DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

COURSE STRUCTURE & SYLLABUS B. Tech CSE for COMPUTERSCIENCE&ENGINEERINGPROGRAMME

(Applicableforbatchesadmittedfrom2024-2025)

D.N.R. COLLEGE OF ENGINEERING & TECHNOLOGY

(Autonomous)

BALUSUMUDI, BHIMAVARAM, W.G. Dist., A.P., PIN-534 202

B.Tech. CSE (DR24 Regulation I Year COURSE STRUCTURE &SYLLABUS)

B.Tech. – I Year I Semester (for Group-A Branches)							
S. No.	**Course Code**	**Title**	**Category**	**L/D**	**T**	**P**	**Credits**
1		Communicative English	BS&H	2	0	0	2
2		Engineering Chemistry / Chemistry / Fundamental Chemistry	BS&H	3	0	0	3
3		Linear Algebra & Calculus	BS&H	3	0	0	3
4		Basic Civil & Mechanical Engineering	ES	3	0	0	3
5		Introduction to Programming	ES	3	0	0	3
6		Communicative English Lab	BS&H	0	0	2	1
7		Engineering Chemistry / Chemistry / Fundamental Chemistry Lab	BS&H	0	0	2	1
8		Engineering Workshop	ES	0	0	3	1.5
9		Computer Programming Lab	ES	0	0	3	1.5
10		Health and wellness, Yoga and Sports	BS&H	-	-	1	0.5
Total				**14**	**00**	**11**	**19.5**

B.Tech. – I Year I Semester (for Group-B Branches)							
S. No.	**Course Code**	**Title**	**Category**	**L/D**	**T**	**P**	**Credits**
1		Engineering Physics	BS&H	3	0	0	3
2		Linear Algebra & Calculus	BS&H	3	0	0	3
3		Basic Electrical & Electronics Engineering	ES	3	0	0	3
4		Engineering Graphics	ES	1	0	4	3
5		Introduction to Programming	ES	3	0	0	3
6		IT Workshop	ES	0	0	2	1
7		Engineering Physics Lab	BS&H	0	0	2	1
8		Electrical & Electronics Engineering Workshop	ES	0	0	3	1.5
9		Computer Programming Lab	ES	0	0	3	1.5
10		NSS / NCC / Scouts & Guides / Community Service	BS&H	-	-	1	0.5
Total				**13**	**00**	**15**	**20.5**

B.Tech. – I Year II Semester (for Group-A Branches)

S. No.	Course Code	Title	Category	L/D	T	P	Credits
1	BT24BH1201	Engineering Physics	BS&H	3	0	0	3
2	BT24BH1202	Differential Equations & Vector Calculus	BS&H	3	0	0	3
3	BT24EC1201	Basic Electrical and Electronics Engineering	ES	3	0	0	3
4	BT24ME1201	Engineering Graphics	ES	1	0	4	3
5	BT24CS1201	IT Workshop	ES	0	0	2	1
6	BT24CS1202	Data Structures /	PC	3	0	0	3
	BT24EC1202	Electrical Circuit Analysis – I (Branch specific)					
7	BT24BH1203	Engineering Physics Lab	BS&H	0	0	2	1
8	BT24EC1202	Electrical and Electronics Engineering Workshop	ES	0	0	3	1.5
9	BT24CS1203	Data Structures Lab /	PC	0	0	3	1.5
	BT24EC1204	Electrical Circuit Analysis – I Lab					
10	BT24BH1204	NSS / NCC /Scouts & Guides / Community Service	BS&H	-	-	1	0.5
Total				**13**	**00**	**15**	**20.5**

B.Tech.–IYearIISemester (forGroup-B Branches)

S. No.	Course Code	Title	Category	L/D	T	P	Credits
1	BT24BH1201	Communicative English	BS&H	2	0	0	2
2	BT24BH12	Engineering Chemistry / Chemistry / Fundamental Chemistry	BS&H	3	0	0	3
3		Differential Equations & Vector Calculus	ES	3	0	0	3
4		Basic Civil & Mechanical Engineering	ES	3	0	0	3
5		Engineering Mechanics (Branch specific)	PC	3	0	0	3
		Network Analysis (Branch specific)					
		Data structures (Branch specific)					
6		Communicative English Lab	BS&H	0	0	2	1
7		Engineering Chemistry / Chemistry / Fundamental Chemistry Lab	BS&H	0	0	2	1
8		Engineering Workshop	ES	0	0	3	1.5
9		Engineering Mechanics & Building Practices Lab Engineering Mechanics Lab	PC	0	0	3	1.5
		Network Analysis Lab					
		Data structures Lab					
10		Health and wellness, Yoga and Sports		-	-	1	0.5
Total				**14**	**00**	**11**	**19.5**

B.Tech. CSE (DR24 Regulation II Year COURSE STRUCTURE &SYLLABUS)

B. Tech.–II Year I Semester

S. No.	Course Code	Title	Category	L/D	T	P	Credits
1	BT24BS2105	Discrete Mathematics &Graph Theory	BS&H	3	0	0	3
2	BT24HS2101	Universal human values – understanding harmony and Ethical human conduct	BS&H	2	1	0	3
3	BT24EC2107	Digital Logic & Computer Organization	ES	3	0	0	3
4	BT24CS2101	Advanced Data Structures & Algorithm Analysis	PC	3	0	0	3
5	BT24CS2102	Object Oriented Programming Through Java	PC	3	0	0	3
6	BT24CS2103	Advanced Data Structures and Algorithm Analysis Lab	PC	0	0	3	1.5
7	BT24CS2104	Object Oriented Programming Through Java Lab	PC	0	0	3	1.5
8	BT24CS2105	Python Programming	PC	0	1	2	2
9	BT24BS2106	Environmental Science	MC	2	0	0	-
Total				**16**	**2**	**8**	**20**

B. Tech – II Year II Semester

S. No.	Course Code	Title	Category	L/D	T	P	Credits
1	BT24HS2201	Managerial Economics and Financial Analysis	MG	2	0	0	2
2	BT24BS2202	Probability & Statistics	ES/BS	3	0	0	3
3	BT24CS2201	Operating Systems	PC	3	0	0	3
4	BT24CS2202	Database Management Systems	PC	3	0	0	3
5	BT24CS2203	Software Engineering	PC	2	1	0	3
6	BT24CS2204	Operating Systems Lab	PC	0	0	3	1.5
7	BT24CS2205	Database Management Systems Lab	PC	0	0	3	1.5
8	BT24CS2206	Full Stack Development – I	SEC	0	1	2	2
9	BT24BS2203	Design Thinking & Innovation	BS&H	1	0	2	2
Total				**14**	**2**	**10**	**21**
10	Mandatory Community Service Project Internship of 08 weeks duration during summer vacation						

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Ph: 08816-221238 Email: dnrcet@gmail.com website: https://dnrcet.org

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B.Tech. INFORMATION TECHNOLOGY (DR24 Regulation II Year COURSE STRUCTURE &SYLLABUS)

B. Tech.–III Year I Semester

S. No.	Course Code	Title	Category	L/D	T	P	Credits
1	BT24IT3101	AdvancedJava	PC	3	0	0	3
2	BT24CS3102	ComputerNetworks	PC	3	0	0	3
3	BT24IT3102	AutomataTheory & Compiler Design	PC	3	0	0	3
4	BT24CS31P1A	1. ObjectOrientedAnalysisandDesign	PE-1	3	0	0	3
	BT24IT31P1A	2. CyberSecurity					
	BT24IT31P1C	3. Artificial Intelligence					
	BT24CS31P1D	4. Microprocessors&Microcontrollers					
	BT24IT31P1B	5. DataWarehousing&DataMining					
5		OR Entrepreneurship Development & Venture Creation	OE-1	3	0	0	3
6	BT24CS3105	AdvancedJavaLab	PC	0	0	3	1.5
7	BT24CS3106	ComputerNetworksLab	PC	0	0	3	1.5
8	BT24CS3107	FullStackDevelopment1	SEC	0	1	2	2
9	BT24CS3108	UserInterfaceDesignusingFlutter/ SWAYAM Plus - Android Application Development (withFlutter)	ES	0	0	2	1
10	BT24BCS3109	EvaluationofCommunityService Internship		-	-	-	2
Total				**15**	1	10	23
MC	MinorCourse(Studentmayselectfromthesamespecialized minors pool)			3	0	3	4.5
MC	MinorCoursethroughSWAYAM/NPTEL(minimum12week, 3 credit course)			3	0	0	3
HC	HonorsCourse(Studentmayselectfromthesamehonors pool)			3	0	0	3
HC	HonorsCourse(Studentmayselectfromthesamehonorspool)			3	0	0	3

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B.Tech. INFORMATION TECHNOLOGY (DR24 Regulation II Year COURSE STRUCTURE &SYLLABUS)

B. Tech – III Year II Semester

S. No.	Course Code	Title	Category	L/D	T	P	Credits
1	BT24CS3202	Cloud Computing	PC	3	0	0	3
2	BT24IT3203	Cryptography&Network Security	PC	3	0	0	3
3	BT24IT3201	Machine Learning	PC	3	0	0	3
4	BT24CS32P2A	1. SoftwareTestingMethodologies	PE-2	3	0	0	3
	BT24CS32P2B	2. Augmented Reality & Virtual Reality					
	BT24CS32P2C	3. DevOps					
	BT24CS32P2D	4. Generative AI					
	BT24EC32P2E	5. 12 week MOOC Swayam/NPTELcourse					
5	BT24CS32P3A	1. SoftwareProjectManagement	PE-3	3	0	0	3
	BT24CS32P3B	2. Mobile Adhoc Networks					
	BT24CS32P3C	3. NaturalLanguage Processing					
	BT24CS32P3D	4. DistributedOperating System					
	BT24CS32P3E	5.					
	BT24CS32P3F	6. 12weekMOOCSwayam/NPTEL course recommendedbytheBoS					
6		OpenElective–II	PC	3	0	0	3
7	BT24CS3204	Cloud Computing Lab	PC	0	0	3	1.5
8	BT24CS3205	Machine Learning Lab	SEC	0	0	3	1.5
9		Softskills//SWAYAMPlus -21st CenturyEmployability Skills	BS & H	0	1	2	2
10		TechnicalPaperWriting&IPR	BS & H	2	0	0	-
Total				**20**	**1**	**08**	**23**
11	MandatoryIndustry Internship/ MiniProject of08weeksdurationduringsummervacation						
MC	Minor Course(Studentmayselectfrom thesamespecializedminors pool)			3	0	3	4.5
MC	MinorCoursethroughSWAYAM/NPTEL(minimum12 week, 3 credit course)			3	0	0	3
HC	HonorsCourse(Studentmayselect from thesamehonors pool)			3	0	0	3

HC	HonorsCourse(Studentmayselectfromthesamehonorspool)	3	0	0	3

*UnderIndustryInternshipinterestedstudentscanpursueSWAYAMPlus coursesviz., Hands-on Masterclass on Data Analytics OR Artificial Intelligence for Real-World Application

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DEPARTMENT OF INFORMATION TECHNOLOGY

III Year – I Semester	Course Code: BT24IT3101	L	T	P	C
		3	0	0	3
ADVANCED JAVA					

CourseObjectives:

Thiscoursedevelopsprogrammingabilityofstudentstocreatedynamicwebapplicationsusingserver side technology with Java Database Connectivity. Students can learn networking and remote method invocation using Java API and different Java frameworks like Spring will increase ability of students in web application development.

CO1:.	Explain JDBC architecture, JDBC drivers, major classes/interfaces, and perform database operations including CRUD, transaction management, batch updates, and RowSet objects.
CO2	Analyze J2EE architecture, containers, server types, HTTP protocols, request processing, and structure of web applications.
CO3:	Apply Servlet API for building dynamic web applications, including Servlet lifecycle, configuration, session tracking, event handling, filters, and response manipulation.
CO4:.	Demonstrate JSP concepts including JSP architecture, lifecycle, scripting elements, directives, actions, implicit objects, Expression Language, JSTL, custom tags, session management, and exception handling.
CO5: .	Develop CRUD-based web applications using Java web frameworks, particularly Spring MVC, exploring dependency injection, bean lifecycle, Spring annotations, Spring AOP, and database transaction management.
CO6:	Integrate web application components, implement MVC architecture using Spring, and design robust enterprise-level web applications with data access and transaction management.

CO \ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	2	1	2							
CO2	3	3	2	2	1							
CO3	3	3	3	2	1							
CO4	3	3	2	2	1							
CO5	3	3	3	2	3							
CO6	3	3	3	2	3							3

UnitI:

JDBC Programming : JDBC Architecture, Types of JDBC Drivers, Introduction to major JDBC Classes and Interface, Creating simple JDBC Application, Types of Statement (Statement Interface, Prepared Statement, Callable Statement), Exploring Result Set Operations, Batch Updates in JDBC, Creating CRUD Application, Using Rowsets Objects, Managing Database Transaction.

UnitII:

J2EE and Web Development: J2EE Architecture Types, J2EE Containers, Types of Servers in J2EE Application, HTTP Protocols and API, Request Processing in Web Application, Web Application Structure, Web Containers and Web Architecture Models.

UnitIII:

Servlet API and Overview: Servlet Introduction, Servlet Life Cycle(SLC), Types of Servlet, Servlet Configuration with Deployment Descriptor, Working with Servlet Context and Servlet Config Object, Attributes in Servelt,, Response and Redirection using Request Dispacher and using send Redirect Method, Filter API, Manipulating Responses using Filter API, Session Tracking: using Cookies, HTTP Session, Hidden Form Fields and URL Rewriting, Types of Servlet Event: Context Level and Session Level.

