**B.Sc.ComputerSciencewithDataAnalytics**

Syllabus

 AFFILIATEDCOLLEGES

**ProgramCode:\*\*\***

**2020–2021onwards**

**BHARATHIARUNIVERSITY**

**(A State University, Accredited with “A” Grade by NAAC,Ranked13thamongIndianUniversitiesby MHRD-NIRF,**

**WorldRanking:Times-801-1000,Shanghai-901-1000,URAP-982)**

**Coimbatore-641046,TamilNadu, India**



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| **ProgrammeEducationalObjectives(PEOs)** |
| **The B.Sc. Computer Science with Data Analytics** program describe accomplishments thatgraduates are expectedto attainwithin fiveto sevenyears after graduation. |
| **PEO1** | Develop in depth understanding of the key technologies in data science andbusiness analytics: data mining, machine learning, visualization techniques,predictivemodeling, andstatistics |
| **PEO2** | ApplyprinciplesofDataSciencetotheanalysis of businessproblem |
| **PEO3** | Demonstrate knowledge of statistical data analysis techniques utilized inbusinessdecision making.. |



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| **ProgrammeSpecificOutcomes(PSOs)** |
| **Afterthesuccessfulcompletion ofB.Sc.ComputerSciencewithDataAnalytics**programthestudents areexpectedto |
| **PSO1** | Imparteducationwithdomainknowledgeeffectivelyandefficientlyinparwiththeexpectedqualitystandardsfor Dataanalyst professional. |
| **PSO2** | Abilitytoapplythemathematical,technicalandcriticalthinkingskillsinthedisciplineofData analyticsto findsolutions forcomplexproblems. |
| **PSO3** | Abilitytoengageinlife-longlearningandadoptfastchangingtechnologytoprepareforprofessional development. |
| **PSO4** | Expose the students tokey technologies in data science and businessanalytics:data mining, machine learning, visualization techniques, predictive modeling, andstatistics. |
| **PSO5** | Inculcateeffectivecommunicationskillscombinedwithprofessional&ethicalattitude. |



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| **ProgrammeOutcomes(POs)** |
| **On successfulcompletion ofthe B.Sc.ComputerSciencewithDataAnalytics** |
| **PO1** | Exhibitgood **domain knowledge** and completes the assigned responsibilitieseffectivelyand efficientlyin par withtheexpected qualitystandards. |
| **PO2** | Apply**analytical andcriticalthinking**toidentify,formulate,analyze,andsolvecomplex problemsinordertoreachauthenticatedconclusions |
| **PO3** | **Designanddevelopresearchbasedsolutions**forcomplexproblemswithspecifiedneedsthroughappropriateconsiderationforthepublichealth,safety,cultural,societal,andenvironmentalconcerns. |
| **PO4** | Establishtheabilityto**Listen,read,proficientlycommunicateandarticulate****complexideas** withrespecttotheneedsandabilitiesofdiverse audiences. |
| **PO5** | **Deliverinnovativeideastoinstigatenew businessventures**andpossessthequalitiesofa goodentrepreneur |
| **PO6** | Acquirethequalitiesofa**goodleaderandengagein efficientdecisionmaking.** |
| **PO7** | Graduateswillbeabletoundertakeanyresponsibilityasan**individual/memberof****multidisciplinaryteamsandhaveanunderstandingofteamleadership** |
| **PO8** | Functionass**ociallyresponsibleindividual**withethicalvaluesandaccountabletoethicallyvalidateanyactionsordecisionsbeforeproceedingandactivelycontributetothesocietalconcerns. |
| **PO9** | Identifyand**addressowneducationalneedsi**nachangingworldinwayssufficienttomaintainthecompetenceandtoallowthemtocontributetotheadvancementofknowledge |
| **PO10** | **Demonstrateknowledgeandunderstandingofmanagementprinciplesa**ndapplythesetoone ownwork tomanageprojectsand inmultidisciplinaryenvironment. |



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| **Course****Code** | **TitleoftheCourse** | **Credits** | **Hours** | **Maximummarks** |
|  |  |  | **Theory** | **Practical** | **CIA** | **ESE** | **Total** |
| **FIRSTSEMESTER** |
|  | Language–I | 4 | 6 |  | 25 | 75 | 100 |
|  | English–I | 4 | 6 |  | 25 | 75 | 100 |
|  | Core1:ProgramminginC | 4 | 4 |  | 25 | 75 | 100 |
|  | CoreLab1:ProgrammingLab–C | 4 |  | 3 | 40 | 60 | 100 |
|  | Core2:Datastructures | 4 | 4 |  | 25 | 75 | 100 |
|  | Allied1:IntroductiontoLinearalgebra | 4 | 5 |  | 25 | 75 | 100 |
|  | EnvironmentalStudies# | 2 | 2 |  |  | 50 | 50 |
|  | **Total** | **26** | **27** | **3** | **165** | **485** | **650** |
| **SECONDSEMESTER** |
|  | Language–II | 4 | 6 |  | 25 | 75 | 100 |
|  | English– II | 4 | 6 |  | 25 | 75 | 100 |
|  | Core3:Programmingin C++ | 4 | 5 |  | 25 | 75 | 100 |
|  | CoreLab2:ProgrammingLab–C++ | 4 |  | 4 | 40 | 60 | 100 |
|  | CoreLab3:InternetBasics Lab | 2 |  | 2 | 20 | 30 | 50 |
|  | Allied2:DiscreteMathematics | 4 | 5 |  | 25 | 75 | 100 |
|  | ValueEducation –HumanRights# | 2 | 2 |  |  | 50 | 50 |
|  | **Total** | **24** | **24** | **6** | **160** | **440** | **600** |
| **THIRDSEMESTER** |
|  | Core4:JAVAProgramming | 4 | 6 |  | 25 | 75 | 100 |
|  | CoreLab4: JAVAProgrammingLab | 4 |  | 5 | 40 | 60 | 100 |
|  | Core5:DatabaseManagementSystems | 4 | 6 |  | 25 | 75 | 100 |
|  | Allied 3: Data CommunicationandNetworks | 4 | 6 |  | 25 | 75 | 100 |
|  | SkillbasedSubject1 :DataVisualization | 3 | 5 |  | 20 | 55 | 75 |
|  | Tamil @/ Advanced Tamil(OR)Non-majorelective-1(Yogafor Human Excellence)# /Women‟sRights# | 2 | 2 |  |  | 50 | 50 |
|  | **Total** | **21** | **25** | **5** | **135** | **390** | **525** |
| **FOURTHSEMESTER** |



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|  | Core6:PythonProgramming | 4 | 6 |  | 25 | 75 | 100 |
|  | Core7:DataWarehousingandDataMining | 4 | 6 |  | 25 | 75 | 100 |
|  | CoreLab5:PythonProgrammingLab | 4 |  | 6 | 40 | 60 | 100 |
|  | Allied4:DeepLearning | 4 | 6 |  | 25 | 75 | 100 |
|  | SkillBasedSubject2:CapstoneProjectWorkPhase I | 3 |  | 4 | 30 | 45 | 75 |
|  | Tamil @/ Advanced Tamil(OR)Non-majorelective–II(GeneralAwareness)# | 2 | 2 |  |  | 50 | 50 |
|  | **Total** | **21** | **20** | **10** | **145** | **380** | **525** |
| **FIFTHSEMESTER** |
|  | Core8:RProgramming | 4 | 6 |  | 25 | 75 | 100 |
|  | CoreLab6:RProgrammingLab | 4 |  | 6 | 40 | 60 | 100 |
|  | Core9:BigDataAnalytics | 4 | 6 |  | 25 | 75 | 100 |
|  | Elective- IBusinessDataAnalytics/SocialNetwork Analysis/t/ArtificialNeuralNetworkandFuzzySystems | 4 | 6 |  | 25 | 75 | 100 |
|  | SkillBasedSubject3:CapstoneProjectWorkPhase II | 3 |  | 6 | 30 | 45 | 75 |
|  | **Total** | **19** | **18** | **12** | **145** | **330** | **475** |
| **SIXTHSEMESTER** |
|  | Core10 :LinuxandShellProgramming | 4 | 6 |  | 25 | 75 | 100 |
|  | CoreLab7:LinuxandShellProgrammingLab | 4 |  | 5 | 40 | 60 | 100 |
|  | Core11:ProjectWorkLab | 6 |  | 3 | 60 | 90 | 150 |
|  | Elective- IIWebApplicationSecurity/Software Agents/Embeddedsystems | 4 | 5 |  | 25 | 75 | 100 |
|  | Elective- IIIClient Server Computing/Opensource Software/Principles ofSecureCoding | 4 | 5 |  | 25 | 75 | 100 |
|  | SkillbasedSubject4:MachineLearning | 3 | 4 |  | 30 | 45 | 75 |
|  | ExtensionActivities | 2 |  |  | 50 | - | 50 |
|  | Naan Muthalvan - Skill CourseCyber Security **@**<http://kb.naanmudhalvan.in/images/7/71/Cybersecurity.pdf>(or) Machine Learning **#**<http://kb.naanmudhalvan.in/images/1/19/PBL_Google.pdf>(or) Android APP Development **$** <http://kb.naanmudhalvan.in/images/0/08/Android_App_Dev.pdf> | 2 | 2 | - | 25 | 25 | 50\*\* |
|  | **Total** | **29** | **22** | **8** | **280** | **445** | **725** |
|  | **GrandTotal** | **140** | **136** | **44** | **1030** | **2470** | **3500** |
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|  | **ONLINE COURSES** |  |  |

* \*\*NaanMudhalvan – Skill courses- external 25 marks will be assessed by Industry and internal will be offered by respective course teacher.
* **#** Govt – Non-Autonomous Colleges, **$** Aided – Non-Autonomous Colleges, **@** Self - Financing **(**Non – Autonomous).



