HINDUSTHAN COLLEGE OF ENGINEERING AND TECHNOLOGY

(An Autonomous Institution Affiliated to Anna University, Chennai)

(Approved by AICTE, New Delhi, Accredited by NAAC with 'A++'Grade)

COIMBATORE 641032.

M. E. COMPUTER SCIENCE AND ENGINEERING

HINDUSTHAN
EDUCATIONAL AND CHARITABLE TRUST

HICET

CHOICE BASED CREDIT SYSTEM

REGULATION 2024

Academic year 2024-2025

HINDUSTHAN EDUCATIONAL AND CHARITABLE TRUST
HICET

Hindusthan College of Engineering and Technology
(An Autonomous Institution, Affiliated to Anna University, Chennai
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Valley Campus, Pollachi Highway, Coimbatore, Tamil Nadu.

TÜVRheinland CERTIFIED

DETAILS OF CHANGES CARRIED OUT IN CURRICULUM & SYLLABUS

CBCS PATTERN

POSTGRADUATE PROGRAMMES

M.E. COMPUTER SCIENCE AND ENGINEERING (PG)

REGULATION 2024

For the students admitted during the academic year 2024-2025 and onwards

SEMESTERI

S. NO.	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS PER WEEK			CREDITS	CIA	ESE	TOTAL
				L	T	P				
THEORY										
1.	24MA1103	MathematicalfoundationofCSE	FC	3	1	0	4	40	60	100
2.	24CP1201	AdvancedDataStructures and Algorithms	PCC	3	0	0	3	40	60	100
3.	24CP1202	Advanced Database ManagementSystem	PCC	3	0	0	3	40	60	100
4.	24CP1203	SoftwareArchitecture	PCC	3	0	0	3	40	60	100
5.	24RM1161	ResearchMethodology and IPR	RMC	2	1	0	3	40	60	100
PRACTICAL										
7.	24CP1001	AdvancedDataStructures and Algorithms Laboratory	PCC	0	0	4	2	60	40	100
8.	24CP1002	Advanced Database ManagementSystem Laboratory	PCC	0	0	4	2	60	40	100
TOTAL				**14**	**2**	**8**	**20**	**320**	**380**	**700**

SEMESTERII

S. NO.	COURSECODE	COURSETITLE	CATEGORY	PERIODS PERWEEK			CREDITS	CIA	ESE	TOTAL
				L	T	P				
THEORY										
1.	24CP2201	Data Science and Analytics	PCC	3	0	0	3	40	60	100
2.	24CP2202	CloudComputingTechnologies	PCC	3	0	0	3	40	60	100
3.	24CP23XX	ProgramElectiveI	PEC	3	0	0	3	40	60	100
4.	24CP23XX	ProgramElectiveII	PEC	3	0	0	3	40	60	100
THEORYWITHLABCOMPONENT										
5.	24CP2251	MachinelearningTechniques	PCC	3	0	2	4	50	50	100
PRACTICALS										
6.	24CP2001	Data Science and AnalyticsLaboratory	PCC	0	0	4	2	60	40	100
7.	24CP2002	Internship/ Mini Project	EEC	0	0	4	2	0	100	100
TOTAL				**17**	**0**	**8**	**20**	**370**	**430**	**800**

LIST OF PROFESSIONAL ELECTIVES

PROFESSIONALELECTIVE -I										
S.No.	**Course Code**	**Course Title**		**L**	**T**	**P**	**C**	**CIA**	**ESE**	**TOTAL**
1.	24CP2301	Agent Based IntelligentSystems	PEC	3	0	0	3	40	60	100
2.	24CP2302	MulticoreArchitecture	PEC	3	0	0	3	40	60	100
3.	24CP2303	Software DesignPatterns	PEC	3	0	0	3	40	60	100
PROFESSIONALELECTIVE -II										
4.	24CP2304	CompilerOptimization Techniques	PEC	3	0	0	3	40	60	100
5.	24CP2305	DistributedOperatingSystems	PEC	3	0	0	3	40	60	100
6.	24CP2306	Software Process andProjectManagement	PEC	3	0	0	3	40	60	100

SEMESTERIII

S. NO.	COURSE CODE	COURSETITLE	CATEGORY	PERIODS PERWEEK			CREDITS	CIA	ESE	TOTAL
				L	T	P				
THEORY										
1.	24CP33X	ProgramElectiveIII	PEC	3	0	0	3	40	60	100
2.	24CP33X	ProgramElectiveIV	PEC	3	0	0	3	40	60	100
3.	24CP33X	Program ElectiveV	PEC	3	0	0	3	40	60	100
4.	24CP33X	Program ElectiveVI	PEC	3	0	0	3	40	60	100
PRACTICALS										
5.	24CP3901	ProjectWork I	EEC	0	0	12	6	50	50	100
TOTAL				**12**	**0**	**12**	**18**	**210**	**290***	**500**

SEMESTERIV

S. NO.	COURSE CODE	COURSETITLE	CATEGORY	PERIODS PERWEEK			CREDITS	CIA	ESE	TOTAL
				L	T	P				
PRACTICALS										
1.	24CP4901	ProjectWork II	EEC	0	0	24	12	100	100	200
TOTAL				**0**	**0**	**24**	**12**	**100**	**100**	**200**

LIST OF PROFESSIONAL ELECTIVES

ProfessionalElective -III										
	24CP3301	BigDataComputing	PEC	3	0	0	3	40	60	100
	24CP3302	Image Processing andAnalysis	PEC	3	0	0	3	40	60	100
	24CP3303	Data MiningTechniques	PEC	3	0	0	3	40	60	100
ProfessionalElective-IV										
	24CP3304	Deep LearningTechniques	PEC	3	0	0	3	40	60	100
	24CP3305	Soft ComputingTechniques	PEC	3	0	0	3	40	60	100
ProfessionalElective -V										
	24CP3306	LinguisticComputing	PEC	3	0	0	3	40	60	100
	24CP3307	AdvancedCryptography Techniques	PEC	3	0	0	3	40	60	100
ProfessionalElective -VI										
	24CP3308	Bio inspired computing	PEC	3	0	0	3	40	60	100
	24CP3309	Federated learning	PEC	3	0	0	3	40	60	100

CREDIT DISTRIBUTION

R-2024

Semester	I	II	III	IV	TOTAL
CREDITS	20	20	18	12	70

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Chairman
HINDUSTHAN COLLEGE OF ENGG. & TECH.