UnitIV:

Java Server Pages(JSP): Introduction to JSP , Comparison with Servlet, JSP Architecture, JSP: Life Cycle, Scripting Elements, Directives, Action Tags, Implicit Objects, Expression Language(EL), JSP Standard Tag Libraries(JSTL), Custom Tag, Session Management, Exception Handling, CRUD Application

Unit V:

Java Web Frameworks: Spring MVC Spring: Introduction, Architecture, Spring MVC Module, Life Cycle of Bean Factory, Explore: Constructor Injection, Dependency Injection, Inner Beans, Aliases in Bean, Bean Scopes, Spring Annotations, Spring AOP Module, Spring DAO, Database Transaction Management, CRUD Operation using DAO and Spring API.

Text Books:

1. BlackBook"Javaserverprogramming"J2EE,1st ed.,DreamTechPublishers,2008.
2. CompleteReferenceJ2EE,JamesKeogh,McGrawHillpublication
3. ProfessionalJavaServerProgramming,SubrahmanyamAllamaraju,CedricBuest,Wiley Publication
4. SpringinAction,3rd edition,Craigwalls,ManningPublication

ReferenceBooks:

1. CoreJava,VolumeII:AdvancedFeatures,CayHorstmann,GaryCornellPearson Publication
2. JDBC™APITutorialandReference,ThirdEdition,MaydeneFisher,JonEllis,Jonathan Bruce, Addison Wesley
3. BeginningJSP,JSFandTomcat,GiulioZambon,Apress

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DEPARTMENT OF INFORMATION TECHNOLOGY

IIIYear-ISemester	Course Code: BT24CS3102	L	T	P	C
		2	1	0	3
COMPUTER NETWORKS					

CourseObjectives:

- Toprovideinsightaboutnetworks,topologies,andthekeyconcepts.
- Togaincomprehensiveknowledgeaboutthelayeredcommunicationarchitectures(OSIand TCP/IP) and its functionalities.
- To understand the principles, key protocols, design issues, and significance of each layers in ISO and TCP/IP.
- Toknowthebasicconceptsofnetworkservicesandvariousnetworkapplications.

CO1:.	Explain the fundamentals of computer networks, including network types (LAN, MAN, WAN), topologies, reference models (OSI, TCP/IP), and guided/unguided media.
CO2	Analyze data link layer concepts such as framing, flow control, error detection and correction, and implement elementary protocols including Stop-and-Wait, Sliding Window, HDLC, and PPP.
CO3:	Demonstrate Media Access Control techniques including random access (ALOHA, CSMA), controlled access, and channelization methods, and evaluate wired LAN technologies including Ethernet, Fast Ethernet, and Gigabit Ethernet.
CO4:.	Apply network layer concepts including packet switching, routing algorithms, congestion control, tunneling, internetworking, IPv4/IPv6 addressing, and fragmentation.
CO5: .	Analyze transport layer protocols including UDP and TCP, covering services, connection management, flow control, error control, and congestion control mechanisms.
CO6:	Evaluate application layer protocols and services including HTTP, email, TELNET, and DNS, and analyze web-based network security mechanisms.

CO \ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	1	1								
CO2	3	3	2	2								
CO3	3	3	2	2	2							
CO4	3	3	3	2	2							
CO5	3	3	2	2	2							
CO6	3	3	2	2				1				3

UNIT I: Introduction: Network Types, LAN, MAN, WAN, Network Topologies Reference models- The OSI Reference Model- the TCP/IP Reference Model - A Comparison of the OSI and TCP/IP Reference Models, OSI Vs TCP/IP.
PhysicalLayer–IntroductiontoGuidedMedia-Twisted-paircable,CoaxialcableandFiberoptic cable and introduction about unguided media.

UNIT II: Data link layer: Design issues, **Framing**: fixed size framing, variable size framing, flow control, error control, error detection and correction codes, CRC, Checksum: idea, one's complement internet checksum, services provided to Network Layer, **Elementary Data Link Layer protocols**: simplex protocol, Simplex stop and wait, Simplex protocol for Noisy Channel.
Sliding window protocol: One bit, Go back N, Selective repeat-Stop and wait protocol, Data link layer in HDLC, Point to point protocol (PPP)

UNIT – III: Media Access Control: Random Access: ALOHA, Carrier sense multiple access (CSMA), CSMA with Collision Detection, CSMA with Collision Avoidance, **Controlled Access:** Reservation, Polling, Token Passing, **Channelization:** frequency division multiple Access(FDMA), time division multiple access(TDMA), code division multiple access(CDMA).
Wired LANs: Ethernet, Ethernet Protocol, Standard Ethernet, Fast Ethernet(100 Mbps), Gigabit Ethernet, 10 Gigabit Ethernet.

UNIT – IV: The Network Layer Design Issues – Store and Forward Packet Switching- Services Provided to the Transport layer- Implementation of Connectionless Service- Implementation of Connection Oriented Service- Comparison of Virtual Circuit and Datagram Networks,
Routing Algorithms-The Optimality principle-Shortest path, Flooding, Distance vector, Link state, Hierarchical, Congestion Control algorithms-General principles of congestion control, Congestion prevention polices, Approaches to Congestion Control-Traffic Aware Routing-Admission Control- Traffic Throttling-Load Shedding. Traffic Control Algorithm-Leaky bucket & Token bucket.
Internet Working: How networks differ- How networks can be connected- Tunnelling, internetwork routing-, Fragmentation, network layer in the internet – IP protocols-IP Version 4 protocol-IPV4 Header Format, IP addresses, Class full Addressing, CIDR, Subnets-IP Version 6-The main IPV6 header, Transition from IPV4 to IPV6, Comparison of IPV4 & IPV6.

UNIT –V: The Transport Layer: Transport layer protocols: Introduction-services- port number- User data gram protocol-User datagram-UDP services-UDP applications-Transmission control protocol: TCP services- TCP features- Segment- A TCP connection-windows in TCP- flow control- Error control, Congestion control in TCP.
Application Layer –- World Wide Web: HTTP,Electronic mail-Architecture- web basedmail-email security- TELENET-local versus remote Logging-Domain Name System.

Text Books:

1. ComputerNetworksm,AndrewSTanenbaum,FifthEdition.PearsonEducation/PHI
2. DataCommunicationsandNetworks,BehrouzA.Forouzan,FifthEdition TMH.

ReferencesBooks:

1. DataCommunicationsandNetworks-AchutSGodbole,AtulKahate
2. ComputerNetworks,MayankDave,CENGAGE

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DEPARTMENT OF INFORMATION TECHNOLOGY

IIIYear-ISemester	Course Code: BT24IT3102	L	T	P	C
		3	0	0	3
AUTOMATA THEORY & COMPILER DESIGN					

CourseObjectives:

- Introducethenotionofformallanguagesandgrammars
- DesignofGrammars,FAsandPDAs
- Tobecomefamiliarwiththeunderlyingtheoryandmethodsusedincompilerdesign
- ToIntroducetheparsingtechniques,codeoptimizationtechniquesandgenerate code

CO1:.	Explain the fundamentals of formal languages, regular expressions, finite automata (DFA, NFA, NFA-ϵ), and their equivalence and minimization techniques.
CO2	Analyze context-free grammars (CFGs), parse trees, ambiguity, and pushdown automata (PDAs), and demonstrate the equivalence between PDAs and CFGs.
CO3:	Apply lexical analysis concepts, including token specification, recognition, input buffering, and tools like Lex, and perform top-down parsing techniques such as recursive descent and LL(1) parsing.
CO4:.	Demonstrate bottom-up parsing techniques, including shift-reduce parsing, LR, SLR, LALR parsers, and syntax-directed translation schemes with evaluation orders.
CO5: .	Design intermediate code generation strategies, including three-address code, type checking, control flow representation, and simple code generation techniques.
CO6:	Implement code optimization techniques, basic blocks, flow analysis, and generate target code efficiently while handling control and data dependencies.

CO \ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	1	1								
CO2	3	3	2	2								
CO3	3	3	3	2	1							
CO4	3	3	3	2	2							
CO5	3	3	3	2	2							
CO6	3	3	2	2	2							3

UNIT–I:RegularExpressions,LanguagesandFiniteAutomata

Formal Languages and the Chomsky Hierarchy, Regular Expressions and Regular Languages, Algebraic Laws for Regular Expressions, Applications of Regular Expressions, Abstract model of Finite Automaton, Transition Tables and Transition Graphs, Deterministic Finite Automata (DFA), Nondeterministic Finite Automata (NFA), Converting NFA to DFA, Finite Automata with ϵtransitions (NFA-ϵ), Converting NFA-ϵ to NFA/DFA, Minimization of Finite Automata, Equivalence of FA and Regular Expressions

UNIT-II:ContextFreeGrammarsandPushDownAutomata:

Context Free Grammars (CFG) and Context Free Languages (CFL), Design of CFGs, Leftmost and Rightmost Derivations, Parse Trees, Applications of CFGs, Ambiguity in Grammars and Languages, Push Down Automata (PDA), The Language of a PDA, Equivalence of PDAs and CFGs

UNIT-III:LexicalAnalysisandTop-DownParsing

Thestructureofacompiler,Roleoflexicalanalyzer,InputBuffering,Specificationoftokens, Recognition of tokens, The Lexical Analyser Generator –LEX
IntroductiontoSyntaxAnalysis,Eliminatingambiguityandleftrecursionfromacfg,Recursive Decent Parsing, LL(1) Grammars, Nonrecursive Predictive Parsing

UNIT-IV:Bottom-UpParsingandSyntaxDirectedTranslation

Shift-ReduceParsing,SimpleLRparsing,CanonicalLR(1)Parsing,LALRParsing,Parser Generators
SyntaxDirectedDefinitions,EvaluationOrdersforSDDs,SyntaxDirectedTranslationSchemes

UNIT-V:IntermediateCodeGeneration,CodeGenerationandOptimization:

Threeaddresscode,TypesandDeclarations,TranslationofExpressions,TypeChecking,Control Flow,IssuesinthedesignofaCodeGenerator,TheTargetLanguage,AsimpleCodeGeneratorBasicBlocksandFlow

Textbooks:

1. Introduction to Automata Theory, Languages and Computation, J.E.Hopcroft, R.Motwani and J.D.Ullman, 3rd Edition, Pearson, 2008.
2. Compilers Principles, Techniques and Tools, 2nd Edition, Alfred V.Aho, Monica S. Lam, Ravi Sethi,Jeffrey D. Ullman, Pearson

ReferenceBooks:

1. IntroductiontoLanguagesandTheTheoryofComputation,JohnC.Martin,McGrawHill.
2. TheoryofComputerScience-Automata,LanguagesandComputation,K.L.P.Mishraand N.Chandrasekaran, 3rd Edition, PHI, 2007
3. CompilerConstruction||,K.V.N.Sunitha,Pearson,2013
4. CompilerDesign,SandeepSaxena,RajkumarSinghRathore,S.Chandpublication

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DEPARTMENT OF INFORMATION TECHNOLOGY

IIIYear-ISemester	Course Code: BT24CS31P1A	L	T	P	C
		3	0	0	3
OBJECT ORIENTED ANALYSIS AND DESIGN					

Course Objectives:

Themainobjectiveisthestudentsto

- BecomefamiliarwithallphasesofOOAD.
- MasterthemainfeaturesoftheUML.
- Master the main concepts of Object Technologies and how to apply them at work and develop the ability to analyze and solve challenging problem in various domains.
- LearntheObjectdesignPrinciplesandunderstandhowtoapplythemtowards Implementation.

Course Outcomes:

Attheendofthecoursestudentswillbeableto

CO1:.	Explain the structure and complexity of software systems and analyze attributes of complex systems for effective design of organized software architectures.
CO2	Demonstrate UML fundamentals, modeling principles, object-oriented modeling, and the software development life cycle with practical case studies.
CO3:	Apply class and object diagram techniques, including advanced classes, relationships, interfaces, packages, and modeling roles in real-world systems.
CO4:.	Design basic behavioral models including use case diagrams, interaction diagrams, and activity diagrams for software systems.
CO5: .	Develop advanced behavioral and architectural models including events, signals, state machines, processes, component and deployment diagrams.
CO6:	Integrate structural, behavioral, and architectural modeling techniques to analyze and design complex systems in real-world applications.

CO \ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	1	2								
CO2	3	3	2	2								
CO3	3	3	3	2								
CO4	3	3	3	2	1							
CO5	3	3	3	2	2							
CO6	3	3	3	3	2							3

UNITI:

Introduction: The Structure of Complex systems, The Inherent Complexity of Software, Attributes of Complex System, Organized and Disorganized Complexity, Bringing Order to Chaos, Designing Complex Systems. **Case Study:** System Architecture: Satellite-Based Navigation

UNITII:

Introduction to UML: Importance of modeling, principles of modeling, object oriented modeling, conceptual model of the UML, Architecture, and Software Development Life Cycle. **Basic Structural Modeling:** Classes, Relationships, common Mechanisms, and diagrams. **Case Study:** Control System: Traffic Management.

UNITIII:

Class & Object Diagrams: Terms, concepts, modeling techniques for Class & Object Diagrams. **Advanced Structural Modeling:** Advanced classes, advanced relationships, Interfaces, Types and Roles, Packages. **Case Study:** AI: Cryptanalysis.

UNITIV:

Basic Behavioral Modeling-I: Interactions, Interaction diagrams Use cases, Use case Diagrams, Activity Diagrams. **Case Study:** Web Application: Vacation Tracking System

UNITV:

Advanced Behavioral Modeling: Events and signals, state machines, processes andThreads, time and space, state chart diagrams. **Architectural Modeling:** Component, Deployment, Component diagrams and Deployment diagrams. **Case Study:** Weather Forecasting

TextBooks:

1. Grady BOOCH, Robert A. Maksimchuk, Michael W. ENGLE, Bobbi J. Young, Jim Conallen, Kellia Houston , "Object- Oriented Analysis and Design with Applications", 3rd edition, 2013, PEARSON.
2. Grady Booch, James Rumbaugh, Ivar Jacobson: The Unified Modeling Language User Guide, Pearson Education.