First Semester



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| **CourseCode** |  | **ProgramminginC** | **L** | **T** | **P** | **C** |
| **Core/elective/Supportive** | **Core:1** | **4** | **0** | **0** | **4** |
| **Pre- requisite** | * Basicknowledgeincomputers
 | **Syllabusversion** | **I** |
| **CourseObjectives** |
| TointroducetheconceptsofProcedure OrientedProgrammingandthe variousprogrammingconstructsofCprogramming |
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| **ExpectedCourseOutcomes** |
| 1 | Describeabouttheaboutthefundamentalsofcomputers,historyandvarioustypesofsoftwareandhardwaredevices. | K1 |
| 2 | InterprettheconceptsofVariables,Constant,Operatorsandvarioustypesofexpressions | K2 |
| 3 | ApplytheconceptofDecisionmakingstatementsandloopingconstructsforsolvingbasicprograms | K3 |
| 4 | Usetheconcepts offilesandpointers insideaCprogram | K3 |
| 5 | DevelopprogramsincorporatingalltheClanguageconstructs | K4 |
| 6 | Testthecorrectnessoftheprogramsandidentifylogicalandsyntax errors | K5 |
| **K1–Remember K2 –Understand K3–applyK4-AnalyzeK5–evaluateK6-Create** |
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| **UNITI** | **FundamentalsofComputers** | **12** |
| FundamentalsofComputers:Introduction–HistoryofComputers-GenerationsofComputers-Classification of Computers-Basic Anatomy of a Computer System-Input Devices-Processor-OutputDevices-MemoryManagement–TypesofSoftware-OverviewofOperatingSystem-ProgrammingLanguages-TranslatorPrograms-ProblemSolvingTechniques-OverviewofC. |
| **UNITII** | **Overview of C** | **11** |
| Overview of C - Introduction - Character set - C tokens - keyword & Identifiers - Constants -Variables - Data types - Declaration of variables - Assigning values to variables - Defining SymbolicConstants- Arithmetic,Relational,Logical,Assignment, Conditional, Bitwise, Special,IncrementandDecrementoperators-ArithmeticExpressions-Evaluationofexpression-precedenceofarithmeticoperators-Typeconversioninexpression–operatorprecedence&associativity-Mathematicalfunctions-Reading&Writing acharacter-Formatted inputand output. |
| **UNITIII** | **DecisionMakingandBranching** | **12** |
| Decision Making and Branching: Introduction – if, if….else, nesting of if …else statements- else ifladder – The switch statement, The?: Operator – The goto Statement. Decision Making and Looping:Introduction-Thewhilestatement-thedostatement–theforstatement-jumpsinloops.Arrays–CharacterArraysandStrings |
| **UNITIV** | **Functions** | **12** |
| User-DefinedFunctions:Introduction– Needand Elements of User-Defined Functions- Definition-ReturnValuesandtheirtypes-FunctionCalls–Declarations–CategoryofFunctions-NestingofFunctions-Recursion–Passing ArraysandStringstoFunctions-TheScope,VisibilityandLifetimeofVariables-Multi filePrograms-Structures andUnions. |
| **UNITV** | **Pointers** | **13** |

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| Pointers: Introduction-Understanding pointers-Accessing the address of a variable-Declaration andInitialization of pointer Variable – Accessing a variable through its pointer-Chain of pointers- PointerExpressions–PointerIncrementsandScalefactor-PointersandArrays-PointersandStrings–Arrayof pointers – Pointers as Function Arguments- Functions returning pointers – Pointers to Functions –Pointersand Structures.FileManagement in C. |
| **TotalLectureHours** | **60****Hours** |
| **TextBook(S)** |
| **1** | EBalagurusamy:ComputingFundamentals&CProgramming –TataMcGraw-Hill,SecondReprint2008. |
| **ReferenceBook(s):** |
| **1** | AshokNKamthane: Programmingwith ANSIand Turbo C, Pearson,2002. 2. HenryMullish&HubertL.Cooper:TheSpritof C,Jaico, 1996. |
|  | **RelatedOnlineContents(MOOC,SWAYAM,NPTEL,Websitesetc)** |  |
| **1** | [**https://onlinecourses.swayam2.ac.in/aic20\_sp06/preview**](https://onlinecourses.swayam2.ac.in/aic20_sp06/preview) |  |
| **2** | [**https://onlinecourses.swayam2.ac.in/arp19\_ap79/preview**](https://onlinecourses.swayam2.ac.in/arp19_ap79/preview) |  |
| **CourseDesignedby :** |

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|  | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** |
| **CO1** | **L** | **L** | **L** | **L** | **L** | **L** | **L** | **L** | **L** | **L** |
| **CO2** | **M** | **L** | **L** | **L** | **L** | **L** | **L** | **L** | **L** | **L** |
| **CO3** | **S** | **M** | **L** | **L** | **L** | **L** | **L** | **L** | **L** | **L** |
| **CO4** | **S** | **M** | **L** | **L** | **L** | **L** | **L** | **L** | **L** | **L** |
| **CO5** | **S** | **M** | **M** | **L** | **L** | **L** | **L** | **L** | **L** | **L** |
| **CO6** | **S** | **S** | **S** | **L** | **L** | **L** | **L** | **L** | **L** | **L** |

\*S-Strong;M-Medium;L-Low



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| **CourseCode** |  | **ProgrammingLab -C** | **L** | **T** | **P** | **C** |
| **Core/elective/Supportive** | **CoreLab :1** | **0** | **0** | **3** | **4** |
| **Pre- requisite** | * Basicknowledgeincomputers
 | **Syllabusversion** | **I** |
| **CourseObjectives** |
| TointroducetheconceptsofProcedureOrientedProgrammingand thevariousprogrammingconstructsofCprogramming. |
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| **ExpectedCourseOutcomes** |
| 1 | Applythevariousbasicprogrammingconstructslikedecisionmakingstatements.Loopingstatements,functions,structures,pointersandfiles | **K3** |
| 2 | Designprograms usingtheconcept offilesin C and beable tosimulate operations | **K4** |
| 3 | Determinetheefficienttechniquesinprogrammingtosolvevariousscientificproblems | **K5** |
| **K1–Remember K2 –Understand K3–applyK4-AnalyzeK5–evaluateK6-Create** |
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| **EXERCISE1** | **ImplementationofControlstructures** | **6** |
| DevelopvariousC ProgramsusingControlStructures |
| DevelopvariousC programs usingSwitchcase. |
| **EXERCISE2** | **ImplementationofLoopings** | **6** |
| Developvarious C program forthe implementationof looping |
| DevelopvariousC programfortheimplementationoflooping&Conrtol Structures |
| **EXERCISE3** | **ImplementationofFunctions** | **9** |
| DevelopaCprogramtoillustraterecursivefunction. |
| DevelopaCprogramtofind thepalindromeina given sentence |
| Developa Cprogram to manipulatestrings usingstringfunctions. |
| DevelopaCProgramusingFunctions |
| **EXERCISE4** | **ImplementationofPointers** | **6** |
| DevelopaCprogramto swaptwointegersusingpointers. |
| Developa C programusingArrayof Pointers. |
| **EXERCISE5** | **ImplementationofStructures** | **6** |
| DevelopaCprogramusingthestructures. |
| DevelopaC programusingArrayof Structures. |
| **EXERCISE6** | **ImplementationofFiles** | **6** |
| DevelopaCprogramto calculate electricitybillusingfiles |
| **EXERCISE7** | **ImplementationofSecurity** | **6** |
| DevelopaCprogramtoencryptanddecryptastring |
| DevelopaGprogramto encryptanddecryptFiles |
| **TotalLectureHours** | **45****Hours** |
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| **TextBook(S)** |
| **1** | EBalagurusamy:ComputingFundamentals&CProgramming –TataMcGraw-Hill,SecondReprint2008. |
| **ReferenceBook(s)** |
| **1** | AshokNKamthane: Programmingwith ANSIand TurboC, Pearson, 2002. 2.HenryMullish&HubertL.Cooper: TheSprit of C,Jaico, 1996. |
| **CourseDesignedby :** |

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|  | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** |
| **CO1** | **S** | **M** | **L** | **L** | **L** | **L** | **L** | **L** | **L** | **L** |
| **CO2** | **S** | **M** | **M** | **L** | **L** | **L** | **L** | **L** | **L** | **L** |
| **CO3** | **S** | **S** | **S** | **L** | **L** | **L** | **L** | **L** | **L** | **L** |

\*S-Strong;M-Medium;L-Low



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| **CourseCode** |  | **DataStructures** | **L** | **T** | **P** | **C** |
| **Core/elective/Supportive** | **Core:2** | **4** | **0** | **0** | **4** |
| **Pre- requisite** | * Basic knowledge of ProgrammingConstructs
 | **Syllabusversion** | **I** |
| **CourseObjectives** |
| * Tointroducetheconceptofdatastructuresandthetypesofdatastructures
 |  |
| * Todemonstratehowvariousdata structurescanbeimplemented andusedinvariousapplications
 |
| **ExpectedCourseOutcomes** |
| 1 | DefinetheconceptofDatastructureandlistthevariousclassificationsofdatastructures. | **K1** |
| 2 | Demonstratehowarrays, stacks,queues,linkedlists,trees,heaps,GraphsandHashTablesarerepresentedinthemainmemoryandvariousoperationsareperformed on thosedata structures. | **K2** |
| 3 | Illustratethe various file organizations like Sequential, Random and Linkedorganizations. | **K2** |
| 4 | Discovertherealtimeapplicationsofthe variousdatastructures | **K3** |
| 5 | Designalgorithmsforvarioussortingandsearchingtechniques | **K4** |
| **K1–Remember K2 –Understand K3–applyK4-AnalyzeK5–evaluateK6-Create** |
|  |
| **UNITI** | **INTRODUCTION** | **12****Hours** |
| Introduction:IntroductionofAlgorithms,AnalyzingAlgorithms.Arrays:SparseMatrices-RepresentationofArrays.StacksandQueues.Fundamentals-EvaluationofExpressionInfixtoPostfix Conversion-MultipleStacksandQueues |
| **UNITII** | **LINKEDLIST** | **12** |
| Linked List: Singly Linked List - Linked Stacks and Queues - Polynomial Addition - More on LinkedLists-SparseMatrices-DoublyLinkedListandDynamic -StorageManagement-GarbageCollectionandCompaction. |
| **UNITIII** | **NONLINEARDATA STRUCTURES** | **12****Hours** |
| Trees: Basic Terminology - Binary Trees - Binary Tree Representations - Binary Trees -Traversal -More on Binary Trees - Threaded Binary Trees - Binary Tree Representation of Trees - CountingBinaryTrees.Graphs:TerminologyandRepresentations-Traversals,ConnectedComponentsandSpanningTrees,ShortestPathsandTransitiveClosure |
| **UNITIV** | **EXTERNAL-SORTING** | **12****Hours** |
| External Sorting: Storage Devices -Sorting with Disks: K-Way Merging - Sorting with Tapes SymbolTables:StaticTreeTables -DynamicTreeTables-Hash Tables:HashingFunctions-OverflowHandling. |
| **UNITV** | **INTERNAL -SORTING** | **12****Hours** |
| InternalSorting:InsertionSort-QuickSort-2WayMergeSort-HeapSort-ShellSort-Sortingon |

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| SeveralKeys.Files:Files,QueriesandSequentialorganizations-IndexTechniques-FileOrganizations. |
| **TotalHours** | **60****Hours** |
| **TextBook(s)** |
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| **1** | EllisHorowitz,SartajShani,DataStructures,GalgotiaPublication. |
|  |  |  |
| **ReferenceBook(s)** |
| **1** | EllisHorowitz,SartajShani,SanguthevarRajasekaran,ComputerAlgorithms,GalgotiaPublication. |
|  |  |  |
|  | **RelatedOnlineContents(MOOC,SWAYAM,NPTEL,Websitesetc)** |  |
| **1** | [**https://onlinecourses.swayam2.ac.in/aic20\_sp06/preview**](https://onlinecourses.swayam2.ac.in/aic20_sp06/preview) |  |
| **2** | [**https://onlinecourses.swayam2.ac.in/arp19\_ap79/preview**](https://onlinecourses.swayam2.ac.in/arp19_ap79/preview) |  |
| **CourseDesignedby :** |