SYLLABUS

Programme	Course Code	NameoftheCourse	L	T	P	C
M.E.	24CP1201	ADVANCEDDATASTRUCTURES AND ALGORITHMS	3	1	0	4

CourseObjective

- Toextend the students'knowledge ofalgorithms anddatastructures.
- Toenhancetheirexpertiseinalgorithmicanalysisandalgorithmdesign techniques.
- Tounderstandvarioustypesof searchandheapstructures.
- Tostudyvarious types ofgeometric,randomizedandapproximationalgorithms.
- To extrapolate from them in order to apply those algorithmsand techniques tosolveproblems

Unit	Description	InstructionalHours
I	**FUNDAMENTALS** PropertiesofBig-ohNotation–ConditionalAsymptoticNotation–Algorithm Analysis – Amortized Analysis – Introduction to NP-Completeness/NP-Hard – RecurrenceEquations–SolvingRecurrenceEquations–Time-SpaceTradeoff	12
II	**SEARCHSTRUCTURES** Binary Search Trees – AVL Trees – Red-Black trees – Multi-way SearchTrees–B-Trees – Splay Trees– Tries.	12
III	**HEAPSTRUCTURES** Min/Max heaps – Deaps – Leftist Heaps – Binomial Heaps – FibonacciHeaps – Skew Heaps– Lazy BinomialHeaps	12
IV	**GEOMETRICALGORITHMS** Segment Trees –1-Dimensional RangeSearching– k-dTrees –LineSegment Intersection–ComputingtheOverlayofTwoSubdivisions–RangeTrees–VoronoiDiagram	12
V	**ADDITIONALTOPICS** Approximation Algorithms: Vertex Cover & Euclidean Travelling SalespersonProblem– RandomizedAlgorithms:ClosestPairProblem&MinimumSpanning Trees–OnlineAlgorithm:EuclideanSpanningTree	12
	TotalInstructionalHours	60

Course Outcome

CO1:	Analyzealgorithms.
CO2:	Determinealgorithmcorrectness.
CO3:	Chooseappropriatedatastructuresfortheproblemstobesolved.
CO4:	Designalgorithmsforproblemsfromdifferentdomains.
CO5:	Identifyvariousresearchstrategiesonalgorithmicdesign

REFERENCEBOOKS:

R1: EllisHorowitz,SartajSahni,SusanAnderson-Freed,"FundamentalsofDataStructuresinC",SecondEdition, University Press, 2008

R2: GillesBrassard,PaulBratley,"Algorithmics:TheoryandPractice",PrenticeHall,1988.

R3: MarkdeBerg,OtfriedCheong,MarcvanKreveld,MarkOvermars,"Computational GeometryAlgorithmsand Applications", ThirdEdition, Springer, 2008.

R4: R.C.T Lee, S.S Tseng, R.C Chang and Y.T Tsai, "Introduction to the Design and Analysis ofAlgorithms", TataMcGraw-HillEdition, 2012.

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Programme	Course Code	NameoftheCourse	L	T	P	C
M.E.	24CP1202	ADVANCEDDATABASEMANAGEMENTSYSTEM	3	0	0	3

CourseObjective

- TocomprehendtheunderlyingprinciplesofRelationalDatabaseManagementSystem.
- Todevelopdatabasemodelsusingparalleland distributeddatabases.
- TounderstandtheconceptsofXMLandWebdatabases.
- Toapprehendthedesignandimplementation ofactivetemporalanddeductivedatabases.
- Todevelopapplications basedonNoSQLdatabase

Unit	Description	InstructionalHours
I	**RELATIONALMODEL** EntityRelationshipModel–RelationalDataModel–MappingEntityRelationshipModeltoRelationalModel–RelationalAlgebra–Structured Query Language-Database Normalization – Transaction Management-Recovery	9
II	**PARALLELANDDISTRIBUTEDDATABASES** ParallelDatabases–I/OParallelism–Inter-QueryandIntra-QueryParallelism– Inter-Operation and Intra-operation Parallelism – Performanceevaluation forParallelDB Systems–Distributed DatabaseArchitecture-Distributed Data Storage – Distributed Transactions – Distributed QueryProcessing –Distributed Transaction Management – Load balancing tools forDDB–DDBSecurity.	9
III	**XMLANDWEBDATABASES** XMLData Model–DTD –XMLSchema–XMLQuerying– WebDatabases–OpenDatabaseConnectivity-JavaDatabaseConnectivity–Accessing Relational database using PHP – User Driven Querying – WritingtoWeb Databases–Session Management	9
IV	**ACTIVETEMPORALANDDEDUCTIVEDATABASES** Event Condition Action Model – Design and Implementation Issues forActive Databases – Termination, Confluence, Determination andModularization–TemporalDatabases–InterpretingTimeinRelational Databases–DeductiveDatabases –DatalogQueries	9
V	**NoSQLDATABASES** NoSQL database vs traditional RDBMS database – Migrating from RDBMStoNoSQL– CRUD operations– QueryingNoSQL stores– Indexing andOrderingDatasets–MongoDB-DatabasecreationandQuerying–WebApplicationdevelopmentusingMongoDB	9
	TotalInstructionalHours	**45**

Course Outcomes

CO1:	Designandimplementrelationaldatabases
CO2:	Designandimplementparallelanddistributeddatabases.
CO3:	DesignandimplementXMLdatabases,Active,TemporalandDeductivedatabases.
CO4:	Implementtheconceptofdatabaseconnectivitywiththeapplications.
CO5:	Designandimplement NoSQLdatabase.

REFERENCEBOOKS:

R1: R.Elmasri,S.B.Navathe,"FundamentalsofDatabaseSystems",Addison-Wesley,2011.

R2: Han,Jiawei,Jian Pei,andMichelineKamber.Datamining: ConceptsandTechniques.2011.

R3: Thomas Cannolly and Carolyn Begg, "Database Systems, A Practical Approach to Design,Implementation andManagement",ThirdEdition,Pearson Education,2007

R4: Henry F Korth, Abraham Silberschatz, S. Sudharshan, "Database System Concepts", Fifth Edition,McGrawHill, 2006

R5: C. J. Date, A.Kannan and S. Swamynathan, "An Introduction to Database Systems", Eighth Edition,Pearson Education,2006.

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Programme	Course Code	NameoftheCourse	L	T	P	C
M.E.	24CP1203	SOFTWAREARCHITECTURE	3	0	0	3

CourseObjective

- Tounderstandtheneed,designapproachesforsoftwarearchitecturetobridgethe dynamicrequirements andimplementation
- Tolearnthedesignprinciples andtoapplyforlargescalesystems
- Todesignarchitecturesfordistributedheterogeneoussystemsenvironment through brokerageinteraction
- Tobuilddesignknowledgeonserviceorientedandmodeldrivenarchitecturesandtheaspect-oriented architecture.
- Todevelopappropriatearchitecturesforvarious Casestudieslikesemanticwebservices,supply chaincloudservices.