ReferenceBooks:

1. MeilirPage-Jones:FundamentalsofObjectOrientedDesigninUML,PearsonEducation.
2. Pascal Roques: Modeling Software Systems Using UML2, WILEY- Dreamtech IndiaPvt. Ltd.
3. AtulKahate:ObjectOriented Analysis&Design, TheMcGraw-Hill Companies.
4. Appling UML and Patterns: An introduction to Object – Oriented Analysis and Design and Unified Process, Craig Larman, Pearson Education.

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BALUSUMUDI, BHIMAVARAM, W.G. Dist., A.P., PIN-534 202

DEPARTMENT OF INFORMATION TECHNOLOGY

IIIYear-ISemester	Course Code: BT24IT31P1A	L	T	P	C
		3	0	0	3
CYBER SECURITY					

Course Objectives:

The aim of the course is to

- identifysecurityrisksandtakepreventive steps
- understandtheforensicsfundamentals
- understandtheevidencecapturingprocess
- understandthepreservationofdigital evidence

CO1:.	Explain the fundamentals of cybercrime, its origins, types of attacks, vulnerabilities of mobile and wireless devices, and the impact on information security.
CO2	Analyze and apply various cyber attack techniques, including phishing, malware, trojans, DoS/DDoS, SQL injection, buffer overflows, sniffers, and social engineering methods.
CO3:	Demonstrate cybercrime investigation techniques, including digital evidence collection, preservation, eDiscovery, email/IP tracking, recovering deleted evidence, and password cracking.
CO4:.	Evaluate computer forensics tools and techniques for analyzing systems, software, hardware, and multimedia evidence, including Windows, Linux, and mobile forensics.
CO5: .	Apply legal and ethical frameworks related to cybercrime, including the Indian IT Act, amendments, digital signatures, cyberlaw, and global perspectives.
CO6:	Integrate knowledge of cybercrime, forensic tools, and legal aspects to conduct real-world case studies and investigations in a structured manner.

CO \ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	1	1								
CO2	3	3	2	2								
CO3	3	3	3	2	1							
CO4	3	3	3	2	2			2				
CO5	3	2	2	1				3	3			2
CO6	3	3	3	3	2			2	2			3

UNIT I: Introduction to Cybercrime: Introduction, Cybercrime: Definition and Origins of theWord, Cybercrime and Information Security, Cybercriminals,Classificationsof Cybercrime, Cyberstalking, Cybercafe and Cybercrimes, Botnets. Attack Vector, Proliferation of Mobile and Wireless Devices, Security Challenges Posed by Mobile Devices, Attacks on Mobile/Cell Phones, Network and Computer Attacks.

UNIT II: Tools and Methods : Proxy Servers and Anonymizers, Phishing, Password Cracking, Keyloggers and Spywares,Virus and Worms, TrojanHorses and Backdoors, Steganography, Sniffers, Spoofing, Session Hijacking Buffer over flow, DoS and DDoS Attacks, SQL Injection, Buffer Overflow, Attacks on Wireless Networks, Identity Theft (ID Theft), Foot Printing and Social Engineering, Port Scanning, Enumeration.

UNIT III: Cyber Crime Investigation: Introduction, Investigation Tools, eDiscovery, Digital Evidence Collection, Evidence Preservation, E-Mail Investigation, E-Mail Tracking, IP Tracking, E- Mail Recovery, Hands on Case Studies. Encryption and Decryption Methods, Search and Seizure of Computers, Recovering Deleted Evidences, Password Cracking.

UNIT IV: Computer Forensics and Investigations: Understanding Computer Forensics, Preparing for Computer Investigations. Current Computer Forensics Tools: Evaluating Computer Forensics Tools, Computer Forensics Software Tools, Computer Forensics Hardware Tools, Validating and Testing Forensics Software, Face, Iris and Fingerprint Recognition, Audio Video Analysis, Windows System Forensics, Linux System Forensics, Graphics and Network Forensics, E-mail Investigations, Cell Phone and Mobile Device Forensics.

UNIT V: Cyber Crime Legal Perspectives: Introduction, Cybercrime and the Legal Landscape around the World, The Indian IT Act, Challenges to Indian Law and Cybercrime Scenario in India, Consequences of Not Addressing the Weakness in Information Technology Act, Digital Signatures and the Indian IT Act, Amendments to the Indian IT Act, Cybercrime andPunishment, Cyberlaw, Technology and Students: Indian Scenario.

Text Books:

1. SunitBelapureNinaGodbole"CyberSecurity:UnderstandingCyberCrimes,Computer Forensics and Legal Perspectives", WILEY, 2011.
2. NelsonPhillipsandEnfingerSteuart,"ComputerForensicsandInvestigations",Cengage Learning,NewDelhi, 2009.

ReferenceBooks:

1. MichaelT.Simpson,KentBackmanandJamesE.Corley,"HandsonEthicalHacking and Network Defence", Cengage, 2019.
2. ComputerForensics,ComputerCrimeInvestigationbyJohnR.Vacca,FirewallMedia,NewDelhi.
3. AlfredBasta,NadineBasta,MaryBrownandRavinderKumar "Cyber SecurityandCyber Laws" , Cengage,2018.

E-Resources:

1. CERT-InGuidelines-http://www.cert-in.org.in/
2. https://www.coursera.org/learn/introduction-cybersecurity-cyber-attacks[OnlineCourse]
3. https://computersecurity.stanford.edu/free-online-videos[FreeOnlineVideos]
4. Nickolai Zeldovich. 6.858 Computer Systems Security. Fall 2014. Massachusetts Instituteof Technology: MIT OpenCourseWare, https://ocw.mit.eduLicense: Creative CommonsBY-NC-SA.

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DEPARTMENT OF INFORMATION TECHNOLOGY

IIIYear-ISemester	Course Code: BT24IT31P1C	L	T	P	C
		0	0	3	1.5
ARTIFICIAL INTELLIGENCE					

Pre-requisite:

1. KnowledgeinComputerProgramming.
2. Acourseon"MathematicalFoundationsofComputerScience".
3. Backgroundinlinearalgebra,datastructuresandalgorithms,andprobability.

Course Objectives:

1. ThestudentshouldbemadetostudytheconceptsofArtificial Intelligence.
2. Thestudent shouldbemadetolearnthemethodsofsolvingproblemsusingArtificial Intelligence.
3. ThestudentshouldbemadetointroducetheconceptsofExpert Systems.
4. TounderstandtheapplicationsofAI,namelygameplaying,theoremproving,andmachine learning.
5. Tolearndifferentknowledgerepresentationtechniques

CO1:.	Explain the foundations, history, and problem-solving approaches in Artificial Intelligence, including intelligent agents, rationality, and problem formulation.
CO2	Analyze and apply search strategies, including uninformed and heuristic search, hill climbing, A*, AO*, and game-playing algorithms with adversarial search and alpha-beta pruning.
CO3:	Demonstrate knowledge representation techniques including predicate logic, semantic networks, frames, inheritance, rules, and reasoning under uncertainty using probabilistic methods.
CO4:.	Apply logical inference techniques including first-order logic, propositional logic, forward/backward chaining, resolution, and machine learning approaches such as decision trees, explanation-based learning, and reinforcement learning.
CO5: .	Design and implement expert systems, understanding their architecture, knowledge acquisition, heuristics, and the use of expert system shells (e.g., MYCIN, DART, XCON).
CO6:	Integrate AI techniques for problem solving, decision making, learning, and expert systems to develop intelligent applications in real-world scenarios.

CO \ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	1	1								
CO2	3	3	3	2	1							
CO3	3	3	3	2	2							
CO4	3	3	3	2	2							
CO5	3	3	3	2	2			2				3
CO6	3	3	3	3	2			2	2			3

UNIT-I

Introduction: AI problems, foundation of AI and history of AI intelligent agents: Agents and Environments, the concept of rationality, the nature of environments, structure of agents, problem solving agents, problem formulation.

UNIT-II

Searching- Searching for solutions, uniformed search strategies – Breadth first search, depth first Search. Search with partial information (Heuristic search) Hill climbing, A* ,AO* Algorithms, Problemreduction, Game Playing-Adversialsearch,Games,mini-maxalgorithm,optimaldecisionsin multiplayer games, Problem in Game playing, Alpha-Beta pruning, Evaluation functions.

UNIT-III

Representation of Knowledge: Knowledge representation issues, predicate logic-logicprogramming, semantic nets- frames and inheritance, constraint propagation, representing knowledge using rules, rules based deduction systems. Reasoning under uncertainty, review of probability,Bayes' probabilistic interferences and dempstershafer theory.

UNIT-IV

Logic concepts: First order logic. Inference in first order logic, propositional vs. first order inference, unification & lifts forward chaining, Backward chaining, Resolution, Learning from observation Inductive learning, Decision trees, Explanation based learning, Statistical Learning methods, Reinforcement Learning.

UNIT-V

Expert Systems: Architecture of expert systems, Roles of expert systems – Knowledge Acquisition MetaknowledgeHeuristics.Typicalexpertsystems –MYCIN,DART,XCON: Expert systemsshells.

Textbooks:

1. S.RusselandP.Norvig,"ArtificialIntelligence–AModernApproach",SecondEdition, Pearson Education.
2. KevinNightandElaineRich,NairB.,"ArtificialIntelligence(SIE)",McGrawHill

ReferenceBooks:

1. DavidPoole,AlanMackworth,RandyGoebel,"ComputationalIntelligence:alogical

approach", Oxford University Press.
2. G.Luger,"ArtificialIntelligence:StructuresandStrategiesforcomplexproblemsolving", FourthEdition,PearsonEducation.
3. J.Nilsson,"ArtificialIntelligence:AnewSynthesis",ElsevierPublishers.
4. ArtificialIntelligence,SarojKaushik,CENGAGELearning.

OnlineLearningResources:

1. https://ai.google/
2. https://swayam.gov.in/nd1_noc19_me71/preview

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DEPARTMENT OF INFORMATION TECHNOLOGY

IIIYear-ISemester	Course Code: BT24CS31P1D	L	T	P	C
		0	0	3	1.5
MICROPROCESSORS & MICROCONTROLLERS					

CourseObjectives:

- Tointroducefundamentalarchitecturalconceptsofmicroprocessorsandmicrocontrollers.
- Toimpartknowledgeonaddressingmodesandinstructionsetof8086and8051
- Tointroduceassemblylanguageprogrammingconcepts
- ToexplainmemoryandI/Ointerfacingwith8086and8051
- Tointroduce16bitand32bitmicrocontrollers.

CO1:.	Explain the architecture, features, and operation of the 8086 microprocessor, including its internal structure, execution unit, bus interfacing, and system configurations.
CO2	Develop assembly language programs for the 8086 microprocessor using different instructions, addressing modes, and assembler directives.
CO3:	Design and implement microprocessor interfacing with memory, I/O devices, programmable peripheral interfaces, and hardware/software interrupts.
CO4:.	Explain the architecture, instruction set, addressing modes, and programming concepts of the 8051 microcontroller.
CO5: .	Implement interfacing and programming of 8051 microcontroller with timers, serial ports, LCDs, keyboards, ADC/DAC, sensors, stepper motors, and waveform generation.
CO6:	Compare microprocessors, microcontrollers, and modern embedded processors (PIC, ARM) and integrate knowledge to design small embedded systems.

CO \ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	1	2								
CO2	3	3	3	2	1							
CO3	3	3	3	2	2			2				
CO4	3	2	2	2								
CO5	3	3	3	2	2			2				3
CO6	3	3	3	3	2							3

UNITI:

8086 Architecture: Main features, pin diagram/description, 8086 microprocessor family, internal architecture, bus interfacing unit, execution unit, interrupts and interrupt response, 8086 system timing, minimum mode and maximum mode configuration.

UNITII:

8086 Programming: Program development steps, instructions, addressing modes, assembler directives, writing simple programs with an assembler, assembly language program developmenttools.

UNIT III:

8086 Interfacing: Semiconductor memories interfacing (RAM, ROM), Intel 8255 programmable peripheralinterface,InterfacingswitchesandLEDS,Interfacingsevensegmentdisplays,softwarean d hardware interrupt applications, Intel 8251 USART architecture and interfacing, Intel 8237a DMA controller, stepper motor, A/D and D/A converters, Need for 8259 programmable interruptcontrollers.

UNITIV:

Microcontroller, Architecture of 8051, Special Function Registers(SFRs), I/O Pins Ports and Circuits, Instruction set, Addressing modes, Assembly language programming.

UNITV:

Interfacing Microcontroller, Programming 8051 Timers, Serial Port Programming, Interrupts Programming, LCD & Keyboard Interfacing, ADC, DAC & Sensor Interfacing, External Memory Interface,Stepper Motor and Waveform generation,Comparison of Microprocessor,Microcontroller, PIC and ARM processors

Textbooks:

1. MicroprocessorsandInterfacing–ProgrammingandHardwarebyDouglasVHall,SSSP Rao, Tata McGraw Hill Education Private Limited, 3rdEdition,1994.
2. K M Bhurchandi, A K Ray, Advanced Microprocessors and Peripherals, 3rdedition, McGraw Hill Education, 2017.
3. RajKamal,Microcontrollers:Architecture,Programming,InterfacingandSystemDesign,2nd edition,Pearson,2012.

ReferenceBooks:

1. RameshSGaonkar,MicroprocessorArchitectureProgrammingandApplicationswiththe 8085, 6thedition, Penram International Publishing, 2013.
2. KennethJ.Ayala,The8051Microcontroller,3rdedition,CengageLearning,2004.

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DEPARTMENT OF INFORMATION TECHNOLOGY

IIIYear-ISemester	Course Code: BT24IT31P1B	L	T	P	C
		0	1	2	2
DATAWARE HOUSING & DATA MINING					

Pre-requisites: Data Structures, Algorithms, Probability & Statistics, Data Base Management Systems

CourseObjectives: Themainobjectiveofthecourseisto

- Introducebasicconceptsandtechniquesofdatawarehousinganddatamining
- Examinethetypesofthedatatobeminedandapplypre-processingmethodsonrawdata
- Discover interesting patterns, analyze supervised and unsupervised models and estimate the accuracy of the algorithms.