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|  | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** |
| **CO1** | **L** | **L** | **L** | **L** | **L** | **L** | **L** | **L** | **L** | **L** |
| **CO2** | **M** | **L** | **L** | **L** | **L** | **L** | **L** | **L** | **L** | **L** |
| **CO3** | **S** | **M** | **L** | **L** | **L** | **L** | **L** | **L** | **L** | **L** |
| **CO4** | **S** | **M** | **L** | **L** | **L** | **L** | **L** | **L** | **L** | **L** |
| **CO5** | **S** | **M** | **M** | **L** | **L** | **L** | **L** | **L** | **L** | **L** |

\*S-Strong;M-Medium;L-Low



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| **CourseCode** |  | **IntroductiontoLinearAlgebra** | **L** | **T** | **P** | **C** |
| **Core/elective/Supportive** | **Allied:1** | **5** | **0** | **0** | **4** |
| **Pre- requisite** | None | **Syllabus****version** | **I** |
| **CourseObjectives** |
| Tointroducethecomputational techniquesandalgebraicskills essentialfor thestudyofsystems oflinearequations,matrixalgebra,andvectorspaces |
|  |
| **ExpectedCourseOutcomes** |
| 1 | Explaintheconcept/theoryinlinearalgebra,todevelopdynamicandgraphicalviewstotherelatedissuesofthechosentopicsasoutlinedin“coursecontent,”andtoformallyprovetheorems | K2 |
| 2 | Recognizethebasicapplicationsofthechosentopicsandtheirimportanceinthemodernscience | K3 |
| 3 | Developsimplemathematicalmodels,andapplybasiclinearalgebratechniqueslearned fromthechosentopicstosolvesimpleproblems | K3 |
| 4 | Reportandcommunicateeffectivelywithothersandpresentmathematicalresultsinalogical andcoherentfashion | K4 |
| 5 | Appraisethepowerandbeautyofmathematics,andsolveproblemsindependentlyandcollaborativelyas part ofateam | K5 |
| **K1–Remember K2 –Understand K3–applyK4-AnalyzeK5–evaluateK6-Create** |
|  |
| **UNITI** |  | **15** |
| Introduction–VectorsandMatrices–LengthandDotProducts–SolvingLinearEquations–LinearEquations–TheIdeaofElimination–EliminationUsingMatrices–RulesforMatrixOperations–InverseMatrices–Elimination=Factorization:A=LU –TransposesandPermutations |
| **UNITII** |  | **15** |
| Vector Spaces and Subspaces – Spaces of Vectors – The Null space of A: Solving Ax = 0– TheRank and the Row Reduced Form – The complete solution to Ax=b – Independence, Basis, andDimensions–DimensionsofthefourSubspaces–Orthogonality–OrthogonalityoftheFourSubspaces–Projections– LeastSquaresApproximations –Orthogonal BasesandGram–Schmidt. |
| **UNITIII** |  | **15** |
| Determinants – The Properties of Determinants – Permutations and Cofactors – Cramer‟s Rule,Inverse,andVolumes–EigenvaluesandEigenvectors–IntroductiontoEigenvalues–DiagonalizingaMatrix–ApplicationstoDifferentialEquations–SymmetricMatrices–PositiveDefiniteMatrices–SimilarMatrices–TheSingularValueDecomposition |
| **UNITIV** |  | **15** |
| SingularvalueDecomposition–LinearTransformations–TheIdeaofaLinearTransformation–TheMatrixofaLinearTransformation–Change ofBasis–DiagonalizationandthePseudoinverse. |
| **UNITV** |  | **15** |
| ComplexVectorsandComplexMatrices–ComplexNumbers–HermitianandUnitaryMatrices– |

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| TheFast FourierTransform–Applications–Numerical LinearAlgebra. |
| **TotalLectureHours** | **75****Hours** |
| **TextBook(s)** |
| **1** | GilbertStrang(2016).Introductionto LinearAlgebra,5th Edition.Wellesley–CambridgePress |
|  | **ReferenceBooks** |  |
| **1** | S.Lang(1997).Introductionto LinearAlgebra.SecondEdition.Springer. |
| **2** | GilbertStrang(2006).LinearAlgebraand ItsApllications.FourthEdition.CengageLearning. |
| **3** | DavidC. Lay,StevenR.Lay,andJudiJ.McDonald(2014). Linear Algebraand ItsApplications.5th Edition.Pearson. |
|  | **RelatedOnlineContents(MOOC,SWAYAM,NPTEL,Websitesetc)** |  |
| **1** | [**https://onlinecourses.swayam2.ac.in/aic20\_sp06/preview**](https://onlinecourses.swayam2.ac.in/aic20_sp06/preview) |  |
| **2** | [**https://onlinecourses.swayam2.ac.in/arp19\_ap79/preview**](https://onlinecourses.swayam2.ac.in/arp19_ap79/preview) |  |
| **CourseDesignedby:** |

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|  | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** |
| **CO1** | **L** | **L** | **L** | **L** | **L** | **L** | **L** | **L** | **L** | **L** |
| **CO2** | **M** | **L** | **L** | **L** | **L** | **L** | **L** | **L** | **L** | **L** |
| **CO3** | **S** | **M** | **L** | **L** | **L** | **L** | **L** | **L** | **L** | **L** |
| **CO4** | **S** | **M** | **L** | **L** | **L** | **L** | **L** | **L** | **L** | **L** |
| **CO5** | **S** | **M** | **M** | **L** | **L** | **L** | **L** | **L** | **L** | **L** |

\*S-Strong;M-Medium;L-Low



SecondSemester



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| **CourseCode** |  | **ProgramminginC++** | **L** | **T** | **P** | **C** |
| **Core/elective/Supportive** | **Core:3** | **5** | **0** | **0** | **4** |
| **Pre- requisite** | * BasicknowledgeofProcedureOrientedProgrammingconcepts
* BasicknowledgeinCProgramming
 | **Syllabusversion** | **I** |
| **CourseObjectives** |
| TointroduceheconceptsofObjectOrientedProgrammingParadigmandtheprogrammingconstructsofC++ |
|  |
| **ExpectedCourseOutcomes** |
| 1 | Describetheproceduralandobjectorientedparadigmwithconceptsofstreams,classes,functions,data andobjects | **K1** |
| 2 | Demonstratethe various basic programming constructs like decision makingstatements. Loopingstatementsandfunctions | **K2** |
| 3 | Explainthe objectorientedconceptslikeoverloading,inheritance,polymorphism,virtualfunctions,constructorsanddestructors | **K3** |
| 4 | Explainthevariousfilestreamclasses;filetypes,usageoftemplatesandexceptionhandlingmechanisms. | **K3** |
| 5 | Comparetheprosandconsofprocedureorientedlanguagewiththeconceptsofobjectorientedlanguage | **K5** |
| 6 | Developprogramsincorporatingtheprogrammingconstructsofobjectorientedprogrammingconcepts | **K5** |
| **K1–Remember K2 –Understand K3–applyK4-AnalyzeK5–evaluateK6-Create** |
|  |
| **UNITI** | **IntroductiontoC++** | **12** |
| Introduction to C++ - key concepts of Object-Oriented Programming –Advantages – Object OrientedLanguages – I/O in C++ - C++ Declarations. Control Structures : - Decision Making and Statements :If..else,jump,goto,break,continue,Switchcasestatements-LoopsinC++:for,while,do-functionsinC++-inline functions–FunctionOverloading. |
| **UNITII** | **ClassesandObjects** | **14** |
| ClassesandObjects:DeclaringObjects–DefiningMemberFunctions–StaticMembervariablesandfunctions–arrayofobjects–friendfunctions–Overloadingmemberfunctions–Bitfieldsandclasses–Constructoranddestructorwithstaticmembers. |
| **UNITIII** | **OperatorOverloading andInheritance** | **16** |
| OperatorOverloading:Overloadingunary,binaryoperators–OverloadingFriendfunctions–typeconversion–Inheritance:TypesofInheritance–Single,Multilevel,Multiple,Hierarchal,Hybrid,Multipathinheritance–Virtual baseClasses– Abstract Classes. |
| **UNITIV** | **PointersandPolymorphism** | **18** |
| Pointers–Declaration–PointertoClass,Object–thispointer–PointerstoderivedclassesandBaseclasses–Arrays–Characteristics–arrayofclasses–Memorymodels–newanddeleteoperators– |

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| dynamicobject –Binding,PolymorphismandVirtualFunctions. |
| **UNITV** | **FileandExceptionHandling** | **15** |
| Files–Filestreamclasses–file modes–SequentialRead/Writeoperations–BinaryandASCIIFiles–RandomAccessOperation–Templates–ExceptionHandling-String–DeclaringandInitializingstringobjects – StringAttributes– Miscellaneousfunctions . |
| **TotalLectureHours** | **75****Hours** |
| **TextBook(s)** |
| **1** | AshokNKamthane,Object-OrientedProgrammingwithAnsiAndTurboC++,PearsonEducation,2003. |
| **ReferenceBooks** |
| **1** | E.Balagurusamy,Object-OrientedProgrammingwithC++,TMH,1998. |
| **2** | MariaLitvin&GrayLitvin,C++foryou,Vikaspublication,2002. |
| **3** | JohnR Hubbard,Programmingwith C,2nd Edition, TMHpublication, 2002 |
|  | **RelatedOnlineContents(MOOC,SWAYAM,NPTEL,Websitesetc)** |  |
| **1** | [**https://onlinecourses.swayam2.ac.in/aic20\_sp06/preview**](https://onlinecourses.swayam2.ac.in/aic20_sp06/preview) |  |
| **2** | [**https://onlinecourses.swayam2.ac.in/arp19\_ap79/preview**](https://onlinecourses.swayam2.ac.in/arp19_ap79/preview) |  |
| **CourseDesignedby :** |

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|  | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** |
| **CO1** | **M** | **M** | **L** | **L** | **L** | **L** | **L** | **L** | **L** | **L** |
| **CO2** | **M** | **M** | **M** | **L** | **L** | **L** | **L** | **L** | **L** | **L** |
| **CO3** | **S** | **M** | **M** | **L** | **L** | **L** | **L** | **L** | **L** | **L** |
| **CO4** | **S** | **S** | **M** | **L** | **L** | **L** | **L** | **L** | **L** | **L** |
| **CO5** | **S** | **S** | **M** | **L** | **L** | **L** | **L** | **L** | **L** | **L** |
| **CO6** | **S** | **S** | **S** | **L** | **L** | **L** | **L** | **L** | **L** | **L** |