Unit	Description	InstructionalHours
I	**INTRODUCTIONTOSOFTWAREARCHITECTURE** IntroductiontoSoftwareArchitecture-BridgingRequirementsandImplementation,DesignGuidelines,SoftwareQualityattributes.SoftwareArchitecture Design Space. Agile Approach to Software Architecture Design,ModelsforSoftware ArchitectureDescriptionLanguages(ADL).	9
II	**OBJECT-ORIENTEDPARADIGM** Object-OrientedParadigm-DesignPrinciples.Data-CenteredSoftwareArchitecture: Repository Architecture, Blackboard Architecture. HierarchicalArchitectureMain-Subroutine,Master-Slave,Layered,VirtualMachine. Interaction-Oriented Software Architectures: Model-View-Controller (MVC),Presentation-Abstraction-Control(PAC).	9
III	**DISTRIBUTEDARCHITECTURE** Distributed Architecture: Client-Server, Middleware, Multi-tiers, BrokerArchitecture – MOM, CORBA Message Broker Architecture- Service-OrientedArchitecture(SOA),SOAP,UDDI,SOAImplementationinWeb Services,Grid/cloudServiceComputing.HeterogeneousArchitecture-MethodologyofArchitectureDecision,QualityAttributes	9
IV	**ARCHITECTUREOFUSERINTERFACES** ArchitectureofUserInterfacescontainers,casestudy-webservice.ProductLineArchitectures-methodologies,processesandtools.SoftwareReuseandProductLines-ProductLineAnalysis,Designandimplementation,configuration Models. Model Driven Architectures (MDA) –whyMDA-Modeltransformation andsoftware architecture, SOAandMDA.Eclipse modelingframework.	9
V	**ASPECTORIENTEDARCHITECTURES** Aspect Oriented Architectures- AOP in UML, AOP tools, Architectural aspects andmiddleware Selection of Architectures, Evaluation of Architecture Designs, CaseStudy: OnlineComputerVendor,order processing,manufacture&shipping–inventory,supplychaincloud serviceManagement,semanticwebservices	9
	TotalInstructionalHours	**45**

Course Outcome

- CO1: Understandtheneedofsoftwarearchitectureforsustainabledynamic systems
- CO2: Have asoundknowledgeondesignprinciplesandtoapplyforlargescalesystems
- CO3: Designarchitecturesfordistributedheterogeneoussystems
- CO4: Havegoodknowledgeonserviceorientedandmodeldriven architecturesandtheaspect-oriented architecture
- CO5: Haveaworkingknowledgetodevelopappropriatearchitecturesthroughvariouscasestudies.

REFERENCE BOOKS:

R1: Essentials of software Architecture, Ion Gorton, Second Edition, Springer-verlag, 2011

R2: Software Architecture Design Illuminated, Kai Qian, Jones and Bartlett Publishers Canada, 2010

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Programme	Course Code	NameoftheCourse	L	T	P	C
M.E.	24RM1161	RESEARCHMETHODOLOGY	2	1	0	3

CourseObjective

- Identifyanappropriateresearchproblemintheirinterestingdomain.
- UnderstandethicalissuesUnderstandthePreparationofaresearchprojectthesisreport.
- UnderstandthePreparationofaresearchprojectthesisreport
- Understandthelawofpatentandcopyrights.
- UnderstandtheAdequate knowledgeonIPR

Unit	Description	InstructionalHours
I	**RESEARCHPROBLEMFORMULATION** Meaningofresearchproblem-Sourcesofresearchproblem,criteriacharacteristicsofagood researchproblem,errorsinselectingaresearchproblem,scopeandobjectivesofresearchproblem.Approachesof investigation of solutions for research problem, data collection, analysis,interpretation,necessaryinstrumentations	06
II	**LITERATUREREVIEW** Effectiveliteraturestudiesapproaches,analysis,plagiarism,andresearchethics.	06
III	**TECHNICALWRITING/PRESENTATION** Effective technical writing, how to write report, paper, developing a researchproposal,formatofresearch proposal,apresentationandassessmentbyareview committee	06
IV	**INTRODUCTIONTOINTELLECTUALPROPERTYRIGHTS(IPR)** NatureofIntellectualProperty:Patents,Designs,TradeandCopyright.Process of Patenting and Development: technological research, innovation,patenting,development.InternationalScenario:Internationalcooperationon IntellectualProperty.Procedureforgrantsofpatents,PatentingunderPCT.	06
V	**INTELLECTUALPROPERTYRIGHTS(IPR)** Patent Rights: Scope of Patent Rights. Licensing and transfer of technology.Patentinformationanddatabases.GeographicalIndications.NewDevelopments in IPR: Administration of Patent System, IPR of BiologicalSystems,ComputerSoftwareetc.TraditionalknowledgeCaseStudies,IPR andIITs.	06
	TotalInstructionalHours	30

Course Outcome

CO1:	Abilitytoformulateresearchproblem.
CO2:	Abilitytocarryoutresearchanalysis.
CO3:	Abilitytofollowresearchethics.
CO4:	Ability to understand that today's world is controlled by Computer, InformationTechnology,buttomorrowworldwillberuledbyideas,concept,andcreativity.
CO5:	Abilitytounderstand aboutIPRandfilingpatentsinR& D.

REFERENCEBOOKS:

R1: Asimov,"IntroductiontoDesign",PrenticeHall,1962

R2: Halbert,"ResistingIntellectualProperty",Taylor&FrancisLtd,2007

R3: Mayall,"IndustrialDesign",McGrawHill,1992.

R4: Niebel,"ProductDesign",McGrawHill,1974.

R5: RanjitKumar,2ndEdition,"ResearchMethodology:AStepbyStepGuideforbeginners"2010

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ACADEMIC COUNCIL * HINDUSTHAN COLLEGE OF ENGINEERING * Chairman

Programme	Course Code	NameoftheCourse	L	T	P	C
M.E.	24CP1001	ADVANCEDDATASTRUCTURES AND ALGORITHMSLABORATORY	0	0	4	2

CourseObjective

- Tofamiliarizevariousdatastructureimplementations.
- To implement heap and various tree structures like AVL, Red-black, B-Treeandsegmenttrees.
- Tounderstandefficientimplementationoflinesegmentintersection.
- Tounderstandvarioussearchstructures.
- Togetunderstandingofproblemtoprogrammapping.

S.No	DescriptionoftheExperiments
1.	BinarySearch Trees
2.	Min/MaxHeaps
3.	LeftistHeaps
4.	AVLTrees
5.	Red-BlackTrees
6.	B-Trees
7.	SegmentTrees
8.	Linesegmentintersection
	TotalPracticalHours 60

Course Outcome

CO1: Achieveprogrammingskilltoconvert aproblemtoaprogramminglogic.
CO2: Applysuitabledatastructure fortheprobleminhand.
CO3: Implement heap and various tree structures like AVL, Red-black, B-Tree andsegmenttrees.
CO4: Understandtheusageofdatastructuresforgeometricproblems.
CO5: Understandtheimportanceof height balancinginsearchstructures.

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Programme	Course Code	NameoftheCourse	L	T	P	C
M.E.	24CP1002	ADVANCED DATABASE MANAGEMENT SYSTEMLABORATORY	0	0	4	2

CourseObjective

- To explore the features of a Database Management Systems
- Tointerface adatabasewithfrontendtools
- Tounderstandtheinternalsof adatabasesystem

S. No	DescriptionoftheExperiments
1.	Basic SQL
2.	IntermediateSQL
3.	Advanced SQL
4.	ERModeling
5.	DatabaseDesignandNormalization
6.	AccessingDatabasesfromProgramsusingJDBC
7.	BuildingWebApplicationsusingPHP&MySQL
8.	Indexingand Query Processing
9.	QueryEvaluationPlans
10.	ConcurrencyandTransactions
11.	BigDataAnalyticsusingHadoop
	TotalInstructionalHours 60

Course Outcome

CO1: Abilitytouse databasesforbuildingwebapplications

CO2: Gainingknowledgeabouttheinternalsofadatabasesystem

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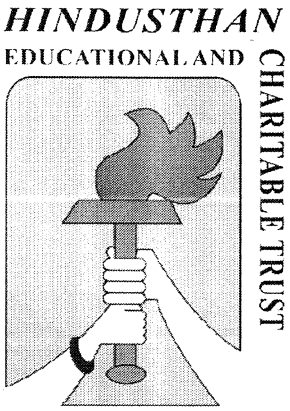
COIMBATORE 641032.