CO1:.	Explain the fundamental concepts of data warehousing, OLAP, cloud data warehouses, and their applications in data analysis and pattern mining.
CO2	Perform data preprocessing including data cleaning, integration, reduction, transformation, and discretization to prepare datasets for analysis.
CO3:	Apply classification techniques, including decision tree induction, Bayesian classification, and rule-based classifiers, to solve data mining problems.
CO4:.	Implement association analysis using algorithms such as Apriori and FP-Growth to discover frequent itemsets and association rules.
CO5: .	Analyze clustering methods, including K-means, hierarchical clustering, and DBSCAN, and evaluate their effectiveness for different types of datasets.
CO6:	Integrate data warehousing and data mining techniques to design solutions for real-world business intelligence and analytics applications.

CO \ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	1	2								
CO2	3	3	3	2	1							
CO3	3	3	3	2	2							
CO4	3	3	3	2	2							
CO5	3	3	3	2	2							
CO6	3	3	3	3	2							3

UNIT–I: Data Warehousing and Online Analytical Processing: Basic concepts, DataWarehouse Modeling: DataCube and OLAP,Data Warehouse Design and Usage,Data Warehouse Implementation, Cloud Data Warehouse, Data Mining and Patten Mining, Technologies, Applications, Major issues, Data Objects & Attribute Types, Basic Statistical Descriptions of Data, Data Visualization, Measuring Data Similarity and Dissimilarity. (Text Book- 1)

UNIT II: Data Preprocessing: An Overview, Data Cleaning, Data Integration, Data Reduction, Data Transformation and Data Discretization. (Text Book- 1)

UNIT–III: Classification: Basic Concepts, General Approach to solving a classification problem, Decision Tree Induction: Attribute Selection Measures, Tree Pruning, Scalability and DecisionTree Induction, Visual Mining for Decision Tree Induction, Bayesian Classification Methods: Bayes Theorem, Naïve Bayes Classification, Rule-Based Classification, Model Evaluation and Selection. (Text Book- 2)

UNIT–IV: Association Analysis: Problem Definition, Frequent Itemset Generation, Rule Generation: Confident Based Pruning, Rule Generation in Apriori Algorithm, Compact Representation of frequent item sets, FP-Growth Algorithm. (Text Book- 2)

UNIT–V: Cluster Analysis: Overview, Basics and Importance of Cluster Analysis, Clustering techniques, Different Types of Clusters; K-means: The Basic K-means Algorithm, K-means Additional Issues, Bi-secting K Means, Agglomerative Hierarchical Clustering: Basic Agglomerative Hierarchical Clustering Algorithm DBSCAN: Traditional Density Center-Based Approach, DBSCAN Algorithm, Strengths and Weaknesses. (Text Book- 2)

Text Books:

1. DataMiningconceptsandTechniques,3rdedition, Jiawei Han, Michel Kamber, Elsevier, 2011.
2. Introduction to Data Mining: Pang-Ning Tan & Michael Steinbach, Vipin Kumar, Pearson,2012.

ReferenceBooks:

1. DataMining:VikramPudiandP.RadhaKrishna,OxfordPublisher.
2. DataMiningTechniques,ArunKPujari,3rdedition,UniversitiesPress,2013.
3. (NPTELcoursebyProf.PabitraMitra)http://onlinecourses.nptel.ac.in/noc17_mg24/preview
4. http://www.saedsayad.com/data_mining_map.htm

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DEPARTMENT OF INFORMATION TECHNOLOGY

IIIYear-ISemester	Course Code: BT24CS3105	L	T	P	C
		0	1	2	2
ADVANCED JAVA LAB					

CourseObjectives:themainobjectivesofthecourse are

- TomakeuseofServletandJSPAPIintheprocessofenterpriseapplication deployment.
- ImplementcomponentssuchasJSTL
- DistinguishApplicationServer,WebContainer,JDBC
- DesignandDevelopmentofwebapplicationhavingcollaborationofServlets,JSPs,Spring

Labshouldcoverthefollowingconcepts:

- JDBCprogramming
- J2EE andWeb development
- Servlets
- JavaServer Pages
- JavaWeb Frameworks

SampleListofExperiments:

1. WriteaJDBCapplicationwhichwillinteractwithDatabaseandperformthefollowingtask.
   a. CreateStudentTablewithRoll No,Name,andAddressfieldandinsertfewrecords.
   b. UsingStatementObjectdisplaythecontentofRecord.
   c. UsingStatementObjectInsertTwoRecord.
   d. UsingStatementObjectUpdateOneRecord.
   e. UsingStatementObjectDeleteOneRecord.
   f. UsingStatementObjectdisplaythecontentofRecord.

2. WriteaJDBCapplicationwhichwillinteractwithDatabaseandperformthefollowingtask.
   a. CreateStudentTablewithRoll No,Name,andAddressfieldandinsertfewrecords.
   b. UsingPreparedStatementObjectdisplaythecontentofRecord.
   c. UsingPreparedStatementObjectInsertTwoRecord.
   d. UsingPreparedStatementObjectUpdateOneRecord.
   e. UsingPreparedStatementObjectDeleteOneRecord.
   f. UsingPreparedStatementObjectdisplaythecontentofRecord

3. WriteaJDBCapplicationwhichwillinteractwithDatabaseandperformthefollowingtask.
   a. Createastoreprocedurewhichwillinsertonerecordintoemployeetable.
   b. Createastoreprocedurewhichwillretrievesalaryforgivenemployee id.
   c. Write a java application which will call the above procedure and display appropriate information on screen

4. DesignaJDBCApplicationwhichwilldemonstrateScrollableResultSetfunctionality.

5. DesignaJDBCApplicationwhichwilldemonstrateUpdatableResult Setfunctionality.

6. WritedowntheProgramfortestingtheServletandstudydeployment descriptor.

7. Writedowntheprogramfortestingtheincludeactionforservletcollaboration.

8. CreateloginformandperformstatemanagementusingCookies,HttpSessionandURL Rewriting.
9. WritedowntheProgramwhichdisplaysthesimpleJSPfile
10. Write down the program in which input the two numbers in an html file and then display the addition in JSP file.
11. PerformDatabaseAccessthroughJSP.
12. WritedownaprogramwhichdemonstratesthecoretagofJSTL.
13. WritedownaprogramwhichdemonstratestheFormattagofJSTL.
14. WritedownaprogramwhichdemonstratestheFunctiontagofJSTL.
15. WritedownaprogramwhichdemonstratestheSQLtagofJSTL.
16. StudyandImplementMVCusingSpring Framework
17. UsingSpringTemplatemanageDatabaseandTransaction.

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DEPARTMENT OF INFORMATION TECHNOLOGY

IIIYear-ISemester	Course Code: BT24CS3106	L	T	P	C
		0	1	2	2
COMPUTER NETWORKS LAB					

Course Objectives:

Learn basic concepts of computer networking and acquire practical notions of protocols with theemphasisonTCP/IP.Alabprovidesapracticalapproachto Ethernet/Internetnetworking: networksareassembled, andexperimentsaremadetounderstandthelayeredarchitecture and how do some important protocols work

List ofExperiments:

1. StudyofNetworkdevicesindetail andconnect thecomputersin LocalAreaNetwork.
2. WriteaProgramtoimplementthedatalinklayerfarmingmethodssuchas i)Characterstuffing ii)bit stuffing.
3. WriteaProgram toimplement datalinklayer farmingmethod checksum.
4. Writeaprogramfor HammingCodegenerationforerrordetectionand correction.
5. WriteaProgramtoimplementonadatasetofcharactersthethreeCRCpolynomials– CRC12,CRC16andCRC CCIP.
6. WriteaProgramtoimplementSlidingwindowprotocolforGobackN.
7. WriteaProgramtoimplementSlidingwindowprotocolforSelective repeat.
8. WriteaProgram toimplementStop andWait Protocol.
9. Writeaprogram for congestioncontrol usingleakybucket algorithm
10. WriteaProgramtoimplementDijkstra‘salgorithmtocomputetheShortestpaththrough agraph.
11. Write a Program to implement Distance vector routing algorithm by obtaining routing table at each node (Take an example subnet graph with weights indicating delay between nodes).
12. WriteaProgram toimplement Broadcasttreebytaking subnetof hosts.
13. Wireshark
    i. PacketCaptureUsing Wireshark
    ii. StartingWireshark
    iii. ViewingCapturedTraffic
    iv. AnalysisandStatistics&Filters.
14. HowtorunNmap scan
15. OperatingSystemDetectionusingNmap
16. Do thefollowing using NS2 Simulator
    i. NS2Simulator-Introduction
    ii. SimulatetoFind theNumber ofPacketsDropped
    iii. SimulatetoFind theNumberofPacketsDroppedby TCP/UDP
    iv. Simulateto Find theNumber ofPacketsDropped dueto Congestion
    v. SimulatetoCompareDataRate&Throughput.

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BALUSUMUDI, BHIMAVARAM, W.G. Dist., A.P., PIN-534 202

DEPARTMENT OF INFORMATION TECHNOLOGY

IIIYear-ISemester	Course Code: BT24CS3107	L	T	P	C
		0	1	2	2
FULLSTACKDEVELOPMENT -1					

Course Objectives:

Themain objectivesof thecourse areto

- Makeuseof HTMLelementsandtheirattributesfordesigningstaticweb pages
- Buildaweb pagebyapplying appropriateCSSstylestoHTMLelements
- ExperimentwithJavaScripttodevelopdynamicwebpagesandvalidateforms

Experimentscoveringthe Topics:

- Lists,LinksandImages
- HTMLTables,FormsandFrames
- HTML5andCascadingStyleSheets,TypesofCSS
- Selectorforms
- CSSwithColor,Background,Font, TextandCSSBox Model
- ApplyingJavaScript-internaland external, I/O,Type Conversion
- JavaScriptConditionalStatementsandLoops,Pre-definedandUser-definedObjects
- JavaScriptFunctionsand Events

Sample Experiments:

1. Lists,Linksand Images

a. WriteaHTML program,toexplain theworkingoflists.
Note: It should have an ordered list, unordered list, nested lists and ordered list in an unordered list and definition lists.

b. Write a HTML program, to explain the working of hyperlinks using <a> tag and href, target Attributes.

c. Create a HTML document that has your image and your friend's image with a specific height and width. Also when clicked on the images it should navigate to their respective profiles.

d. Write a HTML program, in such a way that, rather than placing large images on a page, the preferred technique is to use thumbnails by setting the height and width parameters to something like to 100*100 pixels. Each thumbnail image is also a link to a full sized version of the image. Create an image gallery using this technique

2. HTMLTables,FormsandFrames

a. WriteaHTMLprogram,toexplaintheworkingoftables.(usetags:<table>,<tr>,<th>, <td>andattributes:border,rowspan,colspan)

b. Write a HTML program, to explain the working of tables by preparing a timetable. (Note: Use <caption> tag to set the caption to the table & also use cell spacing, cell padding, border, rowspan, colspan etc.).

c. Write a HTML program, to explain the working of forms by designing Registration form.

(Note: Include text field, password field, number field, date of birth field, checkboxes, radio buttons, list boxes using <select>&<option> tags, <text area> and two buttons ie: submit and reset. Use tables to provide a better view).

d. Write a HTML program, to explain the working of frames, such that page is to be divided into 3 parts on either direction. (Note: first frame□ image, second frame□ paragraph, thirdframe□hyperlink.Andalsomakesureofusing"noframe"attributesuchthat framestobe fixed).

3. HTML5andCascadingStyleSheets,TypesofCSS

a. WriteaHTMLprogram,thatmakesuseof<article>,<aside>,<figure>,<figcaption>, <footer>,<header>,<main>,<nav>,<section>, ,tags.
b. WriteaHTML program,to embedaudioand videointo HTMLweb page.
c. Writeaprogramtoapplydifferenttypes(orlevelsofstylesorstylespecificationformats) -inline,internal,externalstylestoHTMLelements.(identifyselector,propertyandvalue).

4. Selectorforms

a. Writeaprogramtoapplydifferenttypesofselector forms
   i. Simpleselector(element, id,class,group,universal)
   ii. Combinatorselector(descendant,child,adjacentsibling,generalsibling)
   iii.Pseudo-class selector
   iv. Pseudo-elementselector
   v. Attributeselector

5. CSSwithColor,Background,Font,TextandCSSBoxModel

a. Writeaprogramto demonstratethevariouswaysyoucanreferenceacolor in CSS.
b. WriteaCSSrulethatplacesabackgroundimagehalfwaydownthepage,tiltingithorizontally. The image should remain in place when the user scrolls up or down.
c. Writeaprogram usingthefollowing termsrelatedto CSSfontand text:
   i. font-size ii.font-weight iii.font-style
   iv.text-decoration v. text-transformation vi.text-alignment
d. Writeaprogram,to explain theimportanceof CSSBox model using
   i. Content ii. Border iii. Margin iv. padding

6. ApplyingJavaScript-internalandexternal,I/O,Type Conversion

a. WriteaprogramtoembedinternalandexternalJavaScriptinaweb page.
b. Writeaprogram toexplain thedifferentwaysfordisplaying output.
c. Writeaprogramto explainthedifferentwaysfortaking input.
d. Createawebpagewhichusespromptdialogueboxtoaskavoterforhisnameandage. Display the information in table format along with either the voter can vote or not

7. JavaScriptPre-definedandUser-definedObjects

a. Writeaprogram using document object propertiesand methods.
b. Writeaprogramusingwindowobjectpropertiesandmethods.
c. Writeaprogramusingarrayobjectpropertiesandmethods.
d. Writeaprogramusing mathobject propertiesandmethods.
e. Writeaprogram usingstringobject propertiesand methods.
f. Writeaprogram usingregexobject propertiesandmethods.
g. Writeaprogramusing date objectpropertiesandmethods.
h. Write a program to explain user-defined object by using properties, methods, accessors,constructors and display.