\*S-Strong;M-Medium;L-Low



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| **CourseCode** |  | **ProgrammingLab–C++** | **L** | **T** | **P** | **C** |
| **Core/elective/Supportive** | **CoreLab :2** | **0** | **0** | **4** | **4** |
| **Pre- requisite** | * BasicknowledgeofProcedureOrientedProgrammingconcepts
* BasicknowledgeinCProgramming
 | **Syllabusversion** | **I** |
| **CourseObjectives** |
| Tointroducehe conceptsofObjectOrientedProgrammingParadigmandtheprogrammingconstructsofC++ |
|  |
| **ExpectedCourseOutcomes** |
| 1 | Applythevariousbasicprogrammingconstructslikedecisionmakingstatements.Loopingstatements,functions,conceptslikeoverloading,inheritance,polymorphism,virtualfunctions,constructorsanddestructors | **K3** |
| 2 | IllustratetheconceptofVirtualClasses,inlinefunctionsandfriendfunctions | **K4** |
| 3 | Comparethevariousfilestreamclasses;filetypes,usageoftemplatesandexceptionhandlingmechanisms. | **K5** |
| 4 | Comparetheprosandconsofprocedureorientedlanguagewiththeconceptsofobjectorientedlanguage | **K5** |
| **K1–Remember K2 –Understand K3 –applyK4-AnalyzeK5–evaluateK6-Create** |
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| **PROGRAM-****1** |  | **5** |
| WriteaC++ProgramtocreateaclasstoimplementthedatastructureSTACK.WriteaconstructortoinitializetheTOPoftheSTACK.WriteamemberfunctionPUSH()toinsertanelementandmemberfunctionPOP()todelete an elementcheck foroverflowand underflowconditions. |
| **PROGRAM-2** |  | **5** |
| WriteaC++ProgramtocreateaclassARITHMETICwhichconsistsofaFLOATandanINTEGERvariable.WritememberfunctionsADD(),SUB(),MUL(),DIV()toperformaddition,subtraction,multiplication,division respectively.Write amemberfunction togetand displayvalues. |
| **PROGRAM-3** |  | **5** |
| WriteaC++Programtoreadanintegernumberandfindthesumofallthedigitsuntilitreducestoasingledigitusingconstructors,destructorsandinlinememberfunctions. |
| **PROGRAM-4** |  | **5** |
| WriteaC++ProgramtocreateaclassFLOAT thatcontains onefloatdatamember.Overload allthefourArithmeticoperatorssothat theyoperate ontheobjectFLOAT. |
| **PROGRAM-5** |  | **5** |
| WriteaC++ProgramtocreateaclassSTRING.WriteaMemberFunctiontoinitialize,getand |



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| displaystings.Overloadtheoperators++and==toconcatenatetwoStringsandtocomparetwostringsrespectively. |
| **PROGRAM-6** |  | **5** |
| WriteaC++Programtocreateclass,whichconsistsofEMPLOYEEDetaillikeE\_Number,E\_Name,Department,Basic,Salary,Grade.Writeamemberfunctiontogetanddisplaythem.DeriveaclassPAYfromtheaboveclassandwriteamemberfunctiontocalculateDA,HRAandPFdependingonthegrade. |
| **PROGRAM -7** |  | **5** |
| WriteaC++ProgramtocreateaclassSHAPEwhichconsistsoftwoVIRTUALFUNCTIONSCalculate\_Area()andCalculate\_Perimeter()tocalculateareaandperimeterofvariousfigures.DerivethreeclassesSQUARE,RECTANGLE,TRIANGEfromclassShapeandCalculateAreaandPerimeterofeachclass separatelyand displaytheresult. |
| **PROGRAM -8** |  | **5** |
| Write a C++ Program to create two classes each class consists of two private variables, a integer and afloat variable. Write member functions to get and display them. Write a FRIEND Function common tobothclasses,whichtakestheobjectofabovetwoclassesasargumentsandtheintegerandfloatvaluesofboth objects separatelyand displaytheresult. |
| **PROGRAM -9** |  | **5** |
| WriteaC++ProgramusingFunctionOverloadingtoreadtwoMatricesofdifferentDataTypessuchasintegersandfloatingpointnumbers.Findoutthesumoftheabovetwomatricesseparatelyanddisplaythe sum of thesearrays individually. |
| **PROGRAM-****10** |  | **5** |
| WriteaC++Program tocheck whetherthe givenstringis apalindromeornotusingPointers. |
| **PROGRAM-****11** |  | **5** |
| WriteaC++Programtocreatea Fileand todisplaythecontentsof that filewith line numbers. |
| **PROGRAM -12** |  | **5** |
| WriteaC++Programtomergetwofilesintoasingle file. |
| **TotalLectureHours** | **60****Hours** |
|  |
| **TextBook(s)** |
| **1** | AshokNKamthane, Object-OrientedProgrammingwithAnsiAndTurbo C++,PearsonEducation,2003. |
|  | **ReferenceBooks** |
| **1** | E.Balagurusamy,Object-OrientedProgrammingwithC++,TMH,1998. |
| **2** | Maria Litvin&GrayLitvin,C++foryou,Vikaspublication, 2002. |
| **3** | JohnRHubbard, ProgrammingwithC, 2ndEdition,TMH publication,2002 |
| **CourseDesignedby :** |

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|  | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** |
| **CO1** | **S** | **S** | **M** | **L** | **L** | **L** | **L** | **L** | **L** | **L** |
| **CO2** | **S** | **S** | **M** | **L** | **L** | **L** | **L** | **L** | **L** | **L** |
| **CO3** | **S** | **S** | **M** | **L** | **L** | **L** | **L** | **L** | **L** | **L** |
| **CO4** | **S** | **S** | **S** | **L** | **L** | **L** | **L** | **L** | **L** | **L** |

\*S-Strong;M-Medium;L-Low



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| **CourseCode** |  | **InternetBasics -Lab** | **L** | **T** | **P** | **C** |
| **Core/elective/Supportive** | **CoreLab :3** | **0** | **0** | **2** | **2** |
| **Pre- requisite** | * BasicknowledgeinComputers
 | **Syllabus****version** | **I** |
| **CourseObjectives** |
| 1. IntroducethefundamentalsofInternet andtheWebfunctions.
2. Impartknowledgeandessentialskillsnecessarytousetheinternetanditsvariouscomponents.
3. Find,evaluate,anduse onlineinformationresources.
4. UseGoogleAppsforeducationeffectively.
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| **ExpectedCourseOutcomes** |
| 1 | ApplythepredefinedprocedurestocreateGmailaccount,checkandreceivemessages | **K3** |
| 2 | Applythe predefinedprocedures toperform variousbasic operationson internet | **K3** |
| 3 | Utilizevariousgoogleapplicationslikedocs,googleclassroom,googledrive,googleforms,googlemeetandslides | **K3** |
| **K1–Remember K2 –Understand K3–applyK4-AnalyzeK5–evaluateK6-Create** |
|  |
| **PROGRAM-1** | **2** |
| CreateanemailaccountinGmail.Usingtheaccountcreatedcomposeamailtoinviteothercollegestudentsforyourcollegefest,enclosetheinvitationasattachmentandsendthemailtoatleast50recipients.Use CC andBCC options accordingly |
| **PROGRAM-2** | **2** |
| OpenyourinboxintheGmailaccountcreated,checkthemailreceivedfromyourpeerfromothercollegeinvitingyouforhiscollegefest,anddownloadtheinvitation.Replytothemailwithathankyounote fortheinviteandforwardthemailto otherfriends |
| **PROGRAM-3** | **2** |
| Assumethatyouarestudyinginfinalyearofyourgraduationandareeagerlylookingforajob.Visitanyjobportalanduploadyour resume. |
| **PROGRAM-4** | **2** |
| CreateameetingusingGoogle calendarand sharemeetingid totheattendees. TransfertheownershiptotheManageroncethe meetingidisgenerated. |
| **PROGRAM-5** | **2** |
| Createalabel anduploadbulk contactsusingimportoptionin GoogleContacts |
| **PROGRAM-6** | **4** |
| CreateyourownGoogleclassroomandinviteallyourfriendsthroughemailid.PoststudymaterialinGoogleclassroomusingGoogledrive.CreateaseparatefolderforeverysubjectanduploadallunitwiseE-Content Materials. |
| **PROGRAM-7** |  |
| CreateandshareafolderinGoogleDriveusing„sharealink‟optionandsetthepermissiontoaccessthatfolderbyyourfriends only. |
| **PROGRAM-8** |  |
| Createone-pagestoryinyourmother tonguebyusingvoicerecognition facilityof Google Docs |

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| **PROGRAM-9** | **2** |
| CreatearegistrationformforyourDepartmentSeminarorConferenceusingGoogleForms. |
| **PROGRAM-10** | **2** |
| Createaquestionpaperwithmultiplechoicetypesofquestionsforasubjectofyourchoice,usingGoogleForms. |
| **PROGRAM-11** | **4** |
| CreateameetusingGoogleCalendar andrecordthemeetusingGoogleMeet.CreateaGoogleslidesfor atopicandsharethesamewithyour friends. |
| **PROGRAM-12** | **4** |
| Createtemplate foraseminarcertificate usingGoogleSlides. |  |
| **PROGRAM-13** |  |
| CreateasheettoillustratesimplemathematicalcalculationsusingGoogle Sheets.Createstudent‟sinternalmarkstatementandsharetheGooglesheetsvialink. | **4** |
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| **TotalLectureHours** | **30****Hours** |
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| **TextBook(s)** |
| 1 | IanLamont,Google Drive&Docsin30 Minutes,2ndEdition. |
| **ReferenceBook(s)** |
| 1 | SherryKinkoph Gunter,MyGoogleApps, 2014. |
| **CourseDesignedby :** |

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|  | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** |
| **CO1** | **M** | **M** | **L** | **L** | **L** | **L** | **L** | **L** | **L** | **L** |
| **CO2** | **S** | **M** | **L** | **L** | **L** | **L** | **L** | **L** | **L** | **L** |
| **CO3** | **S** | **S** | **S** | **L** | **L** | **L** | **L** | **L** | **L** | **L** |