M. E. COMPUTER SCIENCE AND ENGINEERING



CHOICE BASED CREDIT SYSTEM

REGULATION 2020

Revised Curriculum and Syllabus

Academic year 2024-2025

HINDUSTHAN EDUCATIONAL AND CHARITABLE TRUST
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DETAILS OF CHANGES CARRIED OUT IN CURRICULUM & SYLLABUS

CBCS PATTERN

POSTGRADUATE PROGRAMMES

M.E. COMPUTER SCIENCE AND ENGINEERING (PG)

REGULATION 2020

For the students admitted during the academic year 2023-2024 and onwards

SEMESTERI

S. NO.	COURSE CODE	COURSETITLE	CATEGORY	PERIODSPER WEEK			CREDITS	CIA	ESE	TOTAL
				L	T	P				
THEORY										
1.	20MA1103	MathematicalfoundationofCSE	FC	3	1	0	4	40	60	100
2.	20CP1201	AdvanceDataStructures	PCC	3	1	0	4	40	60	100
3.	20CP1202	Advanced Database ManagementSystem	PCC	3	0	0	3	40	60	100
4.	20CP1203	SoftwareArchitecture	PCC	3	0	0	3	40	60	100
5.	20RM1161	ResearchMethodologyandIPR	RMC	2	0	0	2	40	60	100
6.	20AC10XX	AuditCourseI	AC	2	0	0	0	100	0	100
PRACTICALS										
7.	20CP1001	Advance Data StructuresLaboratory	PCC	0	0	4	2	60	40	100
8.	20CP1002	Advanced Database ManagementSystem Laboratory	PCC	0	0	4	2	60	40	100
TOTAL				**16**	**2**	**8**	**20**	**420**	**380**	**800**

SEMESTER II

S. NO.	COURSECODE	COURSETITLE	CATEGORY	PERIODS PERWEEK			CREDITS	CIA	ESE	TOTAL
				L	T	P				
THEORY										

1.	20CP2201	Advancedalgorithms	PCC	3	0	0	3	40	60	100
2.	20CP2202	CloudComputingTechnologies	PCC	3	0	0	3	40	60	100
3.	20CP23XX	ProgramElectiveI	PEC	3	0	0	3	40	60	100
4.	20CP23XX	ProgramElectiveII	PEC	3	0	0	3	40	60	100
5.	20AC20XX	AuditCourseII	AC	2	0	0	0	100	0	100
THEORYWITHLABCOMPONENT										
6.	20CP2251	MachinelearningTechniques	PCC	3	0	2	4	50	50	100
PRACTICALS										
7.	20CP2001	Advanced AlgorithmsLaboratory	PCC	0	0	4	2	60	40	100
8.	20CP2002	Internship/ Mini Project	EEC	0	0	2	1	0	100	100
TOTAL				**17**	**0**	**8**	**19**	**370**	**430**	**800**

AUDITCOURSESSEMESTER–I

S.No	CourseCode	CourseName	L	T	P	C
1	20AC1091	EnglishforResearchPaperwriting	2	0	0	0
2	20AC1092	DisasterManagement	2	0	0	0
3	20AC1093	SanskritforTechnicalknowledge	2	0	0	0
4	20AC1094	PedagogyStudies	2	0	0	0
5	20AC1095	ConstitutionofIndia	2	0	0	0

AUDITCOURSESSEMESTER– II

S.No	CourseCode	CourseName	L	T	P	C
1	20AC2091	ValueEducation	2	0	0	0
2	20AC2092	StressManagement byYoga	2	0	0	0
3	20AC2093	Personality Development Through LifeEnlightenment Skills	2	0	0	0
4	20AC2094	UnnatBharat Abhiyan	2	0	0	0

LIST OF PROFESSIONAL ELECTIVES

PROFESSIONALELECTIVE -I										
S.No.	**Course Code**	**Course Title**		**L**	**T**	**P**	**C**	**CIA**	**ESE**	**TOTAL**
1.	20CP2301	Agent Based IntelligentSystems	PEC	3	0	0	3	40	60	100
2.	20CP2302	MulticoreArchitecture	PEC	3	0	0	3	40	60	100

3.	20CP2303	Software DesignPatterns	PEC	3	0	0	3	40	60	100
PROFESSIONALELECTIVE -II										
4.	20CP2304	CompilerOptimization Techniques	PEC	3	0	0	3	40	60	100
5.	20CP2305	DistributedOperatingSystems	PEC	3	0	0	3	40	60	100
6.	20CP2306	Software Process andProjectManagement	PEC	3	0	0	3	40	60	100

SEMESTERIII

S. NO.	COURSECODE	COURSETITLE	CATEGORY	PERIODS PERWEEK			CREDITS	CIA	ESE	TOTAL
				L	T	P				
THEORY										
1.	20CP33XX	ProgramElectiveIII/ NPTEL	PEC	3	0	0	3	40	60	100
2.	20CP33XX	ProgramElectiveIV	PEC	3	0	0	3	40	60	100
3.	20CP33XX	Program ElectiveV	PEC	3	0	0	3	40	60	100
4.	20XX3401	OpenElective	OEC	3	0	0	3	40	60	100
PRACTICALS										
5.	20CP3901	ProjectPhase I	EEC	0	0	14	7	50	50	100
TOTAL				**12**	**0**	**14**	**19**	**210**	**290**	**500**

SEMESTERIV

S. NO.	COURSE CODE	COURSETITLE	CATEGORY	PERIODS PERWEEK			CREDITS	CIA	ESE	TOTAL
				L	T	P				
PRACTICALS										
1.	20CP4901	ProjectPhaseII	EEC	0	0	24	12	100	100	200
TOTAL				**0**	**0**	**24**	**12**	**100**	**100**	**200**

LIST OF PROFESSIONAL ELECTIVES

ProfessionalElective -III										
7.	20CP3301	BigDataComputing	PEC	3	0	0	3	40	60	100
8.	20CP3302	Image Processing andAnalysis	PEC	3	0	0	3	40	60	100
9.	20CP3303	Data MiningTechniques	PEC	3	0	0	3	40	60	100
ProfessionalElective-IV										
9.	20CP3304	Deep LearningTechniques	PEC	3	0	0	3	40	60	100
10.	20CP3305	Soft ComputingTechniques	PEC	3	0	0	3	40	60	100
ProfessionalElective -V										
11.	20CP3306	LinguisticComputing	PEC	3	0	0	3	40	60	100
12.	20CP3307	AdvancedCryptography Techniques	PEC	3	0	0	3	40	60	100

OPENELECTIVECOURSES(OEC)

***(outof 2courses one coursemustbe selected)**

S. NO.	COURSEC ODE	COURSETITLE	CATEGORY	PERIODS PERWEEK			CREDITS	CIA	ESE	TOTAL
				L	T	P				
1.	20CP3401	Data Science forEngineers(NPTEL)	OEC	3	0	0	3	40	60	100
2.	20CP3402	CyberSecurity	OEC	3	0	0	3	40	60	100

CREDIT DISTRIBUTION

R-2020

Semester	I	II	III	IV	TOTAL
CREDITS	20	19	19	12	70

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SYLLABUS

Programme	Course Code	NameoftheCourse	L	T	P	C
M.E.	20CP3301	BIGDATACOMPUTING	3	0	0	3

CourseObjective

1. IntroduceBigDataandHadoop
2. IntroduceBigDataPlatform
3. IntroduceBigdatastreamingplatformforfastData
4. ToLearnabout Machinelearning
5. TounderstandtheApplicationofBigData.

