sleuth Kit.						
Text Book	 C J Brooks, C Grow, P Craig, D Short, Cybersecurity essentials John Wiley & Sons, 2018, ISBN 978 1119362395 Stallings, W. Cryptography and Network Security: Principles and Practice (8th ed.). Pearson Education, 2023, 9357059717 						
Reference Books	 Kaufman, C., Perlman, R., & Speciner, M., Network Security: Private Communication in a Public World, 2nd ed, Prentice Hall, 9357059717. Anderson, R. J, Security Engineering: A Guide to Building Dependable Distributed Systems, 3rd ed, Wiley, 2020, 9781119642787 						

Course Code		Course Title	Analytics & Systems of Big Data				
Dept./Faculty			L	Т	P	С	
proposing the course	Engineering	(LTPC)	3	1	0	4	
To be offered for	DD CSE, M.Tech CSE(DSAI)	Туре	Core Elective				
		Status	New		Modifie	cation =	
Pre-requisite		Submitted for	or approval Senate 62				
Learning Objectives	The course intends to expose computer engineering students to recent advances in storage and analytics involved with big data. Topics related to Map reduce, globally distributed storage systems and analytics such as feature extraction, learning, similarity, etc. are dealt with to expose the students to current trends in data storage & analytics.						
Learning Outcomes	 The course shall equip students with required storage mechanisms / analytics algorithms for large distributed data intensive applications Ability to understand, visualize and perform analytics of huge data Ability to design and test drive big data and descriptive cum predictive analytics solutions for real life scenarios. 						
Contents of the course (With approximate break-up of hours for L/T/P)	Descriptive Statistics – Data Visualization & Interpretation – Data Pre-processing Techniques – Dimensionality Reduction Techniques - Inferential Statistics [L9, T2] Predictive Analytics –Supervised v/s Unsupervised Learning - Basic algorithms for Association Rules, Data Classification, Clustering, Prediction, Outlier Analysis - Measures of Performance / Interestingness as applicable to each predictive analytics technique - domain specific feature extraction, similarity measures, Recent advances in Data Mining such as closed, maximal item sets, bucket brigade classifiers, clustering paradigms [L12, T4] Map reduce abstraction, Cluster and Data centre network, Distributed Storage, Data deduplication storage systems, Venti and DDFS - Shingles and minhashing, locality sensitive hashing - Clustering in high dimensional space [L10, T2] Mining Data Streams - Stream Data Model – Sampling Data in the Stream –Filtering Streams – Counting Distance Elements in a Stream Web link analysis [L11, T3]						
Text Books	1. Jure Leskovec, AnandRajaraman, Jeffrey David Ullman, "Mining of Massive Datasets", Cambridge University Press, Second Edition, 2014, ISBN 9781316638491						
Reference Books	 J Han, M Kamber, Data Mining Concepts & Techniques, Elsevier, 3rd Edition, 2007, ISBN: 9780123814791. Raj Kamal, Big Data Analytics, Introduction to Hadoop, Spark, and MachineLearning, McGraw Hill, 2019, ISBN 9789353164973. www.cs.princeton.edu/courses/archive/spring13/cos598C/index.html - Princeton University Course Webpage. 						