\*S-Strong;M-Medium;L-Low



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| **CourseCode** |  | **DiscreteMathematics** | **L** | **T** | **P** | **C** |
| **Core/elective/Supportive** | **Allied:2** | **5** | **0** | **0** | **4** |
| **Pre- requisite** | BasicknowledgeinMathematics | **Syllabusversion** | **I** |
| **CourseObjectives** |  |
| * Introducestudentstothetechniques,algorithms,andreasoningprocessesinvolvedinthestudyofdiscrete mathematicalstructures.
* Introducestudentstosettheory,inductivereasoning,elementaryandadvancedcountingtechniques,equivalencerelations, recurrencerelations, graphs, and trees.
* Introducestudents toprovemathematicalstatements bymeans ofinductivereasoning
 |
| **ExpectedCourseOutcomes** |
| 1 | Understanddiscretemathematicalpreliminariesand applydiscretemathematicsinformalrepresentationof variouscomputingconstructs | **K2** |
| 2 | Demonstrateanunderstandingofrelations,functions,Combinatoricsandlattices | **K2** |
| 3 | Applythetechniquesofdiscretestructuresandlogicalreasoningtosolveavarietyofproblemsandwriteanargumentusinglogicalnotation | **K3** |
| 4 | Analyzeandconstructmathematicalargumentsthatrelatetothestudyofdiscretestructures | **K4** |
| 5 | Developand model problems with the concepts and techniques of discretemathematics. | **K4** |
| **K1–Remember K2 –Understand K3–applyK4-AnalyzeK5–evaluateK6-Create** |
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| **UNITI** | **MATHEMATICALLOGIC** | **15** |
| Proposition –LogicalOperators–TruthTables–Laws ofLogic–Equivalances–Rules ofinterface–validityArguments–ConsistencyofSpecifications**–**PropositonalCalculus–Quantifiersanduniverseof discourse. |
| **UNITII** | **PROOFTECHNIQUES &RELATIONSANDFUNCTIONS** | **15** |
| **PROOF TECHNIQUES**: Introduction – Methods of proving theorems – Direct Proofs, Proof byContraposition,Vacuousandtrivialproofs,Proofsbycontradiction–MistakesinProofs–Mathematical induction – Strong Mathematical induction – Strong mathematical induction and wellordering– Program Correctness.**RELATIONS AND FUNCTIONS:** Definition and properties of binary relations– RepresentingRelations – Closures of Relations – Composition of Relations – Equivalence Relations – Partitions andCovering of sets – Partial Orderings – n-array Relations and their applications. Functions – Injective,Surjective,Bijectivefunctions, Composition, identityand inverse. |
| **UNITIII** | **COMBINATORICS** | **15** |
| Basics of Counting – The Pigeonhole principle – Permutations and Combinations with and withoutrepetition,Permutationswithindistinguishableelements–distributionsofobjects–Generatingpermutationsand combinations in lexicographic order. |

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| **UNITIV** | **RECURRENCERELATIONS** | **15** |
| SomeRecurrenceRelationModels–Solutionoflinearhomogeneousrecurrencerelationswithconstantcoefficients–solutionoflinearnon-homogeneousrecurrencerelationsbythemethodofcharacteristicroots –Divideandconquerrecurrencerelations. |
| **UNITV** | **LATTICES** | **15** |
| Latticesaspartiallyorderedset–PropertiesofLattices–Latticesas algebraicsystem–Sublattices –DirectProductand Homomorphism–Somespeciallattices. |
| **TotalLectureHours** | **75**Hours |
| **TextBook(s)** |
| **1** | KennethH.Rosen,“DiscreteMathematicsanditsapplications”,McGrawHill,2011. |
| **2** | JudithL.Gersting,“MathematicalStructures forComputerScience”,W.H>FreemanandCompany,2014 |
| **3** | TremblayJ.P.andManoharR.,“DiscreteandCombinatorialMathamatics–AnIntroduction”,AddisonWesley,2009. |
| **ReferenceBooks** |
| **1** | DoerrAlanandLevasseurK.,“AppliedDiscreteStructuresforComputerScience”,GalgotiaPublications,2002 |
| **2** | BenardKolman,Robert C.BusbyandSharanRoss,“DiscreteMathematicalStructures”,PearsonEducation,2014 |
| **RelatedOnlineContents(MOOC,SWAYAM,NPTEL,Websitesetc)** |
| **1** | [**https://onlinecourses.swayam2.ac.in/aic20\_sp06/preview**](https://onlinecourses.swayam2.ac.in/aic20_sp06/preview) |  |
| **2** | [**https://onlinecourses.swayam2.ac.in/arp19\_ap79/preview**](https://onlinecourses.swayam2.ac.in/arp19_ap79/preview) |  |
| **CourseDesignedby :** |

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|  | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** |
| **CO1** | **M** | **L** | **L** | **L** | **L** | **L** | **L** | **L** | **L** | **L** |
| **CO2** | **M** | **L** | **L** | **L** | **L** | **L** | **L** | **L** | **L** | **L** |
| **CO3** | **S** | **M** | **L** | **L** | **L** | **L** | **L** | **L** | **L** | **L** |
| **CO4** | **S** | **M** | **M** | **L** | **L** | **L** | **L** | **L** | **L** | **L** |
| **CO5** | **S** | **S** | **S** | **L** | **L** | **L** | **L** | **L** | **L** | **L** |

\*S-Strong;M-Medium;L-Low



ThirdSemester



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| **CourseCode** |  | **JavaProgramming** | **L** | **T** | **P** | **C** |
| **Core/elective/Supportive** | **Core:4** | **6** | **0** | **0** | **4** |
| **Pre- requisite** | * Basic knowledge of ProgrammingConstructs.
* Knowledge on Object OrientedProgrammingConcepts.
 | **Syllabusversion** | **I** |
| **CourseObjectives** |
| * TointroducetheconceptsofObjectOrientedProgrammingParadigmand the programming

constructsofJAVA |
| **ExpectedCourseOutcomes** |
| 1 | Recitethe historyofJAVA and its evolution | **K1** |
| 2 | Explainthevariousprogramminglanguageconstructs,objectorientedconceptslikeoverloading,inheritance,polymorphism,Interfaces,threads,exceptionhandlingandpackages | **K2** |
| 3 | IllustratetheconceptsofApplets,filesandtheconceptofstreamclasses. | **K3** |
| 4 | OutlinethebenefitsandapplicationsofobjectsorientedprogrammingconceptsanddefendhowJAVAdiffersfromotherprogramminglanguages | **K3** |
| 5 | Judgetheprosandconsofother objectoriented languagewiththeconceptsofJAVA | **K4** |
| **K1–Remember K2 –Understand K3–applyK4-AnalyzeK5–evaluateK6-Create** |
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| **UNITI** |  | **18** |
| Fundamentals of Object-Oriented Programming: Object-Oriented Paradigm – Basic Concepts ofObject-Oriented Programming – Benefits of Object-Oriented Programming – Application of Object-Oriented Programming. Java Evolution: History – Features – How Java differs from C and C++ – JavaandInternet –Javaandwww –WebBrowsers.OverviewofJava:simpleJavaprogram–Structure –JavaTokens – Statements – JavaVirtual Machine. |
| **UNITII** |  | **18** |
| Constants, Variables, Data Types - Operators and Expressions – Decision Making and Branching: if,if...else,nestedif,switch?:Operator-Decision MakingandLooping: while,do,for– JumpsinLoops-Labeled Loops–Classes,ObjectsandMethods. |
| **UNITIII** |  | **18** |
| Arrays,StringsandVectors–Interfaces:MultipleInheritance–Packages:PuttingClassestogether–MultithreadedProgramming. |
| **UNITIV** |  | **18** |
| ManagingErrorsandExceptions–AppletProgramming–GraphicsProgramming. |
| **UNITV** |  | **18** |
| ManagingInput/OutputFilesinJava:ConceptsofStreams-StreamClasses–ByteStreamclasses–Characterstreamclasses–Usingstreams–I/OClasses–FileClass–I/Oexceptions–Creationoffiles–Reading/Writing characters,Byte-HandlingPrimitiveDataTypes–RandomAccessFiles. |

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| **TotalLectureHours** | **90** |
| **TextBook(s)** |
| **1** | ProgrammingwithJava–APrimer-E. Balagurusamy,3rd Edition,TMH. |
| **ReferenceBook(s)** |
| **1** | TheComplete ReferenceJava2-PatrickNaughton &Hebert Schildt, 3rdEdition,TMH |
| **2** | Programmingwith Java– JohnR. Hubbard, 2ndEdition, TMH. |
|  | **RelatedOnlineContents(MOOC,SWAYAM,NPTEL,Websitesetc)** |  |
| **1** | [**https://onlinecourses.swayam2.ac.in/aic20\_sp06/preview**](https://onlinecourses.swayam2.ac.in/aic20_sp06/preview) |  |
| **2** | [**https://onlinecourses.swayam2.ac.in/arp19\_ap79/preview**](https://onlinecourses.swayam2.ac.in/arp19_ap79/preview) |  |
| **CourseDesignedby :** |

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|  | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** |
| **CO1** | **M** | **L** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **-** |
| **CO2** | **M** | **L** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **-** |
| **CO3** | **S** | **M** | **L** | **-** | **-** | **-** | **-** | **-** | **-** | **-** |
| **CO4** | **S** | **M** | **M** | **-** | **-** | **-** | **-** | **-** | **-** | **-** |
| **CO5** | **S** | **S** | **S** | **-** | **-** | **-** | **-** | **-** | **-** | **-** |

\*S-Strong;M-Medium;L-Low



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| **CourseCode** |  | **JAVAProgrammingLab** | **L** | **T** | **P** | **C** |
| **Core/elective/Supportive** | **CoreLab:4** | **0** | **0** | **5** | **4** |
| **Pre- requisite** | * Basic knowledge of ProgrammingConstructs
* Knowledge on Object OrientedProgrammingConcepts
 | **Syllabusversion** | **I** |
| **CourseObjectives** |
| * To introduce the concepts of Object Oriented Programming Paradigm and the programmingconstructsof JAVA
 |
| **ExpectedCourseOutcomes** |
| 1 | ApplythevariousbasicprogrammingconstructsofJAVAlikedecisionmakingstatements.Loopingstatements,overloading,inheritance,polymorphism,constructorsanddestructors | **K3** |
| 2 | Illustratetheconceptsofthreadingandmulti-threading | **K4** |
| 3 | Designprogramsusingvariousfilestreamclasses;filetypes,andframes | **K4** |
| **K1–Remember K2 –Understand K3–applyK4-AnalyzeK5–evaluateK6-Create** |
|  |
| **PROGRAM1** | **3** |
| WriteaJavaApplicationsto extractaportion ofacharacterstringandprinttheextractedstring. |
| **PROGRAM2** | **3** |
| WriteaJavaProgramto implementtheconceptof multipleinheritanceusingInterfaces. |
| **PROGRAM3** | **3** |
| WriteaJavaProgramtocreateanExceptioncalledpayout-of-bounds andthrowtheexception |
| **PROGRAM4** | **3** |
| Write a Java Program to implement the concept of multithreading with the use of any threemultiplicationtables andassign threedifferentpriorities to them. |
| **PROGRAM5** | **6** |
| WriteaJavaProgramtodrawseveralshapesinthecreatedwindows |
| **PROGRAM6** | **6** |
| WriteaJavaProgramtocreateaframewithfourtextfieldsname,street,cityandpincodewithsuitabletables.Alsoaddabuttoncalledmydetails.Whenthebuttonisclickeditscorrespondingvaluesareto beappearedin thetext fields. |
| **PROGRAM7** | **6** |
| WriteaJavaProgramtodemonstratetheMultipleSelectionList-box. |
| **PROGRAM8** | **6** |
| WriteaJavaProgram tocreateaframe withthree textfields forname,age and qualificationandatextfieldformultiplelinefor address |
| **PROGRAM9** | **6** |
| WriteaJavaProgramtocreateMenuBars andpulldownmenus. |
| **PROGRAM10** | **6** |
| Write a JavaProgramtocreate frameswhichrespondtothe mouseclicks.Foreacheventswithmouse |