Unit	Description	Instructional Hours
I	**INTRODUCTIONTOBIGDATA** IntroductiontoBigData-BigDataenablingTechnologies-HadoopStackforBig Data-HadoopDistributedFileSystem-HadoopMapReduce1.0-HadoopMapReduce2.0-MapReduceexamples.	9
II	**BIG DATAPLATFORM** ParallelProgrammingwithspark-IntroductiontoSpark-SparkBuilt-inLibraries-Design of Key Value stores-Data placement Strategies-CAP Theorem-ConsistencySolutions-Designof Zookeeper-CQL(CassandraQueryLanguage)	9
III	**BIGDATASTREAMINGPLATFORMSFORFASTDATA** Introduction to Big Data Streaming Platforms for Fast Data-Introduction to Big DataStreaming Systems-Big Data Pipelines for Real-Time computing -Design of HBase-SparkStreamingandSlidingWindowAnalytics-Sliding WindowAnalytics-IntroductiontoKafka.	9
IV	**MACHINELEARNING** BigDataMachineLearning-MachineLearningAlgorithmK-MeansUsingMapReduce for Big Data Analytics -Parallel K-Means Using Map Reduce On Big DataClusterAnalysis-DecisionTreesfor BigDataAnalytics-BigDataPredictive Analytics .	9
V	**BIGDATAAPPLICATIONS** IntroductiontoBigDataApplications(GraphProcessing-IntroductiontoPregel-Parameter Servers-PageRank Algorithm in Big Data-Spark GraphX & GraphAnalytics-CaseStudy: Flight DataAnalysisUsingSparkGraphX	9
	TotalInstructionalHours	**45**

Course Outcome

CO1:	UnderstandtheBigDataandHadoop
CO2:	UnderstandtheBigDataPlatform
CO3:	UnderstandtheBigdatastreamingplatformfor fastData
CO4:	ExploretheMachinelearning
CO5:	IllustrateVariousBigDataapplications

TEXTBOOK:

T1: BartBaesens,AnalyticsinaBigDataWorld:TheEssentialGuidetoDataScienceanditsApplications,Wiley, 2014

REFERENCEBOOKS:

R1: https://nptel.ac.in/courses/106/104/106104189/

R2: DirkDeroosetal.,HadoopforDummies,Dreamtech Press,2014.

R3: ChuckLam,HadoopinAction,December,2010.

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Programme	Course Code	NameoftheCourse	L	T	P	C
M.E.	20CP3302	IMAGEPROCESSINGANDANALYSIS	3	0	0	3

CourseObjective

1. Describeandexplainbasicprinciplesofdigitalimageprocessing.
2. Designandimplementalgorithmsthat performbasicimageprocessing(e.g.noiseremovalandimageenhancement).
3. Design and implement algorithms for advanced imageanalysis(e.g.imagecompression,imagesegmentation).
4. Assesstheperformanceofimageprocessingalgorithms andsystems
5. Assessimageprocessingalgorithmsinpracticalapplications.

Unit	Description	Instructional Hours
I	**IMAGEPROCESSINGFUNDAMENTALS** Introduction–Elementsofvisualperception,StepsinImageProcessingSystems–DigitalImagingSystem-ImageAcquisition–SamplingandQuantization–Pixel Relationships – File Formats – colour images and models - Image Operations – Arithmetic,logical, statistical and spatial operations.	9
II	**IMAGEENHANCEMENTANDRESTORATION** ImageTransforms-Discreteand FastFourierTransform and Discrete CosineTransform ,Spatial Domain -Gray level Transformations Histogram ProcessingSpatial Filtering – SmoothingandSharpening.FrequencyDomain: Filteringin FrequencyDomain–SmoothingandSharpeningfilters–HomomorphicFiltering.,Noisemodels,Constrainedand Unconstrainedrestorationmodels.	9
III	**IMAGESEGMENTATIONANDMORPHOLOGY** DetectionofDiscontinuities–EdgeOperators–EdgeLinkingandBoundaryDetection–Thresholding–RegionBasedSegmentation–MotionSegmentation,ImageMorphology:BinaryandGraylevelmorphologyoperations-Erosion,Dilation, Opening and Closing Operations Distance Transforms- Basicmorphological Algorithms. Features – Textures - Boundary representations andDescriptions-ComponentLabeling–RegionaldescriptorsandFeatureSelection Techniques.	9
IV	**IMAGEANALYSISANDCLASSIFICATION** Image segmentation- pixel based, edge based, region based segmentation. ActivecontourmodelsandLevelsetsformedicalimagesegmentation,Imagerepresentationandanalysis,Featureextractionandrepresentation,Statistical,Shape, Texture,featureandstatisticalimageclassification	9
V	**IMAGEREGISTRATIONANDVISUALIZATION** Rigid body visualization, Principal axis registration, Interactive principal axisregistration, Feature based registration, Elastic deformation based registration,Image visualization – 2D display methods, 3D display methods, virtual realitybasedinteractive visualization	9
	TotalInstructionalHours	**45**

CourseOutcome

CO1: Analyzegeneralterminologyofdigitalimageprocessing.

CO2: Examinevarioustypesofimages,intensitytransformationsandspatialfiltering.

CO3: Develop Fourier transform for image processing in frequency domain.
CO4: Evaluate the methodologies for image segmentation, restoration etc.
CO5: Implement image process and analysis algorithms.

REFERENCEBOOKS:

R1: AlasdairMcAndrew,—IntroductiontoDigitalImageProcessingwithMatlab‖,CengageLearning2011,India

R2: AnilJJain,—FundamentalsofDigitalImageProcessing‖,PHI,2006

R3: Kavyan Najarian and Robert Splerstor,Biomedical signals and Image processing‖,CRC – Taylor and Francis,NewYork, 2006

R4: Rafael C.Gonzalez and Richard E.Woods, —Digital Image Processing‖, Third Edition, Pearson Education,2008,NewDelhi

R5: S.Sridhar,—DigitalImageProcessing‖,OxfordUniversityPress,2011

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Programme	Course Code	NameoftheCourse	L	T	P	C
M.E.	20CP3303	DATAMININGTECHNIQUES	3	0	0	3

CourseObjective

1. Tounderstanddataminingprinciplesandtechniquesand IntroduceDMasacutting edgebusinessintelligence.
2. Toexposethestudentstotheconceptsofdatawarehousingarchitectureandimplementation.
3. To learn various Data Mining techniques such asclassification,clustering&Associationrulemining
4. Tostudytheoverviewofdevelopingareas– webmining,textminingandethicalaspects ofdata mining.
5. Toidentifybusinessapplicationsandtrendsofdatamining.