8. JavaScriptConditionalStatementsand Loops

a. Write a program which asks the user to enter three integers, obtains the numbers from the user and outputs HTML text that displays the larger number followed by the words "LARGERNUMBER"inan informationmessagedialog.Ifthenumbers areequal,output HTML text as "EQUAL NUMBERS".
b. Writeaprogramto displayweek daysusing switch case.
c. Writeaprogramto print1 to10 numbersusing for,while anddo-while loops.
d. Writeaprogramto printdatain objectusingfor-in, for-eachandfor-of loops
e. Develop a program to determine whether a given number is an 'ARMSTRONG NUMBER'ornot.[Eg: 153isanArmstrongnumber,sincesumofthecube ofthedigitsis equal to the number i.e.,13 + 53+ 33 = 153]
f. Write a program to display the denomination of the amount deposited in the bank in terms of 100's, 50's, 20's, 10's, 5's, 2's & 1's. (Eg: If deposited amount is Rs.163, the output should be 1-100's, 1-50's, 1- 10's, 1-2's & 1-1's)

9. JavascriptFunctionsand Events

a. Designaappropriatefunctionshouldbecalledtodisplay
    i. Factorialofthatnumber
    ii. Fibonacciseriesuptothatnumber
    iii. Primenumbersupto that number
    iv. Isit palindromeor not
b. DesignaHTMLhavingatextboxandfourbuttonsnamedFactorial,Fibonacci,Prime, and Palindrome. When a button is pressed an appropriate function should be called to display
    i. Factorialofthatnumber
    ii. Fibonacciseriesuptothatnumber
    iii. Primenumbersupto that number
    iv. Isit palindromeor not
c. Writeaprogramto validatethefollowingfieldsinaregistration page
    i. Name(startwithalphabetandfollowedbyalphanumericandthelengthshouldnot be less than 6 characters)
    ii. Mobile(onlynumbersandlength10 digits)
    iii. E-mail(shouldcontainformatlike xxxxxxx@xxxxxx.xxx)

TextBooks:

1. ProgrammingtheWorld WideWeb,7thEdition,RobetWSebesta,Pearson,2013.
2. WebProgrammingwithHTML5,CSSandJavaScript,JohnDean,Jones&Bartlett Learning, 2019 (Chapters 1-11).
3. Pro MERN Stack: Full Stack Web App Development with Mongo, Express, React, and Node, Vasan Subramanian, 2nd edition, APress, O'Reilly.

WebLinks:

1. https://www.w3schools.com/html
2. https://www.w3schools.com/css
3. https://www.w3schools.com/js/

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BALUSUMUDI, BHIMAVARAM, W.G. Dist., A.P., PIN-534 202

DEPARTMENT OF INFORMATION TECHNOLOGY

IIIYear-ISemester	Course Code: BT24CS3108	L	T	P	C
		0	1	2	2
USER INTERFACE DESIGN USING FLUTTER					

CourseObjectives:

- LearnstoImplementFlutterWidgetsandLayouts
- UnderstandsResponsiveUIDesignandwithNavigationinFlutter
- KnowledgeonWidgesandcustomizewidgetsforspecificUIelements,Themes
- Understandtoincludeanimationapartfromfetchingdata

ListofExperiments:

Studentsneedtoimplementthefollowingexperiments

1. a)InstallFlutterandDartSDK.
   b)WriteasimpleDartprogramtounderstandthelanguage basics.

2. a)ExplorevariousFlutterwidgets(Text,Image,Container,etc.).
   b) Implementdifferentlayoutstructuresusing Row,Column,andStackwidgets.

3. a)DesignaresponsiveUIthatadaptstodifferentscreen sizes.
   b) Implementmediaqueriesandbreakpointsforresponsiveness.

4. a)SetupnavigationbetweendifferentscreensusingNavigator.
   b) Implementnavigationwithnamedroutes.

5. a)Learnaboutstatefulandstatelesswidgets.
   b) ImplementstatemanagementusingsetStateandProvider.

6. a)CreatecustomwidgetsforspecificUIelements.
   b) Applystylingusingthemesandcustomstyles.

7. a)Designaformwithvariousinputfields.
   b) Implementformvalidationanderrorhandling.

8. a)AddanimationstoUIelementsusingFlutter'sanimationframework.
   b) Experimentwithdifferenttypesofanimations(fade,slide,etc.).

9. a)FetchdatafromaRESTAPI.
   b) Displaythefetcheddatainameaningfulwayintheui.

10. a)WriteunittestsforUI components.
    b) UseFlutter'sdebuggingtoolstoidentifyandfixissues.

Text Books:

1. MarcoL.Napoli,BeginningFlutter:AHands-onGuidetoAppDevelopment.

2. RapPayne,BeginningAppDevelopmentwithFlutter:CreateCross-PlatformMobileApps1stEdition, Apres
3. RichardRose,Flutter&DartCookbook,DevelopingFullstackApplicationsforthe Cloud, Oreilly.

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DEPARTMENT OF INFORMATION TECHNOLOGY

IIIYear-IISemester	**Course Code:** BT24CS3202	**L**	**T**	**P**	**C**
		0	**1**	**2**	**2**

CLOUD COMPUTING

Course Objectives:

- To explain the evolving utility computing model called cloud computing.
- To introduce the various levels of services offered by cloud.
- To discuss the fundamentals of cloud enabling technologies such as distributed computing, service-oriented architecture and virtualization.
- To emphasize the security and other challenges in cloud computing.
- To introduce the advanced concepts such as containers, serverless computing and cloud-centric Internet of Things.

CO1:.	Explain the fundamentals of cloud computing, including service models, deployment models, reference architecture, characteristics, benefits, and major cloud service providers.
CO2	Describe cloud-enabling technologies such as parallel and distributed computing, RPC, SOA, web services, and virtualization.
CO3:	Analyze virtualization and container technologies, including hypervisors, container platforms, orchestration tools, and public cloud VM and container services.
CO4:.	Identify and evaluate key challenges in cloud computing such as economics, scalability, fault tolerance, interoperability, energy efficiency, and security.
CO5: .	Apply cloud security concepts, shared responsibility models, and security mechanisms across different cloud deployment models.
CO6:	Demonstrate knowledge of advanced cloud concepts including serverless computing, IoT integration, edge and fog computing, DevOps, infrastructure-as-code, and quantum cloud computing.

CO \ PO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3	2	1									
CO2	3	3	2	2								
CO3	3	3	3	2	2							
CO4	3	3	2	3								
CO5	3	3	2	2	2			2				
CO6	3	2	3	2	3							3

UNIT-I:IntroductiontoCloudComputingFundamentals
Cloud computing at a glance, defining a cloud, cloud computing reference model, types of services (IaaS, PaaS, SaaS), cloud deployment models (public, private, hybrid), utility computing, cloud computing characteristics and benefits, cloud service providers (Amazon Web Services, Microsoft Azure, Google App Engine).
UNIT-II:CloudEnablingTechnologies
Ubiquitous Internet, parallel and distributed computing, elements of parallel computing, hardware architectures for parallel computing (SISD, SIMD, MISD, MIMD), elements of distributed computing, Inter-process communication,technologies for distributed computing, remote procedure calls (RPC), service-oriented architecture (SOA), Web services, virtualization.
UNIT-III:Virtualizationand Containers
Characteristics of virtualized environments, taxonomy of virtualization techniques, virtualization and cloud Computing, pros and cons of virtualization, technology examples (XEN, VMware), building blocks of containers, container platforms (LXC, Docker),containerorchestration,DockerSwarmandKubernetes,publiccloudVM(e.g.AmazonEC2) and container (e.g. Amazon Elastic Container Service) offerings.
UNIT-IV:Cloudcomputingchallenges
Economics of the cloud, cloud interoperability and standards, scalability and fault tolerance, energy efficiency in clouds, federated clouds, cloud computing security, fundamentals of computer security, cloud security architecture, cloud shared responsibility model, security in cloud deployment models.
UNIT-V:Advanced concepts in cloudcomputing
Serverless computing, Function-as-a-Service, serverless computing architecture, public cloud (e.g. AWS Lambda) and open-source (e.g. OpenFaaS) serverless platforms, Internet ofThings (IoT), applications, cloud-centric IoT and layers, edge and fog computing, DevOps, infrastructure-as-code, quantum cloud computing.

TextBooks:

1. MasteringCloudComputing,2nd edition,RajkumarBuyya,ChristianVecchiola,Thamarai Selvi, Shivananda Poojara, Satish N. Srirama, Mc Graw Hill, 2024.
2. Distributed and Cloud Computing, Kai Hwang, Geoffery C. Fox, Jack J. Dongarra,Elsevier, 2012.

ReferenceBooks:

1. Cloud Computing, Theory and Practice, Dan C Marinescu, 2nd edition, MK Elsevier,2018.
2. EssentialsofcloudComputing,K.Chandrasekhran,CRCpress,2014.
3. Online documentation and tutorials from cloud service providers (e.g., AWS, Azure, GCP)

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DEPARTMENT OF INFORMATION TECHNOLOGY

IIIYear-IISemester	Course Code: BT24IT3203	L	T	P	C
		0	1	2	2

CRYPTOGRAPHY & NETWORK SECURITY

CourseObjectives:

The main objectives of this course are to explore the working principles and utilities of various cryptographic algorithms including secret key cryptography, hashes and message digests, public key algorithms, design issues and working principles of various authentication protocols and various secure communication standards including Kerberos, IPsec, and SSL/TLS.

CO1:.	Explain the basic principles of information security, cryptographic goals, attacks, services, mechanisms, and the mathematical foundations of cryptography.
CO2	Analyze symmetric key cryptographic techniques including DES, AES, block and stream ciphers, and their security properties.
CO3:	Apply asymmetric key cryptographic algorithms such as RSA, Rabin, ElGamal, and Elliptic Curve Cryptography to secure communication.
CO4:.	Demonstrate data integrity and authentication mechanisms using cryptographic hash functions, digital signature schemes, and key management techniques.
CO5: .	Explain network security mechanisms at the application, transport, and network layers including PGP, SSL/TLS, IPSec, and system security components.
CO6:	Evaluate security threats, vulnerabilities, and countermeasures in cryptographic systems and networked environments.

CO \ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	1									
CO2	3	3	2	2								
CO3	3	3	3	2								
CO4	3	3	2	2				2				
CO5	3	3	2	2	2			2				
CO6	3	3	2	3				2				3

UNITI:

Basic Principles : Security Goals, Cryptographic Attacks, Services and Mechanisms, Mathematics of Cryptography- integer arithmetic, modular arithmetic, matrices, linear conguence.

UNITII:

Symmetric Encryption: Mathematics of Symmetric Key Cryptography-algebraic structures, GF(2^n) Fields, Introduction to Modern Symmetric Key Ciphers-modern block ciphers, modern streamciphers, Data Encryption Standard- DES structure, DES analysis, Security of DES, Multiple DES, Advanced Encryption Standard-transformations, key expansions, AES ciphers, Analysis of AES.

UNIT III:

Asymmetric Encryption: Mathematics of Asymmetric Key Cryptography-primes, primality testing, factorization, CRT, Asymmetric Key Cryptography- RSA crypto system, Rabin cryptosystem, Elgamal Crypto system, ECC

UNITIV:

Data Integrity, Digital Signature Schemes & Key Management : Message Integrity and Message Authentication-message integrity, Random Oracle model, Message authentication, Cryptographic Hash Functions-whirlpool, SHA-512, Digital Signature- process, services, attacks, schemes, applications, Key Management-symmetric key distribution, Kerberos.

UNITV:

Network Security-I: Security at application layer: PGP and S/MIME, Security at the TransportLayer: SSL and TLS, **Network Security-II :** Security at the Network Layer: IPSec-two modes, two security protocols, security association, IKE, ISAKMP, System Security-users, trust, trusted systems, buffer overflow, malicious software, worms, viruses, IDS, Firewalls.

Text Books:

1. Cryptography and Network Security, 3rd Edition Behrouz A Forouzan, Deb deep Mukhopadhyay, McGraw Hill,2015
2. CryptographyandNetworkSecurity,4thEdition,WilliamStallings,(6e)Pearson,2006
3. EverydayCryptography,1stEdition,KeithM.Martin,Oxford,2016

ReferenceBooks:

1. NetworkSecurityandCryptography,1stEdition,BernardMeneges,CengageLearning, 2018

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DEPARTMENT OF INFORMATION TECHNOLOGY

IIIYear-IISemester	**Course Code:** BT24IT3201	**L**	**T**	**P**	**C**
		0	**1**	**2**	**2**

MACHINE LEARNING

CourseObjectives:

The objectives of the course is to

- Define machine learning and its different types (supervised and unsupervised) and understand their applications.
- Apply supervised learning algorithms including decision trees and k-nearest neighbours (k-NN).
- Implementunsupervisedlearningtechniques,suchasK-meansclustering.

CO1:.	Explain the fundamentals, paradigms, and workflow of machine learning including data acquisition, feature engineering, model selection, training, evaluation, and prediction.
CO2	Apply nearest neighbor–based learning techniques and distance measures for classification and regression problems.
CO3:	Analyze and implement decision tree–based and probabilistic models such as Random Forests and Naïve Bayes classifiers.
CO4:.	Design and apply linear and non-linear discriminant models including Perceptron, SVM, Logistic Regression, and Multi-Layer Perceptrons.
CO5: .	Apply clustering techniques such as K-Means, hierarchical clustering, density-based and soft clustering for unsupervised learning tasks.
CO6:	Evaluate and compare machine learning models using appropriate performance metrics to solve real-world data-driven problems.