Course Code		Course Title	Advanced Data Structures and Algorithms					
Dept./Faculty	Computer Science &	Structure	L	Т	P	С		
proposing the course	Enginering	(LTPC)	3	1	0	4		
To be offered for	DD CSE,M. Tech CSE(DSAI)	Туре	Core		Elective	e 🗆		
		Status	New		Modific	cation =		
Pre-requisite		Submitted for	or approval Senate 62					
Learning Objectives	Learning Objectives To introduce mathematical models, advanced data structures and algorithm design strategies. To introduce various analysis in the design of algorithms.							
Learning Outcomes	 The ability to design and analyse algorithms for computational problems that arise in CS. To understand and appreciate the notion of solvability and insolvability. The ability to gauge easy vs hard instances of a computational problem. 							
Contents of the course (With approximate break-up of hours for L/T/P)	Mathematical Models and Encoding: Mathematical models - Turing Machine, Random Access Machine along with their input encoding/representation. The notion input size/magnitude, time/space complexity analysis in terms of input size. Introduction to asymptotic analysis. (L5,T2) Recursive vs Iterative Algorithms, Recurrence relations, solving recurrence relations - guess method, substitution method (review). The recurrence tree method, Proof of Master theorem, solving recurrence relations using characteristic equation method. The number of binary search trees, Catalan number (L5,T2) Advanced data structures; Min-Max Heap, Deap, leftist trees, Symmetric Heaps -design and analysis of algorithms for basic operations. Applications. (L7,T2) Introduction to probabilistic analysis; Average Case analysis of search, sorting problems. Lower bound theory arguments for search and sorting problems. Order Statistics and its applications (L5,T2) Introduction to amortized analysis; potential function method. Binomial-Heaps and Fibonacci Heaps, Splay trees, dynamic tables (7L,T2) Algorithm design; Case studies following greedy algorithms and dynamic programming. Introduction to graph algorithms - application of BFS/DFS, topological sorting, strongly connected components. Proof of correctness of greedy algorithms (L7,T2) Introduction to NP-completeness, NP, NP-Hardness result of well-known problems (L6)							
Text Books	 T. H. Cormen, C. E. Leiserson, and R. L. Rivest, "Introduction to Algorithms," Prentice Hall India, 2 nd Edition, 2001. ISBN 9780262533058. E. Horowitz, S. Sahni, and S. Rajasekaran, "Computer Algorithms," 2 nd Edition, Galgotia Publications, 2007. ISBN 9780716783169. 							
Reference Books	 Aho, Hopcroft, and Ullmann, "Data Structures & Algorithms," Addison Wesley, 1983. ISBN: 9780201000238. Algorithm Design, Eva Tardos and Kleinberg, Pearson, 2006, ISBN: 9780321295354. 							

Course Code		Course Title	Analytics & Systems of Big Data Practice				
Dept./Faculty	Computer Science &	Structure	L	Т	P	С	
proposing the course	oposing the course Engineering (LTPC)	(LTPC)	0	0	4	2	
To be offered for	DD CSE, M.Tech CSE(DSAI)	Туре	Core		Elective		
		Status	New		Modification =		
Pre-requisite		Submitted for	or approval		Senate	62	
Learning Objectives	The course intends to expose computer engineering students to recent advances in storage and analytics involved with big data. Topics related to Map reduce, globally distributed storage systems and analytics such as feature extraction, learning, similarity, etc. are dealt with to expose the students to current trends in data storage & analytics.						
Learning Outcomes	 Ability to understand, visualize and perform analytics of huge data Ability to design and test drive big data and descriptive cum predictive analytics solutions for real life scenarios. Handle and Design Live and Big Data to support analytics solutions 						
Contents of the course (With approximate break-up of hours for L/T/P)	Exercises using R / Python on Descriptive Statistics, Predictive Analytics - association rule mining, classification, clustering where in various existing algorithms are tested over benchmark datasets – Exercises on Map Reduce Frame work – Hadoop / Pyspark –SQL for Big Data solutions - Selected algorithms of Predictive analytics using Map Reduce Framework for Big Data - Similarity Measures – LSH Implementation – Link Analysis - Page Rank computation. [P28]						
Text Books	1. Jure Leskovec, Anand Rajaraman, Jeffrey David Ullman, "Mining of Massive Datasets", Cambridge University Press, Second Edition, 2014, ISBN 9781316638491						
Reference Books	 J Han, M Kamber, Data Mining Concepts & Techniques, Elsevier, 3rd Edition, 2007, ISBN: 9780123814791. Raj Kamal, Big Data Analytics, Introduction to Hadoop, Spark, and MachineLearning, McGraw Hill, 2019, ISBN 9789353164973. www.cs.princeton.edu/courses/archive/spring13/cos598C/index.html - Princeton University Course Webpage. 						