Unit	Description	Instructional Hours
I	**INTRODUCTIONTODATAWAREHOUSING** EvolutionofDecisionSupportSystems-DatawarehousingComponents–Building aDatawarehouse,DataWarehouse andDBMS,Datamarts,Metadata, Multidimensional data model, OLAP vs OLTP, OLAP operations,Datacubes,SchemasforMultidimensionalDatabase:Stars,Snowflakesand Factconstellations	9
II	**DATAWAREHOUSEPROCESSANDARCHITECTURE** Types of OLAP servers, 3–Tier data warehouse architecture, distributed andvirtualdatawarehouses.Datawarehouseimplementation,tuningandtestingofdatawarehouse.DataStaging(ETL)DesignandDevelopment,datawarehousevisualization,DataWarehouseDeployment,Maintenance, Growth, Business Intelligence Overview- Data Warehousing and BusinessIntelligenceTrends-Business Applications-tools-SAS	9
III	**INTRODUCTIONTODATAMINING** Data mining-KDD versus data mining, Stages of the Data Mining Process-task primitives, Data Mining Techniques -Data mining knowledgerepresentation– Dataminingquerylanguages,IntegrationofaDataMiningSystemwithaDataWarehouse–Issues,Datapreprocessing–Datacleaning,Datatransformation,Feature selection,Dimensionalityreduction, Discretizationandgeneratingconcepthierarchies-Miningfrequentpatterns-association-correlation	9
IV	**CLASSIFICATIONANDCLUSTERING** Decision Tree Induction - Bayesian Classification – Rule BasedClassification–ClassificationbyBackpropagation– SupportVectorMachines–AssociativeClassification–Lazy Learners–OtherClassificationMethods–Ciusteringtechniques–Partitioning methods- k-means-Hierarchical Methods – distance based agglomerative and divisible clustering,Density-BasedMethods–expectationmaximization -GridBasedMethods – Model-BasedClusteringMethods–Constraint–BasedClusterAnalysis–OutlierAnalysis	9
V	**PREDICTIVEMODELINGOFBIGDATAANDTRENDSINDATAMINING** Statistics and Data Analysis – EDA – Small and Big Data –LogisticRegressionModel-OrdinaryRegressionModel-Miningcomplexdataobjects –Spatialdatabases–Temporaldatabases–Multimediadatabases–Time seriesandsequencedata –Textmining–Webmining–ApplicationsinDatamining	9

	TotalInstructionalHours	**45**

CourseOutcome	CO1:	Evolvemultidimensionalintelligentmodelfromtypicalsystem.
	CO2:	Discover the knowledge imbibed in the high dimensional system and gainknowledgeon datawarehouse process.
	CO3:	Acquireknowledgeofdataprocessinganddataquality.
	CO4:	Designanddeployclassificationandclusteringtechniques.
	CO5:	Evaluatevariousminingtechniquesoncomplexdataobjects.

REFERENCEBOOKS:

R1: Jiawei Han, Micheline Kamber, "Data Mining: Concepts and Techniques", Morgan Kaufmann, Thirdedition,2011.

R2: AlexBerson,StephenJ.Smith,"DataWarehousing,DataMining&OLAP",TataMcGrawHill,Tenth Reprint,2007.

R3: G. K. Gupta, "Introduction to Data Mining with Case Studies", Eastern Economy Edition, PrenticeHall of India, Third Edition, 2014.

R4: Ian.H.Witten, Eibe Frank and Mark.A.Hall, "Data Mining: Practical MachineLearningToolsandTechniques",MorganKaufmann,Thirdedition,2011

R5: BruceRatner,"StatisticalandMachine-LearningDataMining:Techniquesfor BetterPredictiveModelingandAnalysisofBigData",CRCPress,SecondEdition,2012

R6: Mehmed kantardzic, "Data mining: Concepts, Models, Methods, and Algorithms", Wiley-Blackwell,Second Edition,2011.

R7: Ian Witten, Eibe Frank, "Data Mining: Practical Machine Learning Tools and Techniques",ThirdEdition,Morgan Kaufmann,2011.

R8: George M Marakas, "Modern Data Warehousing, Mining and Visualization: Core Concepts",PrenticeHall,2002.

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Programme	Course Code	NameoftheCourse	L	T	P	C
M.E.	20CP3304	DEEPLEARNINGTECHNIQUES	3	0	0	3

CourseObjective

1. 1.TounderstandthebasicideasandprinciplesofNeuralNetworks
2. TounderstandthebasicconceptsofBigDataandStatisticalDataAnalysis
3. TofamiliarizethestudentwithTheImageProcessingfacilitieslikeTensorflowandKeras
4. ToappreciatetheuseofDeepLearningApplications
5. TounderstandandimplementDeepLearningArchitectures

Unit	Description	Instructional Hours
I	**BASICSOFNEURALNETWORKS** BasicconceptofNeurons–PerceptronAlgorithm–FeedForwardandBackPropagationNetworks. **Suggested Activities:** Discussion of role of Neural Networks, External learning –Boltzmann Machine and Perceptron, Practical – Installation of Tensor Flow andKeras. **Suggested Evaluation Methods:** Tutorial – Perceptron,Assignment problems onbackpropagationnetworks,Quizzes onNeuralNetworks.	9
II	**INTRODUCTIONTODEEPLEARNING** Feed Forward Neural Networks – Gradient Descent – Back Propagation Algorithm – Vanishing Gradient problem – Mitigation – RelU Heuristics for Avoiding Bad LocalMinima – Heuristics for Faster Training – Nestors Accelerated Gradient Descent –Regularization– Dropout. **SuggestedActivities:** DiscussionofroleofGradientDescentinDeepLearning,Externallearning– Featureextractionandfeaturelearning,SurveyofDeepLearningDevelopmentFrameworks,DiscussionofGradientDescentProblem. **SuggestedEvaluationMethods** Tutorial – Gradient descent in deep learning, Assignment problems in optimization.Quizzes on deeplearningregularizationandoptimization.	9
III	**CONVOLUTIONALNEURALNETWORKS** CNN Architectures – Convolution – Pooling Layers – Transfer Learning – ImageClassificationusing TransferLearning **SuggestedActivities:** DiscussionofroleofConvolutionalNetworksinMachineLearning,Externallearning– Conceptofconvolutionand needfor Pooling. **SuggestedEvaluationMethods:**Tutorial– Imageclassificationandrecurrentnets,Assignmentproblemsinimageclassificationperformances, QuizzesonConvolutionalNeuralNetworks.	9
IV	**MOREDEEPLEARNINGARCHITECTURES** LSTM, GRU, Encoder/Decoder Architectures – Autoencoders – Standard-Sparse–Denoising–Contractive-VariationalAutoencoders–Adversarial	9

GenerativeNetworks–AutoencoderandDBM

Suggested Activities: Discussion of role of Deep Learning architectures,Externallearning– Compression offeatures usingAutoencoders.