CO \ PO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3	2	1	2								
CO2	3	3	3	2	2							
CO3	3	3	3	2	2							
CO4	3	3	3	2	2							
CO5	3	3	3	2	2							
CO6	3	3	3	3	2							3

UNIT-I: Introduction to Machine Learning: Evolution of Machine Learning, Paradigms for ML, Learning by Rote, Learning by Induction, Reinforcement Learning, Types of Data, Matching, Stages in Machine Learning, Data Acquisition, Feature Engineering, Data Representation, Model Selection, Model Learning, Model Evaluation, Model Prediction, Search and Learning, Data Sets.

UNIT-II: Nearest Neighbor-Based Models: Introduction to Proximity Measures, Distance Measures, Non-Metric Similarity Functions, Proximity Between Binary Patterns, Different Classification Algorithms Based on the Distance Measures, K-Nearest Neighbor Classifier,

Radius Distance Nearest Neighbor Algorithm, KNN Regression, Performance of Classifiers, Performance of Regression Algorithms.

UNIT-III: Models Based on Decision Trees: Decision Trees for Classification, Impurity Measures, Properties, Regression Based on Decision Trees, Bias–Variance Trade-off, Random Forests for Classification and Regression. The Bayes Classifier: Introductionto the Bayes Classifier, Bayes' Rule and Inference, The Bayes Classifier and its Optimality, Multi-Class Classification, Class Conditional Independence and Naive Bayes Classifier (NBC)

UNIT-IV: Linear Discriminants for Machine Learning: Introduction to Linear Discriminants, Linear Discriminants for Classification, Perceptron Classifier, Perceptron Learning Algorithm, Support Vector Machines, Linearly Non-Separable Case, Non-linear SVM, Kernel Trick, Logistic Regression, Linear Regression, Multi-Layer Perceptrons (MLPs), Backpropagation for Training an MLP.

UNIT-V: Clustering : Introduction to Clustering, Partitioning of Data, Matrix Factorization, Clustering of Patterns, Divisive Clustering, Agglomerative Clustering, Partitional Clustering, K- Means Clustering, Soft Partitioning, Soft Clustering, Fuzzy C-Means Clustering, Rough Clustering, Rough K-Means Clustering Algorithm, Expectation Maximization-Based Clustering, Spectral Clustering.

Text Books:

1. "MachineLearningTheoryandPractice",MNMurthy,VSAnanthanarayana,UniversitiesPress (India), 2024

ReferenceBooks:

1. "MachineLearning",TomM.Mitchell,McGraw-HillPublication,2017
2. "MachineLearninginAction",PeterHarrington,DreamTech
3. "Introduction toData Mining", Pang-NingTan, MichelStenbach,Vipin Kumar,7th Edition, 2019.

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DEPARTMENT OF INFORMATION TECHNOLOGY

IIIYear-IISemester	Course Code: BT24CS32P2A	L	T	P	C
		0	1	2	2

SOFTWARE TESTING METHODOLOGIES

Course Objectives

- To provide knowledge of the concepts in software testing such as testing process, criteria, strategies, and methodologies.
- To develop skills in software test automation and management using the latest tools.

CO1:.	Explain the fundamental concepts, objectives, and importance of software testing, including defect taxonomy and consequences of software bugs.
CO2	Apply path testing techniques using flow graphs, predicates, achievable paths, and path sensitization to identify software defects.
CO3:	Analyze and implement transaction flow testing, data flow testing, and domain testing techniques for systematic test design.
CO4:.	Apply logic-based testing methods including decision tables, path expressions, and specification-based testing.
CO5: .	Design and execute state-based testing using state graphs, transition testing, and testability principles.
CO6:	Apply graph-based testing techniques and utilize automated testing tools to evaluate software quality.

CO \ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	1									
CO2	3	3	3	2								
CO3	3	3	3	2	2							
CO4	3	3	2	2								
CO5	3	3	3	2	2							
CO6	3	3	3	3	3							3

UNIT-I

Introduction: Purpose of testing, Dichotomies, model for testing, consequences of bugs, taxonomy of bugs Flow graphs and Path testing: Basics concepts of path testing, predicates, path predicates and achievable paths, path sensitizing, path instrumentation, application of path testing.

UNIT-II

TransactionFlowTesting:transactionflows,transactionflowtestingtechniques.

Data Flow testing: Basics of data flow testing, strategies in data flow testing, application of data flow testing.

Domain Testing: domains and paths, Nice & ugly domains, domain testing, domains and interfacestesting, domain and interface testing, domains and testability.

UNIT-III

Paths, Path products and Regular expressions: path products & path expression, reduction procedure, applications, regular expressions & flow anomaly detection.

LogicBasedTesting:overview,decisiontables,pathexpressions,kvcharts,specifications.

UNIT-IV

State,StateGraphsandTransitiontesting:stategraphs,good&badstategraphs,statetesting, Testability tips.

UNIT-V

Graph Matrices and Application: Motivational overview, matrix of graph, relations, power of amatrix, node reduction algorithm, building tools. (Student should be given an exposure to a tool like Jmeter/selenium/soapUI/Catalon).

Text Books:

1. SoftwareTestingtechniques-BarisBeizer,Dreamtech,secondedition.
2. SoftwareTestingTools–Dr.K.V.K.K.Prasad, Dreamtech.

ReferenceBooks:

1. ThecraftofsoftwaretestingBrianMarick,PearsonEducation.
2. SoftwareTestingTechniques–SPD(Oreille)
3. SoftwareTestingintheRealWorld–EdwardKit,Pearson.
4. EffectivemethodsofSoftwareTesting,Perry,JohnWiley.
5. ArtofSoftwareTesting–Meyers,JohnWiley.

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DEPARTMENT OF INFORMATION TECHNOLOGY

IIIYear-IISemester	Course Code: BT24CS32P2B	L	T	P	C
		0	1	2	2

AUGMENTED REALITY & VIRTUAL REALITY

Objectives:

- Provide a foundation to the fast growing field of AR and make the students aware of the various AR concepts.
- To give historical and modern overviews and perspectives on virtualreality. It describes the fundamentals of sensation, perception, technical and engineering aspects of virtual reality systems.

CO1:.	Explain the fundamental concepts, history, components, and applications of Augmented Reality (AR) and related fields.
CO2	Analyze AR display technologies, tracking methods, calibration techniques, and coordinate systems used in real-world AR systems.
CO3:	Apply computer vision, interaction techniques, and software architecture principles to design AR applications.
CO4:.	Explain the principles of Virtual Reality (VR), including human perception, geometry of virtual worlds, lighting, and optics.
CO5: .	Analyze human visual physiology and perception to design effective VR rendering, immersive visuals, and latency-optimized systems.
CO6:	Design immersive AR/VR interactions incorporating motion, audio, locomotion, and human sensory systems.

CO \ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2										
CO2	3	3	2	2								
CO3	3	3	3	2	3							
CO4	3	2	2									
CO5	3	3	2	2								
CO6	3	3	3	3	3							3

UNIT-I

Introduction to Augmented Reality: Augmented Reality- Defining augmented reality, history of augmented reality, Examples, Related fields

Displays: Multimodal Displays, VisualPerception, Requirements and Characteristics, Spatial Display Model, Visual Displays

Tracking: Tracking, Calibration, and Registration, Coordinate Systems, Characteristics of Tracking Technology, Stationary Tracking Systems, Mobile Sensors

UNIT-II

ComputerVisionforAugmentedReality: MarkerTracking, Multiple-CameraInfraredTracking, Natural Feature Tracking by Detection, Outdoor Tracking.

Interaction: OutputModalities, InputModalities, TangibleInterfaces, VirtualUserInterfacesonReal Surfaces, Augmented Paper, Multi-view Interfaces, Haptic Interaction

SoftwareArchitectures: ARApplicationRequirements, SoftwareEngineeringRequirements, Distributed Object Systems, Dataflow, Scene Graphs

UNIT-III

Introduction to Virtual Reality: Defining Virtual Reality, History of VR, Human Physiology andPerception

TheGeometryofVirtualWorlds: GeometricModels, Axis-AngleRepresentationsofRotation, Viewing Transformations

Light and Optics: Basic Behavior of Light, Lenses, Optical Aberrations, The Human Eye, Cameras, Displays

UNIT-IV

The Physiology of Human Vision: From the Cornea to Photoreceptors, From Photoreceptors to the Visual Cortex, Eye Movements, Implications for VR

Visual Perception: Visual Perception - Perception of Depth, Perception of Motion, **Perception of Color Visual Rendering:** Visual Rendering -Ray Tracing and Shading Models, Rasterization, Correcting Optical Distortions, Improving Latency and Frame Rates, Immersive Photos and Videos

UNIT-V

Motion in Real and Virtual Worlds: Velocities and Accelerations, The Vestibular System, Physics in the Virtual World, Mismatched Motion and Vection

Interaction: MotorProgramsandRemapping, Locomotion, SocialInteraction

Audio: ThePhysicsofSound, ThePhysiologyofHumanHearing, AuditoryPerception, Auditory Rendering

Text Books:

1. AugmentedReality:Principles&PracticebySchmalstieg/Hollerer,PearsonEducation India;First edition (12 October 2016),ISBN-10: 9332578494
2. VirtualReality,StevenM.LaValle,CambridgeUniversityPress, 2016

ReferenceBooks:

1. Allan Fowler-AR Game Development‖, 1st Edition, A press Publications, 2018, ISBN 978- 1484236178
2. Understanding Virtual Reality: Interface, Application and Design, William R Sherman and Alan B Craig, (The Morgan Kaufmann Series in Computer Graphics)". Morgan Kaufmann Publishers, San Francisco, CA, 2002
3. Developing Virtual Reality Applications: Foundations of Effective Design, Alan B Craig, William R Sherman and Jeffrey D Will, Morgan Kaufmann, 2009
4. Designing for Mixed Reality, Kharis O'Connell Published by O'Reilly Media, Inc., 2016, ISBN:9781491962381
5. SanniSiltanen-Theoryandapplicationsofmarker-basedaugmentedreality.Julkaisija–UtgivarePublisher.2012.ISBN978-951-38-7449-0
6. GerardJounghyunKim,"DesigningVirtualSystems:TheStructuredApproach",2005

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DEPARTMENT OF INFORMATION TECHNOLOGY

IIIYear-IISemester	**Course Code:** BT24CS32P2C	**L**	**T**	**P**	**C**
		0	**1**	**2**	**2**
DevOps					

Course Objectives:

The main objectives of this courseareto:

- Describe the agile relationship between development and IT operations.
- Understand the skill sets and high-functioning teams involved in DevOps and related methods to reach a continuous delivery capability.
- Implement automated system update and DevOps lifecycle.

CO1:.	Explain the principles of SDLC, Agile methodology, DevOps concepts, lifecycle, architecture, workflows, and CI/CD practices.
CO2	Apply source code management techniques using Git, including version control, branching, collaboration, and code quality analysis tools.
CO3:	Implement build automation and continuous integration using Jenkins pipelines, jobs, and distributed build environments.
CO4:.	Demonstrate continuous delivery and deployment practices using Docker containerization and automated testing tools.
CO5: .	Apply configuration management and infrastructure automation using Ansible for application deployment.
CO6:	Deploy and manage containerized applications using Kubernetes/OpenShift and evaluate modern DevOps tools such as Puppet and Chef.

CO \ PO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3	2										
CO2	3	3	2		3							
CO3	3	3	3	2	3							
CO4	3	3	3	2	3							
CO5	3	2	3	2	3							
CO6	3	3	3	2	3							3

UNIT-I

Introduction to DevOps: Introduction to SDLC, Agile Model. Introduction to Devops. DevOps Features, DevOps Architecture, DevOps Lifecycle, Understanding Workflow and principles, Introduction to DevOps tools, Build Automation, Delivery Automation, Understanding Code Quality, Automation of CI/ CD. Release management, Scrum, Kanban, delivery pipeline, bottlenecks, examples

UNIT-II

Source Code Management (GIT): The need for source code control, The history of source code management, Roles and code, source code management system and migrations. What is Version Control and GIT, GIT Installation, GIT features, GIT workflow, working withremote repository, GIT commands, GIT branching, GIT staging and collaboration. UNIT TESTING - CODE COVERAGE: Junit, nUnit & Code Coverage with Sonar Qube, SonarQube - Code Quality Analysis.

UNIT-III

BuildAutomation -ContinuousIntegration(CI): BuildAutomation,WhatisCIWhyClis Required, CI tools, Introduction to Jenkins (With Architecture), jenkins workflow, jenkins master slave architecture, Jenkins Pipelines, PIPELINE BASICS - Jenkins Master, Node, Agent, and Executor Freestyle Projects & Pipelines, Jenkins for Continuous Integration, Create and Manage Builds, User Management in Jenkins Schedule Builds, Launch Builds on Slave Nodes.

UNIT-IV

Continuous Delivery (CD): Importance of Continuous Delivery, CONTINUOUS DEPLOYMENT CD Flow, Containerization with Docker: Introduction to Docker, Docker installation, Docker commands, Images & Containers, DockerFile, Running containers, Working with containers and publish to Docker Hub.

TestingTools: Introduction to Selenium and its features, JavaScript testing.

UNIT-V

Configuration Management - ANSIBLE: Introduction to Ansible, Ansible tasks, Roles, Jinja templating, Vaults, Deployments using Ansible.

CONTAINERIZATION USING KUBERNETES(OPENSHIFT): Introduction to Kubernetes Namespace & Resources, CI/CD - On OCP, BC, DC & ConfigMaps, Deploying Apps on Openshift Container Pods. Introduction to Puppet master and Chef.

TextBooks:

1. Joyner,Joseph.,Devops forBeginners:DevopsSoftwareDevelopmentMethodGuide for Software Developers and It Professionals, 1st Edition Mihails Konoplows, 2015.
2. AlissonMachadodeMenezes.,Hands-onDevOpswithLinux,1st Edition,BPB Publications, India, 2021.