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| suchas mouseup, mousedown,etc., thecorrespondingmessagetobe displayed. |
| **PROGRAM11** | **6** |
| WriteaJavaProgram todrawcircle,square, ellipseandrectangle at themouseclickpositions. |
| **PROGRAM12** | **6** |
| WriteaJavaProgramwhich openanexistingfile and appendtextto thatfile. |
|  |
| **TotalLectureHours** | **60****Hours** |
| **TextBook(s)** |
| **1** | ProgrammingwithJava–APrimer-E. Balagurusamy,3rd Edition,TMH. |
| **ReferenceBook(s)** |
| **1** | TheComplete Reference Java2-PatrickNaughton &Hebert Schildt, 3rd Edition, TMH |
| **CourseDesignedby :** |

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|  | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** |
| **CO1** | **S** | **S** | **S** | **-** | **-** | **-** | **-** | **-** | **-** | **-** |
| **CO2** | **S** | **S** | **S** | **-** | **-** | **-** | **-** | **-** | **-** | **-** |
| **CO3** | **S** | **S** | **S** | **-** | **-** | **-** | **-** | **-** | **-** | **-** |

\*S-Strong;M-Medium;L-Low



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| **CourseCode** |  | **DatabaseManagementSystems** | **L** | **T** | **P** | **C** |
| **Core/elective/Supportive** | **Core:5** | **6** | **0** | **0** | **4** |
| **Pre- requisite** | None | **Syllabus****version** | **I** |
| **CourseObjectives** |
| * The objective of the course is to present an introduction to database management systems, withan emphasis on how to organize, maintain and retrieve - efficiently, and effectively -information froma DBMS.
 |
| **ExpectedCourseOutcomes** |
| 1 | Describethefundamentalelementsof relationaldatabasemanagementsystems | **K2** |
| 2 | Explainthebasicconceptsofrelationaldatamodel,entity-relationshipmodel,relationaldatabasedesign,relationalalgebraand SQL. | **K2** |
| 3 | Explaintheconceptsoftransactionprocessing,basicdatabasestoragestructuresandaccesstechniques | **K2** |
| 3 | ConstructER-modelstorepresentsimpledatabaseapplicationscenarios | **K3** |
| 4 | Applythe normalizationtechniques toimprovise the databasedesign | **K3** |
| 5 | DevelopDDLandDMLcommandstoperform basicoperationson adatabase | **K3** |
| **K1–Remember K2 –Understand K3–apply K4-AnalyzeK5–evaluateK6-Create** |
|  |
| **UNITI** | INTRODUCTIONTODBMS | **18** |
| File Systems Organization – Sequential, Pointer, Indexed, Direct – Purpose of Database System-Database System Terminologies-Database characteristics- Data models – Types of data models –ComponentsofDBMS-RelationalAlgebra.LOGICALDATABASEDESIGN:RelationalDBMS–Codd‟s Rule – Entity- Relationship model – Extended ER Normalization – Functional Dependencies,Anomaly- 1NFto 5NF-Domain KeyNormal Form–Denormalization |
| **UNITII** | SQL&QUERYOPTIMIZATION | **18** |
| I SQL Standards – Data types – Database Objects- DDL-DML-DCL-TCL-Embedded SQL-Static VsDynamicSQL–QUERYOPTIMIZATION:QueryProcessingandOptimization–HeuristicsandCostEstimates in QueryOptimization. |
| **UNITIII** | TRANSACTIONPROCESSINGANDCONCURRENCYCONTROL | **18** |
| Introduction-PropertiesofTransaction-Serializability-ConcurrencyControl–LockingMechanisms-TwoPhaseCommitProtocol-Deadlock. |
| **UNITIV** | TRENDSINDATABASETECHNOLOGY | **18** |
| OverviewofPhysicalStorageMedia–MagneticDisks–RAID–Tertiarystorage–FileOrganization– Organization of Records in Files – Indexing and Hashing –Ordered Indices – B+ tree Index Files – Btree Index Files – Static Hashing – Dynamic Hashing – Introduction to Distributed Databases- Clientservertechnology-MultidimensionalandParalleldatabases-Spatialandmultimediadatabases-Mobileand web databases-Data Warehouse-Mining-Data marts. |
| **UNITV** | ADVANCEDTOPICS | **18** |
| DATABASESECURITY:Data Classification-Threatsandrisks–DatabaseaccessControl–TypesofPrivileges–Cryptography-StatisticalDatabases.-DistributedDatabases-Architecture-Transaction |

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| Processing-DataWarehousingandMining-Classification-Associationrules-Clustering-InformationRetrieval-Relevanceranking-CrawlingandIndexingtheWeb-ObjectOrientedDatabases-XMLDatabases. |
| **TotalLectureHours** | **90** |
| **TextBook(s)** |
| **1** | RamezElmasriandShamkantB.Navathe,“FundamentalsofDatabaseSystems”,FifthEdition,PearsonEducation, 2008. |
| **ReferenceBook(s)** |
| **1** | AbrahamSilberschatz,HenryF.KorthandS.Sudharshan,“DatabaseSystemConcepts”,SixthEdition,TataMcGrawHill,2011. |
| **2** | C.J.Date,A.KannanandS.Swamynathan,“AnIntroductiontoDatabaseSystems”,EighthEdition,Pearson Education,2006. |
| **3** | AtulKahate,“IntroductiontoDatabaseManagementSystems”,PearsonEducation,NewDelhi,2006. |
| **4** | AlexisLeonandMathewsLeon,“DatabaseManagementSystems”,VikasPublishingHousePrivateLimited,NewDelhi,2003. |
| **5** | RaghuRamakrishnan,“DatabaseManagementSystems”, Fourth Edition,TataMcGrawHill,2010. |
| **6** | G.K.Gupta,“DatabaseManagementSystems”,TataMcGrawHill,2011. |
| **7** | RobCornell,“DatabaseSystemsDesignandImplementation”,CengageLearning,2011. |
|  | **RelatedOnlineContents(MOOC,SWAYAM,NPTEL,Websitesetc)** |  |
| **1** | [**https://onlinecourses.swayam2.ac.in/aic20\_sp06/preview**](https://onlinecourses.swayam2.ac.in/aic20_sp06/preview) |  |
| **2** | [**https://onlinecourses.swayam2.ac.in/arp19\_ap79/preview**](https://onlinecourses.swayam2.ac.in/arp19_ap79/preview) |  |
| **CourseDesignedby:** |

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|  | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** |
| **CO1** | **M** | **L** | **L** | **L** | **L** | **L** | **L** | **L** | **L** | **L** |
| **CO2** | **M** | **L** | **L** | **L** | **L** | **L** | **L** | **L** | **L** | **L** |
| **CO3** | **S** | **M** | **L** | **L** | **L** | **L** | **L** | **L** | **L** | **L** |
| **CO4** | **S** | **M** | **M** | **L** | **L** | **L** | **L** | **L** | **L** | **L** |
| **CO5** | **S** | **S** | **S** | **L** | **L** | **L** | **L** | **L** | **L** | **L** |

\*S-Strong;M-Medium;L-Low



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| **CourseCode** |  | **DataCommunicationandNetworks** | **L** | **T** | **P** | **C** |
| **Core/elective/Supportive** | **Allied:3** | **6** | **0** | **0** | **4** |
| **Pre- requisite** | None | **Syllabus****version** | **I** |
| **CourseObjectives** |
| * Tointroducetheconceptsofdatacommunicationnetworks
* Toexplainthevarioustypestopologies andtransmissionmedia
 |
| **ExpectedCourseOutcomes** |
| 1 | Describethebasisand structureofcomputernetworks | **K2** |
| 2 | Understandtheconcept ofanalog/digitalsignals andtransmissions | **K2** |
| 3 | Describethelayers of the OSImodel | **K2** |
| 4 | Explaintheconceptof ISDNarchitectureandinterfaces | **K2** |
| 5 | Identifythedifferenttypesof networktopologies andprotocols. | **K3** |
| **K1–Remember K2 –Understand K3–applyK4-AnalyzeK5–evaluateK6-Create** |
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| **UNITI** | **IntroductiontocommunicationsandNetworking** | **16** |
| IntroductiontocommunicationsandNetworking:Introduction–Fundamentalconcepts-Datacommunications – Protocols- standards - Standards organizations - Signal propagations- Analog andDigitalsignals-Bandwidthofasignalandamedium-Fourieranalysisandtheconceptofbandwidthofasignal-Thedatatransmissionrateandthebandwidth.Informationencoding:Introduction–Representingdifferentsymbols-Minimizingerrors-Multimedia–Multimedia andData compression |
| **UNITII** | **Analoganddigitaltransmissionmethods** | **17** |
| Analoganddigitaltransmissionmethods:Introduction-Analogsignal,Analogtransmission-Digitalsignal,Digitaltransmission-Digitalsignal,Analogtransmission-Baudrateandbitspersecond-Analogsignal, Digital (Storageand) transmission-Nyquist Theorem. |
| **UNITIII** | **ModesofdatatransmissionandMultiplexing** | **20** |
| Modes of data transmission and Multiplexing: Introduction – Parallel and Serial communication -Asynchronous, Synchronous and Isochronous communication - Simplex, Half-duplex and Full-duplexcommunication–Multiplexing-TypesofMultiplexing-FDMversusTDM.TransmissionErrors:Detectionand correction: Introduction –Errorclassification–TypesofErrors –Errordetection. |
| **UNITIV** | **Transmissionmedia** | **18** |
| Transmission media: Introduction - Guided media - Un Guided media - Shannon capacity. Networktopologies, switching and routing algorithms: Introduction - Mesh topology - Star topology - Treetopology - Ring topology - Bus topology - Hybrid topology - Switching basics- Circuit switching –Packetswitching-Messageswitching-RouterandRouting–Factorsaffectingroutingalgorithms-Routingalgorithm -Approachestorouting. |
| **UNITV** | **NetworkingprotocolsandOSImodel** | **19** |
| Networking protocols and OSI model: Introduction – Protocols in computer communications - TheOSI model - OSI layer functions.Integrated services digital networking (ISDN):Introduction–BackgroundofISDN-ISDNarchitecture–ISDNinterfaces-Functionalgrouping–Referencepoints - ISDN protocol architecture - Broadband ISDN (B-ISDN). of ATM – Packet size – Virtualcircuitsin ATM – ATM cells– Switching–ATMlayers – Miscellaneous Topics. |
| **TotalLectureHours** | **90** |

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|  | **Hours** |
| **TextBook(s)** |
| **1** | DataCommunicationsandNetworks,Achyut.S.Godbole,TataMcGraw-HillPublishingCompany,2007. |
| **ReferenceBook(s)** |
| **1** | B.A. Forouzan –“Data CommunicationsandNetworking(3rdEd.) “ –TMH |
| **2** | A.S.Tanenbaum–“ComputerNetworks(4thEd.)”– PearsonEducation/PHI |
| **3** | W.Stallings –“Dataand ComputerCommunications(5thEd.)”–PHI/PearsonEducation |
| **CourseDesignedby :** |