SuggestedEvaluationMethods: Tutorial–LSTMandAutoencoders,Assignment problemsindeepgenerativemodels,DeepBeliefNetworks,Quizzesondeeplearningarchitectures.

APPLICATIONSOFDEEPLEARNING

V	Image Segmentation – Object Detection – Automatic Image Captioning – ImagegenerationwithGenerativeAdversarialNetworks–VideotoTextwithLSTMModels– AttentionModelsforComputerVision–CaseStudy:NamedEntityRecognition – Opinion Mining using Recurrent Neural Networks– Parsing andSentimentAnalysisusingRecursiveNeuralNetworks– SentenceClassificationusingConvolutional NeuralNetworks – DialogueGenerationwithLSTMs.	9

SuggestedActivities:

DiscussionofroleofDeepLearninginImageandNLPapplications,Externallearning– NLPconcepts.

SuggestedEvaluationMethods:

Tutorial–Imagesegmentation,Assignmentproblemsinparsingandsentimentanalysis,Quizzeson deeplearning architectures.

TotalInstructionalHours **45**

Course Outcome

CO1: UnderstandtheroleofDeeplearninginMachineLearningApplications.

CO2: TogetfamiliarwiththeuseofTensorFlow/KerasinDeepLearningApplications.

CO3: TodesignandimplementDeepLearningApplications.

CO4: CriticallyAnalyseDifferent DeepLearningModelsinImageRelatedProjects.

CO5: TodesignandimplementConvolutional NeuralNetworks,ToknowaboutapplicationsofDeep LearninginNLPandImageProcessing.

REFERENCEBOOKS:

R1: IanGoodFellow,YoshuaBengio,Aaron Courville,"Deep Learning",MIT Press,2017.R2: FrancoisChollet,"DeepLearning withPython",ManningPublications, 2018.

R3: PhilKim,"MatlabDeepLearning:WithMachineLearning,NeuralNetworksandArtificialIntelligence", Apress ,2017.

R4: RagavVenkatesan,BaoxinLi,"ConvolutionalNeuralNetworksinVisualComputing",CRCPress,2018.

R5: NavinKumarManaswi,"DeepLearningwithApplicationsUsingPython",Apress,2018

R6: JoshuaF.Wiley,"RDeepLearningEssentials",PacktPublications,2016.

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Programme	Course Code	NameoftheCourse	L	T	P	C
M.E.	20CP3305	SOFTCOMPUTINGTECHNIQUES	3	0	0	3

CourseObjective

1. Tolearnthekeyaspects ofSoft computingandNeuralnetworks.
2. Tostudythefuzzylogiccomponents.
3. Togaininsight ontoneurofuzzymodelingandcontrol.
4. Toknowaboutthecomponentsandbuildingblockhypothesisofgeneticalgorithm.
5. Togainknowledgeinmachinelearningthroughneuralnetworks

Unit	Description	Instructional Hours
I	**INTRODUCTIONTOSOFTCOMPUTING** Evolution of Computing – Soft Computing Constituents – From Conventional AI toComputational Intelligence –MachineLearning Basics	9
II	**GENETICALGORITHMS** IntroductiontoGeneticAlgorithms(GA)–ApplicationsofGA–Building Block Hypothesis- Representation– Fitness Measures – Genetic Operators-.GAbasedMachine Learning	9
III	**NEURALNETWORKS** MachineLearningusingNeuralNetwork.AdaptiveNetworks–FeedForward Networks – Supervised Learning Neural Networks – Radial BasisFunctionNetworks– ReinforcementLearning–UnsupervisedLearning Neural Networks – Adaptive Resonance Architectures – Advances in NeuralNetworks	9
IV	**FUZZYLOGIC** FuzzySets–OperationsonFuzzySets–FuzzyRelations –Membership Functions-Fuzzy Rules and Fuzzy Reasoning – Fuzzy Inference Systems – FuzzyExpertSystems– Fuzzy DecisionMaking.	9
V	**NEURO-FUZZYMODELING** AdaptiveNeuro-FuzzyInferenceSystems–CoactiveNeuro-FuzzyModeling – Classification and Regression Trees – Data Clustering Algorithms – RulebasedStructure Identification –Neuro-FuzzyControl–CaseStudies.	9
	TotalInstructionalHours	**45**

Course Outcome

CO1:	DifferentiateConventionalAIandComputationalIntelligence.
CO2:	Discussonmachinelearningthroughneuralnetworks.
CO3:	Applyknowledgeindeveloping aFuzzyexpertsystem.
CO4:	Model NeuroFuzzysystemforclusteringandclassification.
CO5:	DiscoverknowledgetodevelopGeneticAlgorithmandSupportvectormachinebasedmachinelearning system

REFERENCEBOOKS:

R1: Jyh-Shing Roger Jang, Chuen-Tsai Sun, EijiMizutani, "Neuro-Fuzzy and Soft Computing", Prentice-Hall of India, 2002.

R2: KwangH.Lee,"FirstcourseonFuzzyTheoryandApplications",Springer,2005.

R3: George J. Klir and Bo Yuan, "Fuzzy Sets and Fuzzy Logic-Theory and Applications", Prentice Hall,1996.

R4: James A. Freeman and David M. Skapura, "Neural Networks Algorithms, Applications, andProgrammingTechniques",AddisonWesley,2003.

R5: David E.Goldberg, "Genetic Algorithms in Search, Optimization and Machine Learning", AddisonWesley, 1989.

R6: MitchellMelanie,"AnIntroductiontoGeneticAlgorithm",MITPress,1996

R7: S.N.Sivanandam,S.N.Deepa,"IntroductiontoGeneticAlgorithms",Springer,2008edition

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Programme	Course Code	NameoftheCourse	L	T	P	C
M.E.	20CP3306	LINGUISTICCOMPUTING	3	0	0	3

CourseObjective

1. Tolearnthefundamentalsofnaturallanguageprocessing
2. To appreciate the use of CFG and PCFG in NLP3.Tounderstandtheroleofsemanticsandpragmatics
4. ToUnderstandingsemanticsandpragmaticsofEnglishlanguageforprocessing
5. ToWritingprogramsinPythontocarryoutnaturalLanguageprocessing

Unit	Description	Instructional Hours
I	**INTRODUCTION** Words-RegularExpressionsandAutomata-WordsandTransducers-N-grams - Part-ofSpeech –Tagging-HiddenMarkovandMaximum EntropyModels.	9
II	**SPEECH** Speech–Phonetics -SpeechSynthesis -AutomaticSpeechRecognition–Speech Recognition:-AdvancedTopics-ComputationalPhonology	9
III	**SYNTAX** FormalGrammarsofEnglish-SyntacticParsing-StatisticalParsing-Features andUnification-LanguageandComplexity.	9
IV	**SEMANTICSANDPRAGMATICS** The Representation of Meaning - Computational Semantics - LexicalSemantics-ComputationalLexicalSemantics-ComputationalDiscourse	9
V	**APPLICATIONS** Information Extraction - Question Answering and Summarization - DialogueandConversationalAgents-Machine Translation	9
	TotalInstructionalHours	**45**

Course Outcome

CO1: Totagagiventext withbasicLanguagefeatures
CO2: Todesignaninnovativeapplicationusing NLPcomponents
CO3: Toimplementarulebasedsystemtotacklemorphology/syntaxofalanguage
CO4: Todesignatagsettobeusedforstatisticalprocessingfor real-timeapplications
CO5: Tocompareandcontrastuseofdifferentstatisticalapproachesfordifferenttypesof NLPapplications

TEXT BOOKS

T1: DanielJurafsky,—SpeechandLanguageProcessing:AnIntroductiontoNaturalLanguageProcessing, ComputationalLinguisticsandSpeechl, PearsonPublication,2014.