ReferenceBooks:

1. LenBass,IngoWeber,LimingZhu.DevOps:ASoftwareArchitect'sPerspective. Addison Wesley; ISBN-10
2. GeneKimJeHumble,PatrickDebois,JohnWillis.TheDevOpsHandbook,1st Edition, IT Revolution Press, 2016.
3. Verona,Joakim PracticalDevOps,1st Edition,PacktPublishing,2016.
4. JoakimVerona.PracticalDevops,Ingramshorttitle;2nd edition(2018).ISBN10: 1788392574
5. Deepak Gaikwad, Viral Thakkar.DevOps Tools from Practitioner's Viewpoint. Wiley publications. ISBN: 9788126579952

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BALUSUMUDI, BHIMAVARAM, W.G. Dist., A.P., PIN-534 202

DEPARTMENT OF INFORMATION TECHNOLOGY

IIIYear-IISemester	**Course Code:** BT24CS32P2D	**L**	**T**	**P**	**C**
		0	**1**	**2**	**2**
GENERATIVE AI					

Course Objectives:

- Understand the basics of GenerativeAI.
- Know the basics of Text Generation.
- Understand the process of generating videos.
- Know about GAN and its variants.

CO1:.	Explain JDBC architecture, JDBC drivers, major classes/interfaces, and perform database operations including CRUD, transaction management, batch updates, and RowSet objects.
CO2	Analyze J2EE architecture, containers, server types, HTTP protocols, request processing, and structure of web applications.
CO3:	Apply Servlet API for building dynamic web applications, including Servlet lifecycle, configuration, session tracking, event handling, filters, and response manipulation.
CO4:.	Demonstrate JSP concepts including JSP architecture, lifecycle, scripting elements, directives, actions, implicit objects, Expression Language, JSTL, custom tags, session management, and exception handling.
CO5: .	Develop CRUD-based web applications using Java web frameworks, particularly Spring MVC, exploring dependency injection, bean lifecycle, Spring annotations, Spring AOP, and database transaction management.
CO6:	Integrate web application components, implement MVC architecture using Spring, and design robust enterprise-level web applications with data access and transaction management.

CO \ PO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3	2	2	1	2							
CO2	3	3	2	2	1							
CO3	3	3	3	2	1							
CO4	3	3	2	2	1							
CO5	3	3	3	2	3							
CO6	3	3	3	2	3							3

UNITI:

Introduction To Gen Ai: Historical Overview of Generative modelling,Difference between Gen AI and Discriminative Modeling, Importance of generative models in AI and Machine Learning, Types of Generative models, GANs, VAEs, autoregressive models and Vector quantized Diffusion models,Understanding ifprobabilisticmodeling and generative process, Challenges of Generative Modeling, Future of Gen AI, Ethical Aspects of AI, ResponsibleAI, Use Cases.

UNITII:

GenerativeModels For Text: LanguageModels Basics, Building blocksof Language models, Transformer Architecture, Encoder and Decoder, Attention mechanisms, Generation of Text, ModelslikeBERTandGPTmodels,GenerationofText,Auto encoding, RegressionModels, Exploring ChatGPT, Prompt Engineering: Designing Prompts, Revising Prompts using Reinforcement Learning from Human Feedback (RLHF),Retrieval Augmented Generation, Multimodal LLM, Issues of LLM like hallucination.

UNITIII:

Generation of Images: Introduction to Generative Adversarial Networks,Adversarial Training Process, Nash Equilibrium, Variational Autoencoders, Encoder-Decoder Architectures, Stable Diffusion Models, Introduction to Transformer-based ImageGeneration, CLIP, Visual Transformers ViT- Dall-E2 and Dall-E3, GPT-4V, Issues of Image Generation models like Mode Collapse and Stability.

UNITIV:

Generation of Painting, Music, and Play: Variants of GAN, Types of GAN, Cyclic GAN, Using Cyclic GAN to Generate Paintings, Neural Style Transfer,Style Transfer, Music Generating RNN, MuseGAN, Autonomous agents, Deep Q Algorithm, Actor-critic Network.

UNITV:

Open Source Models And Programming Frameworks: Training and Fine tuning ofGenerative models, GPT 4 All, Transfer learning and Pretrained models, Training vision models, Google Copilot, Programming LLM,LangChain, Open Source Models, Llama, Programming for TimeSformer,Deployment, Hugging Face.

TextBooks:

1. DenisRothman,“TransformersforNaturalLanguageProcessingandComputerVision”, ThirdEdition ,Packt Books, 2024

ReferenceBooks:

1. DavidFoster,”GenerativeDeepLearning”, O’ReilyBooks,2024.
2. AltafRehmani,“GenerativeAIforEveryone”,BlueRoseOne, 2024.

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DEPARTMENT OF INFORMATION TECHNOLOGY

IIIYear-IISemester	**Course Code:** BT24CS32P3A	**L**	**T**	**P**	**C**
		0	**1**	**2**	**2**

SOFTWARE PROJECT MANAGEMENT

Course Objectives:

At the end of the course, the students hall be able to:

- To describe and determine the purpose and importance of project management from the perspectives of planning, tracking and completion of project
- Tocompare anddifferentiateorganizationstructuresandprojectstructures
- To implement a project to manage project schedule, expenses and resources with the application of suitable project management tools

CO1:.	Explain the fundamentals of Generative AI, probabilistic modeling, major generative model families, ethical aspects, and real-world use cases.
CO2	Analyze and compare generative models for text generation, including transformers, LLMs, prompt engineering, RAG, RLHF, and limitations such as hallucinations.
CO3:	Apply generative techniques for image generation using GANs, VAEs, diffusion models, and transformer-based vision architectures.
CO4:.	Demonstrate creative generative applications such as painting, music, and autonomous agents using GAN variants, style transfer, and reinforcement learning.
CO5: .	Implement training, fine-tuning, and deployment of generative models using open-source frameworks and pretrained models.
CO6:	Evaluate societal, ethical, and professional responsibilities in deploying Generative AI systems and pursue continuous learning in emerging AI technologies.

CO \ PO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3	2						3				2
CO2	3	3	2	2	3							2
CO3	3	3	3	2	3							
CO4	2	2	3	2	3							
CO5	3	2	3	2	3							2
CO6	2	2						3	2	2		3

UNIT-I:

Conventional Software Management: The waterfall model, conventional software Management performance.

Evolution of Software Economics: Software Economics, pragmatic software costestimation.

Improving Software Economics: Reducing Software product size, improving software processes, improving team effectiveness, improving automation, Achieving required quality, peer inspections.

The old way and the new: The principles of conventional software Engineering, principles of modern software management, transitioning to an iterative process.

UNIT-II:

Life cycle phases: Engineering and production stages, inception, Elaboration, construction, transition phases.

Artifacts of the process: The artifact sets, Management artifacts, Engineering artifacts, programmatic artifacts.

UNIT-III:

Modelbasedsoftwarearchitectures: AManagementperspectiveandtechnicalperspective.

Work Flows of the process: Software process workflows, Iteration workflows.**Checkpointsoftheprocess:Major**milestones,MinorMilestones,Periodicstatus assessments.

IterativeProcessPlanning: Workbreakdownstructures,planningguidelines,costand schedule estimating, Iteration planning process, Pragmatic planning.

UNIT-IV:

Project Organizations and Responsibilities: Line-of-Business Organizations, Project Organizations, evolution of Organizations.

ProcessAutomation: AutomationBuildingblocks,TheProject Environment.

Project Control and Process instrumentation: The seven core Metrics, Management indicators, quality indicators, life cycle expectations, pragmatic Software Metrics, Metrics automation.

UNIT-V:

Agile Methodology, ADAPTing to Scrum, Patterns for Adopting Scrum, Iterating towards Agility. **Fundamentals of DevOps**: Architecture, Deployments, Orchestration, Need, Instance of applications, DevOps delivery pipeline, DevOps eco system. DevOps adoption in projects: Technology aspects, Agiling capabilities, Tool stack implementation, People aspect, processes

TextBooks:

1. SoftwareProjectManagement,WalkerRoyce,PEA,2005.
2. Succeeding with Agile: Software Development Using Scrum, Mike Cohn, Addison Wesley.
3. The DevOps Handbook: How to Create World-Class Agility, Reliability, and Security in Technology Organizations, Gene Kim , John Willis , Patrick Debois , Jez Humb,1st Edition, O'Reilly publications, 2016.

ReferenceBooks:

1. SoftwareProjectManagement,BobHughes,3/e,MikeCotterell,TMH
2. SoftwareProjectManagement,JoelHenry,PEA
3. SoftwareProjectManagementinpractice,PankajJalote,PEA,2005,
4. EffectiveSoftwareProjectManagement,RobertK.Wysocki,Wiley,2006.
5. ProjectManagementinIT,KathySchwalbe,Cengage

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DEPARTMENT OF INFORMATION TECHNOLOGY

IIIYear-IISemester	Course Code: BT24CS32P3B	L	T	P	C
		0	1	2	2

MOBILE ADHOC NETWORKS

Course Objectives:

From the course the student will learn

- Architect sensor networks for various application setups.
- Devise appropriated at a dissemination protocols and model links cost.
- Understanding of the fundamental concepts of wireless sensor networks and has a basic knowledge of the various protocols at various layers.
- Evaluate the performance of sensor networks and identify bottlenecks.

CO1:.	Explain the fundamentals of ad hoc wireless networks, MANET characteristics, applications, challenges, and MAC protocols.
CO2	Analyze and compare routing and transport layer protocols for ad hoc wireless networks, including topology-based and position-based approaches.
CO3:	Assess security requirements, threats, and protection mechanisms in MANETs, including secure routing and intrusion detection systems.
CO4:.	Describe the architecture, design issues, and applications of wireless sensor networks, including data retrieval and protocol stack layers.
CO5: .	Evaluate security mechanisms in WSNs, including key management, secure data aggregation, and sensor network operating systems.
CO6:	Apply modern simulation tools and programming environments to model, analyze, and evaluate MANETs and WSNs for real-world scenarios.

CO \ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2										2
CO2	3	3	2	2								
CO3	3	3	2	2				3				
CO4	3	2	2									
CO5	3	3	2	2				3				
CO6	2	2	2	3	3							2

UNIT I: Introduction to Ad Hoc Wireless Networks- Cellular and Ad Hoc Wireless Networks, Characteristics of MANETs, Applications of MANETs, Issues and Challenges of MANETs, Ad Hoc Wireless Internet, MAC protocols for Ad hoc Wireless Networks-Issues, Design Goals and Classifications of the MAC Protocols.

UNIT II: Routing Protocols for Ad Hoc Wireless Networks- Issues in Designing aRouting Protocol, Classifications of Routing Protocols, Topology-based versus Position- based Approaches, Issues and design goals of a Transport layer protocol, Classification of Transport layer solutions, TCP over Ad hoc Wireless Networks, Solutions for TCP over Ad Hoc Wireless Networks, Other Transport layer protocols.

UNIT III: Security protocols for Ad hoc Wireless Networks- Security in Ad hoc Wireless Networks, Network Security Requirements, Issues and Challenges in Security Provisioning, Network Security Attacks, Key Management, Secure Routing in Ad hoc Wireless Networks, Cooperation in MANETs, Intrusion Detection Systems.

UNIT IV: Basics of Wireless Sensors and Applications- The Mica Mote, Sensing and Communication Range, Design Issues, Energy Consumption, Clustering of Sensors, Applications, Data Retrieval in Sensor Networks-Classification of WSNs, MAC layer, Routing layer, Transport layer, High-level application layer support, Adapting to the inherent dynamic nature of WSNs.

UNIT V: Security in WSNs- Security in WSNs, Key Management in WSNs, Secure Data Aggregation in WSNs, Sensor Network Hardware-Components of Sensor Mote, Sensor Network Operating Systems–TinyOS, LA-TinyOS, SOS, RETOS, Imperative Language- nesC, **Dataflow Style Language-**TinyGALS, Node-Level Simulators, NS-2 and its sensor network extension, TOSSIM.

TextBooks:

1. Ad Hoc Wireless Networks – Architectures and Protocols, 1st edition, C. Siva Ram Murthy, B. S. Murthy, Pearson Education, 2004
2. Ad Hoc and Sensor Networks – Theory and Applications, 2nd edition *Carlos Corderio Dharma P.Aggarwal*, World Scientific Publications / Cambridge University Press, March 2006

ReferenceBooks:Wireless Sensor Networks: An Information Processing Approach, 1st edition, *Feng Zhao, Leonidas Guibas,*Elsevier Science imprint, Morgan Kauffman Publishers,2005, rp2009

1. Wireless Ad hoc Mobile Wireless Networks – Principles, Protocols and Applications, 1stedition,SubirKumarSarkar,etal., Auerbach Publications,Taylor& FrancisGroup, 2008
2. AdhocNetworking,1stedition,*CharlesE.Perkins*,PearsonEducation,2001
3. Wireless Ad hoc Networking, 1st edition, *Shih-Lin Wu, Yu-Chee Tseng*, Auerbach Publications, Taylor & Francis Group, 2007
4. Wireless Sensor Networks – Principles and Practice, 1st edition, Fei Hu, Xiaojun Cao, An Auerbach book, CRC Press, Taylor & Francis Group, 2010

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DEPARTMENT OF INFORMATION TECHNOLOGY

IIIYear-IISemester	**Course Code:** BT24CS32P3C	**L**	**T**	**P**	**C**
		0	**1**	**2**	**2**

NATURAL LANGUAGE PROCESSING

CourseObjectives:

This course introduces the fundamental concepts and techniques of natural language processing (NLP).

- Studentswillgainanin-depthunderstandingofthecomputationalpropertiesofnatural languages and the commonly used algorithms for processing linguistic information.
- The course examines NLP models and algorithms using both the traditional symbolic and the more recent statistical approaches.
- Enable students to be capable to describe the application based on natural language processing and to show the points of syntactic, semantic and pragmatic processing.