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|  | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** |
| **CO1** | **M** | **L** | **L** | **L** | **L** | **L** | **L** | **L** | **L** | **L** |
| **CO2** | **M** | **L** | **L** | **L** | **L** | **L** | **L** | **L** | **L** | **L** |
| **CO3** | **S** | **M** | **L** | **L** | **L** | **L** | **L** | **L** | **L** | **L** |
| **CO4** | **S** | **M** | **M** | **L** | **L** | **L** | **L** | **L** | **L** | **L** |
| **CO5** | **S** | **S** | **S** | **L** | **L** | **L** | **L** | **L** | **L** | **L** |

\*S-Strong;M-Medium;L-Low



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| **CourseCode** |  | **DataVisualization** | **L** | **T** | **P** | **C** |
| **Core/elective/Supportive** | **SkillBasedSubject:1** | **5** | **0** | **0** | **3** |
| **Pre- requisite** | None | **Syllabus****version** | **I** |
| **CourseObjectives** |
| * TointroducetheconceptofDataVisualization
* Toexplainthe varioustechniquesin DataVisualization
 |
| **ExpectedCourseOutcomes** |
| 1 | Understandthebasics of datavisualization | **K2** |
| 2 | Understandtheimportanceofdatavisualization andthe designanduseof manyvisualcomponents | **K2** |
| 3 | Explaintheprocess ofdatavisualization | **K2** |
| 4 | Explainthebasics ofinteractivedatavisualizationtechniquesvisualization-basedissues. | **K2** |
| 5 | Understandthe conceptofvarious typesofvisulaization | **K2** |
| **K1–Remember K2 –Understand K3–applyK4-AnalyzeK5–evaluateK6-Create** |
|  |
| **UNITI** | **Introduction** | **15** |
| Introduction-contextofdatavisualization-definitionmethodology,visualizationdesignobjectives.Key factors-purpose, visualization function and tone, visualization design options- datarepresentation,datapresenation,sevenstagesof datavisualization,widgets,datavisualizationtools. |
| **UNITII** | **visualizingdatamethods** | **15** |
| visualizingdatamethods-mapping,timeseries-connectionsandcorrelations-scatterplotmaps-trees,hierachiesandrecursion-networksnaadgraphs,infographics |
| **UNITIII** | **Visualizingdataprocess** | **15** |
| Visualizing data process- acquiring data, where to find data, tools of acquiring data from the internet,locating file for use with processing, loading text data, dealing withfiles and folders,lisiting files in afolder, asynchronous image downloads, advanced web techniques, using a database, dealing with largenumberoffiles,parsingdata,levelofeffort,toolsforgatheringclues,textisbest,textmarkuplanguages, regular expressions(regexps),grammars and BNF notation, compressed data vectors andgeometry,binarydata formats, advances detect work |
| **UNITIV** | **Interactivedatavisualization** | **15** |
| Interactive data visualization-drawing with data,scales-axes-updates,transaction and mode-interactivity-layouts-geomapping-exportingframework-T3lstabio |
| **UNITV** | **Securitydatavisualization** | **15** |
| Securitydatavisualization-portscanvisualization-vulnerabilityassessmentandexploitation-firewalllogvisualization-instructiondetectionlogvisualization-attackinganddefendingvisualizationsystems-creatingsecurityvisualization system |
| **TotalLectureHours** | **75****Hours** |
| **TextBook(s)** |
| **1** | ScottMurray,”interactivedatavisualizationfortheweb“,O”Reillymedia,inc,2013. |

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| **ReferenceBook(s)** |
| **1** | Benfry,”visualizingdata”,O”Reillymedia,inc,2007 |
| **2** | Greg conti,”security data visualization:”,”graphical techniques for network analysis”,Nostarchpress inc,2007 |
| **CourseDesignedby :** |

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|  | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** |
| **CO1** | **M** | **L** | **L** | **L** | **L** | **L** | **L** | **L** | **L** | **L** |
| **CO2** | **M** | **L** | **L** | **L** | **L** | **L** | **L** | **L** | **L** | **L** |
| **CO3** | **S** | **M** | **L** | **L** | **L** | **L** | **L** | **L** | **L** | **L** |
| **CO4** | **S** | **M** | **M** | **L** | **L** | **L** | **L** | **L** | **L** | **L** |
| **CO5** | **S** | **S** | **S** | **L** | **L** | **L** | **L** | **L** | **L** | **L** |

\*S-Strong;M-Medium;L-Low



FourthSemester



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| **CourseCode** |  | **PythonProgramming** | **L** | **T** | **P** | **C** |
| **Core/elective/Supportive** | **Core:6** | **6** | **0** | **0** | **4** |
| **Pre- requisite** | * KnowledgeinBasicsofObjectOrientedProgramming
 | **Syllabus****version** | **I** |
| **CourseObjectives** |
| * Tointroducethe conceptsof thevarious programmingconstructsof Pythonprogramming
 |
| **ExpectedCourseOutcomes** |
| 1 | Applythevariousbasicprogrammingconstructslikeoperators,expressions,decisionmakingstatementsandLoopingstatements | **K2** |
| 2 | Summarizetheconcept oflists, tuples, functionsand errorhandling | **K2** |
| 3 | ApplytheconceptofDecisionmakingstatements,loopingconstructs,functionsforsolvingbasicprograms | **K3** |
| 4 | Analyzethe conceptsofLists,tuplesanderrorhandlingmechanisms | **K4** |
| 5 | Evaluateaprogramincorporatingallthepythonlanguage constructs | **K5** |
| **K1–Remember K2 –Understand K3–applyK4-AnalyzeK5–evaluateK6-Create** |
|  |
| **UNITI** | **BASICS** | **16** |
| Python-Variables-ExecutingPythonfromtheCommandLine-EditingPythonFiles-PythonReservedWords-BasicSyntax-Comments-StandardDataTypes–RelationalOperators-LogicalOperators -BitWiseOperators -Simple Inputand Output. |
| **UNITII** | **CONTROLSTATEMENTS,LISTS,TUPLES** | **17** |
| **CONTROLSTATEMENTS:**ControlFlowandSyntax-Indenting-ifStatement-statementsandexpressions-stringoperations-BooleanExpressions -whileLoop-breakandcontinue -for Loop.**LISTS:** List-list slices - list methods - list loop–mutability–aliasing - cloning lists - list parameters**.TUPLES:**Tupleassignment, tupleasreturn value-Sets–Dictionaries. |
| **UNITIII** | **FUNCTIONS:** | **20** |
| Definition-PassingparameterstoaFunction-Built-infunctions-VariableNumberofArguments-Scope–Typeconversion-Typecoercion-PassingFunctionstoaFunction–MappingFunctionsinaDictionary–Lambda -Modules-StandardModules –sys –math –time-dir–help Function. |
| **UNITIV** | **ERRORHANDLING:** | **18** |
| RunTimeErrors-ExceptionModel-ExceptionHierarchy-HandlingMultipleExceptions-DataStreams-AccessModesWriting-DatatoaFileReading-DataFromaFile-AdditionalFileMethods-UsingPipesasDataStreams- HandlingIOExceptions -WorkingwithDirectories. |
| **UNITV** | **OBJECTORIENTEDFEATURES**: | **19** |
| Classes Principles of Object Orientation - Creating Classes -Instance Methods - File Organization -Special Methods - Class Variables – Inheritance – Polymorphism - Type Identification - SimpleCharacter Matches - Special Characters – Character Classes – Quantifiers - Dot Character - GreedyMatches–Grouping-MatchingatBeginningorEnd-MatchObjects–Substituting-SplittingaString-CompilingRegular Expressions. |
| **TotalLectureHours** | **90****Hours** |
| **TextBook(s)** |
| **1** | MarkSummerfield.―ProgramminginPython3:ACompleteintroductiontothePython |

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|  | Language,Addison-WesleyProfessional,2009. |
| **2** | MartinC.Brown,―PYTHON:TheCompleteReference‖,McGraw-Hill,2001 |
| **ReferenceBook(s)** |
| **1** | AllenB.Downey,``ThinkPython:HowtoThinkLikeaComputerScientist„„,2ndedition,UpdatedforPython3,Shroff/O„ReillyPublishers,2016 |
| **2** | GuidovanRossumandFredL.DrakeJr,―AnIntroductiontoPython–RevisedandupdatedforPython 3.2,NetworkTheoryLtd., 2011. |
| **CourseDesignedby :** |

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|  | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** |
| **CO1** | **L** | **L** | **L** | **L** | **L** | **L** | **L** | **L** | **L** | **L** |
| **CO2** | **M** | **L** | **L** | **L** | **L** | **L** | **L** | **L** | **L** | **L** |
| **CO3** | **S** | **M** | **L** | **L** | **L** | **L** | **L** | **L** | **L** | **L** |
| **CO4** | **S** | **S** | **M** | **L** | **L** | **L** | **L** | **L** | **L** | **L** |
| **CO5** | **S** | **S** | **S** | **L** | **L** | **L** | **L** | **L** | **L** | **L** |

\*S-Strong;M-Medium;L-Low



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| **CourseCode** |  | **DataWarehousingandDataMining** | **L** | **T** | **P** | **C** |
| **Core/elective/Supportive** | **Core:7** | **6** | **0** | **0** | **4** |
| **Pre- requisite** | None | **Syllabus****version** | **I** |
| **CourseObjectives** |
| * Introduce the concepts of data ware house and data mining and explain the methodologiesusedforanalysis of data
 |  |
| **ExpectedCourseOutcomes** |
| 1 | Understandthefunctionalityofthevariousdatamininganddatawarehousing | **K2** |
|  | component |  |
| 2 |  | Describedifferent methodologiesused indataminingand datawarehousing. |  | **K2** |
| 3 |  | ExplaintheanalyzingtechniquesandOnlineAnalyticalProcessing |  | **K2** |
| 4 | Explainabouttheassociation ruleminingandclassification | **K2** |
| 5 | Comparedifferentapproachesofdatawarehousinganddataminingwithvarioustechnologies | **K4** |
| **K1–Remember K2 –Understand K3–applyK4-AnalyzeK5–evaluateK6-Create** |
|  |
| **UNITI** | **DataWarehousing** | **18** |
| DatawarehousingComponents–BuildingaDatawarehouse–-MappingtheDataWarehousetoaMultiprocessorArchitecture–DBMSSchemasforDecisionSupport–DataExtraction,Cleanup,andTransformationTools–Metadata. |
| **UNITII** | **BusinessAnalysis** | **18** |
| Reporting and Query tools and Applications – Tool Categories – The Need for Applications – CognosImpromptu – Online Analytical Processing (OLAP) – Need – Multidimensional Data Model – OLAPGuidelines – Multidimensional versus Multirelational OLAP – Categories of Tools – OLAP Tools andthe Internet. |
| **UNITIII** | **DataMining** | **17** |
| Introduction–Data–TypesofData–DataMiningFunctionalities–InterestingnessofPatterns–ClassificationofDataMiningSystems–DataMiningTaskPrimitives–IntegrationofaDataMiningSystemwith aData Warehouse–Issues–DataPreprocessing |
| **UNITIV** | **AssociationRuleMiningandClassification** | **19** |
| MiningFrequentPatterns,AssociationsandCorrelations–MiningMethods–MiningvariousKindsof Association Rules – Correlation Analysis – Constraint Based Association Mining – Classificationand Prediction – Basic Concepts – Decision Tree Induction – Bayesian Classification – Rule BasedClassification–ClassificationbyBackpropagation–SupportVectorMachines–AssociativeClassification–LazyLearners –Other Classification Methods–Prediction. |
| **UNITV** | **ClusteringAnd TrendsIn DataMining** | **18** |
| ClusterAnalysis–TypesofData–CategorizationofMajorClusteringMethods–K-means–Partitioning Methods – Hierarchical Methods – Density-Based Methods –Grid Based Methods –Model-BasedClusteringMethods–ClusteringHighDimensionalData–Constraint–BasedClusterAnalysis –Outlier Analysis –Data MiningApplications. |