Course Code		Course Title	Natural Language Processing				
Dept./Faculty	Computer Science &	Structure (LTPC)	L	Т	P	С	
proposing the course	Engineering	(====,	2	0	2	3	
T. 1. CC. 1.C	DD CGE D.T. I. (CGE AD	Туре	Core	Core		e 🗆	
To be offered for	DD CSE, B.Tech (CSE,AI)	Status	New 🔳		Modification		
Pre-requisite		Submitted for approval	l .		Senate	62	
Learning Objectives	 Identify core challenges in NLP such as syntactic ambiguity, semantic variation, and discourse understanding. Appreciate the importance and applications of NLP in real-world domains (e.g., search engines, chatbots, translation). List and describe classical problems in NLP: POS tagging, parsing, translation, sentiment analysis, etc. 						
Learning Outcomes	 Understand the challenges and complexities of natural language processing from both linguistic and computational perspectives. Apply foundational concepts in word, sentence, and discourse-level processing for various NLP tasks. Design and implement basic and statistical models for key NLP tasks like parsing, tagging, translation, and information extraction. Gain hands-on experience with lexical resources, grammars, and statistical models. 						
Contents of the course (With approximate break-up of hours for L/T/P)	Information Extraction and Natural Language Generation: Named Entity Recognition, Relation Extraction MI based techniques for generating coherent taxt. (1.7)						
Text Books	Speech and Language Processing: Daniel Jurafsky and James H. Martin, Prentice Hall, 3 rd Edition, 2025, 978-0131873216						
Reference Books	 Yoav Goldberg, Neural Network Methods in Natural Language Processing, Morgan & Claypool Publishers, 1st Edition, 2017, 978-1627052986 Philipp Koehn, Statistical Machine Translation, Cambridge University Press 2010. 978-0521874151 Christopher D. Manning and Hinrich Schütze, Foundations of Statistical Natural Language Processing MIT Press, 1st Edition, 2019, 978-0521874151 						

Course Code		Course Title	Advanced Data Structures and Algorithms Practice				
Dept./Faculty	Computer Science &	Structure	L	Т	P	С	
proposing the course	Engineering	(LTPC)	0	0	4	2	
To be offered for	DD CSE, M. Tech CSE(DSAI)	Туре			Elective	e 🗆	
		Status	New		Modific	cation =	
Pre-requisite	NIL	Submitted fo	for approval Senate 62			62	
Learning Objectives	To design time or space efficient algorithms using well known paradigms. To get practical exposure on design and analysis of algorithms						
Learning Outcomes	 Students are expected to design efficient algorithms using paradigms such as divide and conquer, dynamic programming, greedy method etc. To be able to implement advanced data structures and revisit classical algorithms using these data structures. 						
Contents of the course (With approximate break-up of hours for L/T/P)	The laboratory component will require the student to write computer programs using a careful choice of data structures and algorithmic paradigms (in C++/Java language) from scratch, based on the concepts learnt in the theory course. Case studies in respect of different paradigms discussed in theory shall be implemented in C++/Java Paradigms — Divide and conquer, dynamic programming, greedy, backtracking, Order Statistics, Probabilistic Algorithms [P28]						
Text Books	 T. H. Cormen, C. E. Leiserson, and R. L. Rivest, Introduction to Algorithms, Prentice Hall India, 2 nd Edition, 2001. ISBN 9780262533058. E. Horowitz, S. Sahni, and S. Rajasekaran, Computer Algorithms, 2 nd Edition, Galgotia Publications, 2007. ISBN 9780716783169. 						
Reference Books	 Aho, Hopcroft, and Ullmann, Data Structures & Algorithms, Addison Wesley, 1983. ISBN: 9780201000238. Algorithm Design, Eva Tardos and Kleinberg, Pearson, 2006, ISBN: 9780321295354. 						