CO1:.	Explain the origins, challenges, and fundamental concepts of Natural Language Processing, including language modeling, regular expressions, and finite-state automata.
CO2	Analyze word-level language models using N-grams, smoothing techniques, and part-of-speech tagging approaches such as rule-based, stochastic, and probabilistic models.
CO3:	Apply syntactic analysis techniques using context-free grammars, parsing algorithms, probabilistic parsing, and feature structures.
CO4:.	Interpret semantic and pragmatic representations using logic-based methods, word sense disambiguation techniques, and similarity measures.
CO5: .	Analyze discourse-level phenomena including coherence, anaphora, and coreference resolution using established linguistic algorithms.
CO6:	Utilize standard NLP tools, corpora, and lexical resources to design and evaluate NLP applications.

CO \ PO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3	2										2
CO2	3	3	2	2								
CO3	3	3	3	2								
CO4	3	3	2	2								
CO5	2	3	2	2								
CO6	2	2	2	3	3							2

UNITI:

INTRODUCTION: Origins and challenges of NLP – Language Modeling: Grammar-based LM, Statistical LM – Regular Expressions, Finite-State Automata – English Morphology, Transducers for lexicon and rules, Tokenization, Detecting and Correcting Spelling Errors, Minimum Edit Distance.

UNITII:

WORD LEVEL ANALYSIS: Unsmoothed N-grams, Evaluating N-grams, Smoothing, Interpolation and Backoff – Word Classes, Part- of-Speech Tagging, Rule-based, Stochastic and Transformation- based tagging, Issues in PoS tagging – Hidden Markov and Maximum Entropy models.

UNIT III:

SYNTACTICANALYSIS: Context-Free Grammars,Grammar rules for English, Treebanks, Normal Forms for grammar – Dependency Grammar – Syntactic Parsing, Ambiguity, Dynamic Programming parsing – Shallow parsing Probabilistic CFG, Probabilistic CYK, Probabilistic Lexicalized CFGs – Feature structures, Unification of feature structures

UNITIV:

SEMANTICS AND PRAGMATICS: Requirements for representation, First-Order Logic, Description Logics – Syntax-Driven Semantic analysis, Semantic attachments – Word Senses, Relations between Senses, Thematic Roles, selectional restrictions – Word Sense Disambiguation, WSD using Supervised, Dictionary & Thesaurus, Bootstrapping methods – Word Similarity using Thesaurus and Distributional methods.

UNITV:

DISCOURSE ANALYSIS AND LEXICAL RESOURCES: Discourse segmentation, Coherence – Reference Phenomena, Anaphora Resolution using Hobbs and Centering Algorithm – Coreference Resolution – Resources: Porter Stemmer, Lemmatizer, Penn Treebank, Brill's Tagger, WordNet, PropBank, FrameNet, Brown Corpus, British National Corpus (BNC).

Text Books:

1. Speech and Language Processing: An Introduction to Natural Language Processing, Computational Linguistics and Speech, 2nd Edition, Daniel Jurafsky, James H. Martin - Pearson Publication,2014.
2. Natural Language Processing with Python, First Edition, Steven Bird, Ewan Klein and Edward Loper, OReilly Media,2009.

ReferenceBooks:

1. Language Processing with Java and Ling Pipe Cookbook, 1st Edition, Breck Baldwin, AtlanticPublisher, 2015.
2. NaturalLanguageProcessingwithJava,2nd Edition,RichardMReese,OReillyMedia,2015.
3. HandbookofNaturalLanguageProcessing,Second,NitinIndurkhyaandFredJ.Damerau, Chapman and Hall/CRC Press, 2010.Edition
4. NaturalLanguageProcessingandInformationRetrieval,3rd Edition,TanveerSiddiqui,U.S. Tiwary, Oxford University Press,2008.

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DEPARTMENT OF INFORMATION TECHNOLOGY

IIIYear-IISemester	Course Code: BT24CS32P3D	L	T	P	C
		0	1	2	2

DISTRIBUTED OPERATING SYSTEM

CourseObjectives:

The main objective of the course is to introduce design issues and different message passing techniques in DOS, distributed systems, RPC implementation and its performance in DOS, distributed shared memory and resource management, distributed file systems and evaluate the performance in terms of fault tolerance, file replication as major factors

CO1:.	Explain the fundamentals, evolution, models, and design issues of distributed computing systems and distributed operating systems.
CO2	Analyze message passing mechanisms including synchronization, buffering, group communication, and failure handling in distributed systems.
CO3:	Apply Remote Procedure Call (RPC) concepts such as transparency, stub generation, communication protocols, security, and performance optimization.
CO4:.	Evaluate Distributed Shared Memory (DSM) systems with respect to architecture, consistency models, synchronization, and coordination algorithms.
CO5: .	Analyze resource management techniques in distributed systems including global scheduling, load balancing, process migration, and threading.
CO6:	Design and evaluate distributed file systems considering file models, caching, replication, fault tolerance, and atomic transactions.

CO \ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2										2
CO2	3	3	2	2								
CO3	3	3	3	2								
CO4	3	3	2	2								
CO5	3	3	3	2								
CO6	3	3	3	3	2							2

UnitI:

Fundamentals:

What is Distributed Computing Systems? Evolution of Distributed Computing System; Distributed Computing System Models; What is Distributed Operating System? Issues in Designing a Distributed Operating System; Introduction to Distributed Computing Environment(DCE).

MessagePassing:

Introduction, Desirable features of a Good Message Passing System, Issues in PC by MessagePassing, Synchronization, Buffering, Multi-datagram Messages, Encoding and Decoding of Message Data, Process Addressing, Failure Handling, Group Communication, Case Study: 4.3 BSD UNIX IPC Mechanism.

UnitII:RemoteProcedureCalls:

Introduction, The RPC Model, Transparency of RPC, Implementing RPC Mechanism, Stub Generation, RPC Messages, Marshaling Arguments and Results, Server Management, Parameter-Passing Semantics, Call Semantics, Communication Protocols for RPCs, Complicated RPCs, Client- Server Binding, Exception Handling, Security, Some Special Types of RPCs, RPC in Heterogeneous Environments, Lightweight RPC, Optimization for Better Performance, Case Studies: Sun RPC

UnitIII:DistributedSharedMemory:

Introduction, General Architecture of DSM systems, Design and Implementation Issues of DSM, Granularity, Structure of Shared Memory Space, Consistency Models, Replacement Strategy, Thrashing, Other approaches to DSM, Heterogeneous DSM, Advantages of DSM. Synchronization: Introduction, Clock Synchronization, Event Ordering, Mutual Exclusion, Dead Lock, Election Algorithms

UnitIV:ResourceManagement:

Introduction, Desirable Features of a Good Global Scheduling Algorithm, Task Assignment Approach, Load – Balancing Approach, Load – Sharing Approach Process Management: Introduction, Process Migration, Threads.

UnitV: Distributed File Systems:

Introduction, Desirable Features of a Good Distributed File System, File models, File–Accessing Models, File –Sharing Semantics, File – Caching Schemes, File Replication, Fault Tolerance, Atomic Transactions and Design Principles.

Text books

1. Pradeep.K.Sinha:DistributedOperatingSystems:ConceptsandDesign,PHI,2007.

Reference Books:

1. AndrewS.Tanenbaum:DistributedOperatingSystems,PearsonEducation,2013.
2. AjayD.KshemkalyaniandMukeshSinghal,DistributedComputing:Principles,Algorithmsand Systems, Cambridge University Press, 2008
3. SunitaMahajan,SeemaShan,“DistributedComputing”,OxfordUniversityPress,2015

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DEPARTMENT OF INFORMATION TECHNOLOGY

IIIYear-IISemester	Course Code: BT24CS3204	L	T	P	C
		0	1	2	2

CLOUD COMPUTING LAB

Course Objectives:

- To introduce the various levels of services offered by cloud.
- To give practical knowledge about working with virtualization and containers.
- To introduce the advanced concepts such as serverless computing and cloud simulation.

CourseOutcomes: At the end of the course, the student should be able to

- Demonstrate various service types, delivery models and technologies of a cloud computing environment.
- Distinguish the services based on virtual machines and containers in the cloud offerings.
- Assess the challenges associated with a cloud-based application.
- Discuss advanced cloud concepts such as server less computing and cloud simulation.
- Examine various programming paradigms suitable to solve real world and scientific problems using cloud services.

List of Experiments:

1. Lab on web services
2. Lab on IPC, messaging, publish/subscribe
3. Install Virtual Box/VMware Workstation with different flavours of Linux or windows OS on top of windows8 or above.
4. Install a C compiler in the virtual machine created using VirtualBox and execute Simple Programs.
5. Create an Amazon EC2 instance and set up a web-server on the instance and associate an IP address with the instance. In the process, create a security group allowing access to port 80 on the instance.

OR

6. Do the same with Open Stack
7. Install Google App Engine. Create a hello world app and other simple web applications using python/java.
8. Start a Docker container and set up a web-server (e.g. apache2 or Python based Flask micro web framework) on the instance. Map the host directory as a data volume for the container.
9. Find a procedure to transfer the files from one virtual machine to another virtual machine. Similarly, from one container to another container.
10. Find a procedure to launch virtual machine using try stack (Online Open stack Demo Version)
11. InstallHadoopsinglenodeclusterandrunsimpleapplicationslikewordcount.
12. Utilize Open FaaS – Server less computing framework and demonstrate basic event driven function invocation.
13. Simulate a cloud scenario using Cloud Sim and run a scheduling algorithm that is not present in Cloud Sim.

TextBooks:

1. MasteringCloudComputing,2nd edition,RajkumarBuyya,ChristianVecchiola,Thamarai Selvi, Shivananda Poojara, Satish N. Srirama, McGraw Hill, 2024.
2. Distributed and Cloud Computing, Kai Hwang, Geoffery C. Fox, Jack J. Dongarra,Elsevier, 2012.

ReferenceBooks:

1. Cloud Computing, Theory and Practice, Dan C Marinescu, 2nd edition, MK Elsevier,2018.
2. Cloud Computing: Principles and Paradigms by Rajkumar Buyya, James Broberg and Andrzej M. Goscinski, Wiley, 2011.
3. Online documentation and tutorials from cloud service providers (e.g. AWS, Google App Engine)
4. Docker,Referencedocumentation, https://docs.docker.com/reference/
5. OpenFaaS,ServerlessFunctionsMadeSimple, https://docs.openfaas.com/

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DEPARTMENT OF INFORMATION TECHNOLOGY

IIIYear-IISemester	**Course Code:** BT24IT3203	**L**	**T**	**P**	**C**
		0	**1**	**2**	**2**

MACHINE LEARNING LAB

CourseObjectives:

- To learn about computing central tendency measures and Data preprocessing techniques
- To learn about classification and regression algorithms
- To apply different clustering algorithms for a problem.

SoftwareRequired:Python/R/Weka

Lab should cover the concepts studied in the coursework, sample list of Experiments:

1. Compute Central Tendency Measures: Mean, Median, Mode Measure of Dispersion: Variance, Standard Deviation.
2. Apply the following Pre-processing techniques for a given dataset.
   a. Attribute selection b. Handling Missing Values c. Discretization
   d. Elimination of Outliers
3. Apply KNN algorithm for classification and regression
4. Demonstrate decision tree algorithm for a classification problem and perform parameter tuning for better results
5. Demonstrate decision tree algorithm for a regression problem
6. Apply Random Forest algorithm for classification and regression
7. Demonstrate Naïve Bayes Classification algorithm.
8. Apply Support Vector algorithm for classification
9. Demonstrate simple linear regression algorithm for a regression problem
10. Apply Logistic regression algorithm for a classification problem
11. Demonstrate Multi-layer Perceptron algorithm for a classification problem
12. Implement the K-means algorithm and apply it to the data you selected. Evaluate performance by measuring the sum of the Euclidean distance of each example from
    Its class center. Test the performance of the algorithm as a function of the parameters K.
13. Demonstrate the use of Fuzzy C-Means Clustering
14. Demonstrate the use of Expectation Maximization based clustering algorithm

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DEPARTMENT OF INFORMATION TECHNOLOGY

IIIYear-IISemester	Course Code:	L	T	P	C
		0	1	2	2
SOFT SKILLS					

CourseObjectives:

- To equip the students with the skills to effectively communicate in English
- To train the students in interviewskills,groupdiscussionsandpresentationskills
- Tomotivatethestudentstodevelop confidence
- Toenhancethestudents'interpersonal skills
- Toimprovethestudents'writingskills

UNIT–I

Analytical Thinking & Listening Skills: Self-Introduction, ShapingYoung Minds -ATalk byAzim Premji (Listening Activity), Self – Analysis, Developing Positive Attitude, Perception.

CommunicationSkills: VerbalCommunication;NonVerbalCommunication(BodyLanguage)

UNIT–II

Self-Management Skills: Anger Management, StressManagement,Time Management, SixThinking Hats, Team Building, Leadership Qualities

Etiquette: SocialEtiquette,BusinessEtiquette,TelephoneEtiquette,DiningEtiquette

UNIT–III

StandardOperationMethods: BasicGrammars,Tenses,Prepositions,Pronunciation,LetterWriting; Note Making, Note Taking,Minutes Preparation, Email & Letter Writing

UNIT-IV

Job-Oriented Skills: Group Discussion, Mock Group Discussions, Resume Preparation, Interview Skills, Mock Interviews

UNIT-V

Interpersonal relationships: Introduction, Importance, Types, Uses,Factors affecting interpersonal relationships, Accommodating different styles, Consequences of interpersonal relationships

Text books:

1. BarunK.Mitra,PersonalityDevelopmentandSoftSkills,OxfordUniversityPress,2011.
2. S.P.Dhanavel,EnglishandSoftSkills,OrientBlackswan,2010.

Referencebooks:

1. R.S.Aggarwal,AModernApproachtoVerbal& Non-Verbal Reasoning,S.Chand& Company Ltd., 2018.
2. Raman,Meenakshi&Sharma,Sangeeta,TechnicalCommunicationPrinciples andPractice, Oxford University Press, 2011.

E-resources:

1. https://swayam-plus.swayam2.ac.in/courses/course-details?id=P_CAMBR_01