T2: StevenBird,EwanKleinandEdwardLoper,—NaturalLanguageProcessingwithPythonl,FirstEdition,O' ReillyMedia,2009

REFERENCEBOOKS:

R1: BreckBaldwin,—LanguageProcessingwithJavaandLingPipeCookbookl,AtlanticPublisher,2015.

R2: RichardMReese, —NaturalLanguageProcessingwithJaval,O'ReillyMedia, 2015.

R3: NitinIndurkhyaandFredJ.Damerau,—HandbookofNaturalLanguageProcessingl,SecondEdition, Chapmanand Hall/CRCPress,2010

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Programme	Course Code	NameoftheCourse	L	T	P	C
M.E.	20CP3307	ADVANCEDCRYPTOGRAPHYTECHNIQUES	3	0	0	3

CourseObjective

1.To understand the mathematical foundations of security principles.
2.Toappreciatethedifferentaspectsofencryptiontechniques.
3. To understand various attacks present over encryption and authenticationstechniques.
4. To understand the role played by authentication insecurity.
5. Toappreciatethecurrenttrends ofsecuritypractices.

Unit	Description	Instructional Hours
I	**CLASSICALENCRYPTIONANDBLOCKCIPHERS** ClassicalEncryption–SubstitutionCipher–One-time-padEncryption–Block Ciphers–DES–KeyRecoveryAttacksonBlockCiphers–Iterated-DESandDESX– AES– LimitationsofKey-recoverybasedSecurity	9
II	**PSEUDORANDOMFUNCTIONSANDSYMMETRICENCRYPTION** RandomFunctions–Permutations–PseudoFunctions–Pseudo-randomPermutations – Modelling Blockciphers – Security Against Key Recovery –TheBirthdayAttack– Symmetric EncryptionSchemes–ChosenPlaintext Attacks – Semantic Security – Security of CTR and CBC-Chosen CiphertextAttack.	9
III	**HASHFUNCTIONSANDMESSAGEAUTHENTICATION** HashFunction SHA1– Collision resistantHashFunctions– CollisionFindingAttacks– OnewaynessofCollisionresistantHashFunctions–MDTransform – Syntax for message Authentication – PRF as a MAC Paradigm –CBCMAC–Universal-hashingApproach– AuthenticatedEncryption.	9
IV	**NUMBERTHEORYANDASYMMETRICENCRYPTION** Computational Number Theory – Number Theoretic Primitives – Diffie HellmanProblem – Asymmetric Encryption Schemes – Hybrid Encryption – ElGamalSchemeanditsVariants –HomomorphicEncryption–DigitalSignatures	9
V	**SECURITYPRACTICESANDADVANCEDTOPICS** ElectronicMailSecurity–IPSecurity–DigitalCash–Schnorr'sIdentification Protocol and Signature – Blind Signature – Distributed Ledgerand Bitcoin — Secret Sharing – Shamir Threshold Scheme – Security inRouting –Mixnet	9
	TotalInstructionalHours	**45**

Course Outcome

CO1:	Demonstrate the various classical encryption techniques and the adversarycapabilities.
CO2:	Applycomputationalsecrecyandsemanticsecuritytofindouttheprobabilityofhowstrongarethe securityschemes.
CO3:	IllustratethevariousMACand HASHfunctions andapplythe BirthdayattackoverHash.
CO4:	Applynumbertheoryinpublickeyencryptiontechniques.
CO5:	Analyzetheapplicationofcryptographyforsecure E-Commerce andothersecrettransactions.

REFERENCEBOOKS:

R1: MihirBellareandPhillipRogaway,"IntroductiontoModernCryptography",2005.

R2: Jonathan Katz and Yehuda Lindell, "Introduction to Modern Cryptography ",Chapman andHall/CRCPress Second Edition,2015.

R3: Hans Delfts and Helmut Knebl, "Introduction to Cryptography – Principles andApplications", Springer, Third Editionby,2015.

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Programme	Course Code	NameoftheCourse	L	T	P	C
M.E.	20CP3401	DATASCIENCEFORENGINEERS	3	0	0	3

CourseObjective

1. IntroduceRasaprogramminglanguage
2. Introducethemathematicalfoundationsrequiredfordatascience
3. Introducethefirstleveldatasciencealgorithms
4. Introduceadataanalyticsproblemsolvingframework
5. Introduceapracticalcapstonecasestudy

Unit	Description	Instructional Hours
I	**INTRODUCTIONTO R** IntroductiontoR–VariablesandDatatypesinR-DataFrames-Recastingandjoining of data frames-Arithmetic, Logical and Matrix operations in R-advancedprogramminginR:Functions-Control structures-Datavisualizationin Rbasic graphics.	9
II	**LINEARALGEBRAANDSTATISTICS** SolvingLinearEquations-LinearAlgebra-Distances,HyperplanesandHalfspace,Eigenvalues,Eigenvectors-StatisticalModeling-Randomvariablesandprobability Mass/Densityfunctions-SampleStatistics-hypothesesTesting	9
III	**OPTIMIZATION** Optimization forDatascience-UnconstrainedMultivariateOptimization-GradientDescent(LearningRule)-MultivariateOptimizationwithEqualityconstraints-MultivariateOptimizationwithInequalityconstraints-IntroductiontoDatascience-SolvingDataAnalysisproblems–AGuidedThoughtprocess-	9
IV	**REGRESSION** Module: Predictive Modeling-Linear Regression-Model Assessment-Diagnostics toImprove linear model Fit-Simple Linear Regression Model building- Simple LinearRegressionModel Assessment-MultipleLinear Regression-assessingimportanceof differentvariables-subset selection	9
V	**CLASSIFICATIONANDCLUSTERING** CrossValidation-MultipleLinearRegressionmodelingBuildingandselection-Classification-LogisticRegression–PerformanceMeasures-LogisticRegressionimplementationinR-K-Nearest Neighbors-K-NearestNeighborsimplementationin R-K-meansClustering-K-MeansimplementationinR	9
	TotalInstructionalHours	**45**

Course Outcome

CO1:	Describeaflowprocessfordatascience problems
CO2:	Classifydatascienceproblemsintostandardtypology
CO3:	DevelopRcodesfor datasciencesolutions
CO4:	Correlateresultstothesolutionapproachfollowed
CO5:	Assessthesolutionapproach

REFERENCEBOOKS:

R1: Https://Nptel.Ac.In/Courses/106/106/106106179/

R2: IntroductionToLinearAlgebra-ByGilbertStrang.

R3: AppliedStatisticsAndProbabilityForEngineers–ByDouglasMontgomery

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