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| **TotalLectureHours** | **90****Hours** |
| **TextBook(s)** |
| **1** | AlexBersonandStephen J.Smith,“DataWarehousing,DataMiningand OLAP”,TataMcGraw–HillEdition,ThirteenthReprint2008. |
| **2** | JiaweiHanandMichelineKamber,“DataMiningConceptsandTechniques”,ThirdEdition,Elsevier,2012. |
| **ReferenceBook(s)** |
| **1** | Pang-NingTan,MichaelSteinbachandVipinKumar,“IntroductiontoDataMining”,PersonEducation,2007. |
| **2** | K.P.Soman,ShyamDiwakarand V.Aja,“InsightintoDataMiningTheoryandPractice”,EasternEconomyEdition,PrenticeHallof India,2006. |
| **3** | G.K.Gupta,“IntroductiontoDataMiningwithCaseStudies”,EasternEconomyEdition,PrenticeHallofIndia,2006. |
| **4** | DanielT.Larose,“DataMiningMethodsandModels”,Wiley-Interscience,2006. |
|  | **RelatedOnlineContents(MOOC,SWAYAM,NPTEL,Websitesetc)** |  |
| **1** | [**https://onlinecourses.swayam2.ac.in/aic20\_sp06/preview**](https://onlinecourses.swayam2.ac.in/aic20_sp06/preview) |  |
| **2** | [**https://onlinecourses.swayam2.ac.in/arp19\_ap79/preview**](https://onlinecourses.swayam2.ac.in/arp19_ap79/preview) |  |
| **CourseDesignedby :** |

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|  | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** |
| **CO1** | **L** | **L** | **L** | **L** | **L** | **L** | **L** | **L** | **L** | **L** |
| **CO2** | **M** | **L** | **L** | **L** | **L** | **L** | **L** | **L** | **L** | **L** |
| **CO3** | **S** | **M** | **L** | **L** | **L** | **L** | **L** | **L** | **L** | **L** |
| **CO4** | **S** | **M** | **M** | **L** | **L** | **L** | **L** | **L** | **L** | **L** |
| **CO5** | **S** | **S** | **M** | **L** | **L** | **L** | **L** | **L** | **L** | **L** |

\*S-Strong;M-Medium;L-Low



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| **CourseCode** |  | **PythonProgramming-Lab** | **L** | **T** | **P** | **C** |
| **Core/elective/Supportive** | **CoreLab :5** | **0** | **0** | **6** | **4** |
| **Pre- requisite** | * KnowledgeinbasicProgramming
 | **Syllabus****version** | **I** |
| **CourseObjectives** |
| * Tointroducetheconceptsofpythonprogrammingconstructsof C++
 |
|  |
| **ExpectedCourseOutcomes** |
| 1 | ApplytheconceptofDecisionmakingstatements,loopingconstructs,functionsforsolvingbasic programs | **K3** |
| 2 | Analyzethe conceptsofLists,tuplesanderrorhandlingmechanisms | **K4** |
| 3 | Evaluateaprogramincorporatingallthepythonlanguage constructs | **K5** |
| **K1–Remember K2 –Understand K3–applyK4-AnalyzeK5–evaluateK6-Create** |
| **PROGRAM -1** |  | **5** |
| Writeapythonprogramthat displaysthefollowinginformation:Yourname,FulladdressMobilenumber,Collegename, Coursesubjects. |
| **PROGRAM-2** |  | **5** |
| Writeapython programto findthelargestthreeintegersusingif-else and conditionaloperator. |
| **PROGRAM -3** |  | **5** |
| Write a python program that asks the user to enter a series of positive numbers (The user should enteranegativenumberto signalthe endoftheseries)and theprogram shoulddisplaythenumbers inorderandtheirsum. |
| **PROGRAM-4** |  | **5** |
| Writeapython programto findtheproductoftwomatrices[A]mxp and[B]pxr |
| **PROGRAM-5** |  | **5** |
| Writerecursivefunctions forGCD oftwo integers. |
| **PROGRAM-****6** |  | **10** |
| Writerecursivefunctionsforthefactorialofpositiveinteger. |
| **PROGRAM -7** |  | **10** |
| WriterecursivefunctionsforFibonacciSequence uptogivennumber n. |
| **PROGRAM-****8** |  | **10** |
| Writerecursive functionsto displayprimenumber from 2to n. |
| **PROGRAM -9** |  | **10** |
| Writeapython programthat writesaseries ofrandom numberstoafilefrom1 ton anddisplay. |
| **PROGRAM -10** |  | **10** |

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| Writeapythonprogramtosortagivensequence:String, Listand Tuple. |
| **PROGRAM-11** |  | **10** |
| Writeapython programto makeasimplecalculator. |
| **PROGRAM-12** |  | **10** |
| Writeapythonprogramfor LinearSearchandBinarySearch. |
| **TotalLectureHours** | **90****Hours** |
|  |
| **TextBook(s)** |
| **1** | MarkSummerfield.―ProgramminginPython3:ACompleteintroductiontothePythonLanguage,Addison-WesleyProfessional,2009. |
| **2** | MartinC.Brown,―PYTHON:TheCompleteReference‖,McGraw-Hill,2001 |
| **ReferenceBook(s)** |
| **1** | AllenB.Downey,``ThinkPython:HowtoThinkLikeaComputerScientist„„,2ndedition,UpdatedforPython3,Shroff/O„ReillyPublishers,2016 |
| **2** | GuidovanRossumandFredL.DrakeJr,―AnIntroductiontoPython–RevisedandupdatedforPython 3.2,NetworkTheoryLtd., 2011. |
| **CourseDesignedby :** |

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|  | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** |
| **CO1** | **S** | **M** | **M** | **L** | **L** | **L** | **L** | **L** | **L** | **L** |
| **CO2** | **S** | **S** | **M** | **L** | **L** | **L** | **L** | **L** | **L** | **L** |
| **CO3** | **S** | **S** | **S** | **L** | **L** | **L** | **L** | **L** | **L** | **L** |

\*S-Strong;M-Medium;L-Low



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| **CourseCode** |  | **DeepLearning** | **L** | **T** | **P** | **C** |
| **Core/elective/Supportive** | **Allied:4** | **6** | **0** | **0** | **4** |
| **Pre- requisite** | **None** | **Syllabusversion** | **I** |
| **CourseObjectives** |
| * Tointroducestudents tothebasic conceptsandtechniques ofdeepLearning.
 |
| **ExpectedCourseOutcomes** |
| 1 | Understandthebasicconceptsandtechniquesof Deep Learning. | **K2** |
| 2 | TounderstandandapplytheMachinelearningprinciples | **K2** |
| 3 | Tostudythe deeplearningarchitectures | **K2** |
| 4 | Exploreandcreatedeeplearningapplicationswith tensorflow | **K3** |
| **K1–Remember K2 –Understand K3 –applyK4-AnalyzeK5–evaluateK6-Create** |
|  |
| **UNITI** | **Basicsof NeuralNetwork** | **18** |
| TheNeuralNetwork–LimitsofTraditionalComputing–MachineLearning–Neuron–FFNeuralNetworks–TypesofNeurons –Softmax outputlayers |
| **UNITII** | **Variables&Operations** | **18** |
| Tensorflow–Variables–Operations–Placeholders–Sessions–SharingVariables –Graphs–Visualization |
| **UNITIII** | **BasicsofCNN** | **19** |
| ConvolutionNeuralNetwork –FeatureSelection–Max Pooling–Filters andFeatureMaps –ConvolutionLayer–Applications |
| **UNITIV** | **BasicsofRNN** | **17** |
| RecurrentNeuralNetwork–Memorycells –sequenceanalysis–word2vec- LSTM-MemoryaugmentedNeuralNetworks –NTM-–Application |
| **UNITV** | **ReinforcementLearning** | **18** |
| Reinforcement Learning –MDP–Q Learning– Applications |
| **TotalLectureHours** | **90****Hours** |
| **TextBook(s)** |
| **1** | NikhilBuduma,Nicholas Locascio,“FundamentalsofDeep Learning:DesigningNextGenerationMachineIntelligenceAlgorithms”,O'ReillyMedia,2017. |
| **ReferenceBook(s)** |
| **1** | IanGoodfellow,YoshuaBengio,AaronCourville,”Deep Learning(AdaptivecomputationandMachineLearningseries”,MITPress,2017. |
|  | **RelatedOnlineContents(MOOC,SWAYAM,NPTEL,Websitesetc)** |  |
| **1** | [**https://onlinecourses.swayam2.ac.in/aic20\_sp06/preview**](https://onlinecourses.swayam2.ac.in/aic20_sp06/preview) |  |
| **2** | [**https://onlinecourses.swayam2.ac.in/arp19\_ap79/preview**](https://onlinecourses.swayam2.ac.in/arp19_ap79/preview) |  |
| **CourseDesignedby :** |

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|  | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** |
| **CO1** | **M** | **L** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **-** |
| **CO2** | **M** | **L** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **-** |
| **CO3** | **S** | **M** | **M** | **-** | **-** | **-** | **-** | **-** | **-** | **-** |
| **CO4** | **S** | **S** | **S** | **-** | **-** | **-** | **-** | **-** | **-** | **-** |

\*S-Strong;M-Medium;L-Low



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| **CourseCode** |  | **CapstoneProjectWorkPhaseI** | **L** | **T** | **P** | **C** |
| **Core/elective/Supportiv****e** | **SkillBasedSubject2** | **0** | **0** | **4** | **3** |
| **Pre- requisite** | * Students should have a goodunderstandingofsoftwareengineering
* Studentshouldpossessstronganalyticalskills
 | **Syllabusversion** | **I** |
| **CourseObjectives** |
| Themain objectives ofthis courseareto:* Tounderstandand selectthetask basedontheircoreskills.
* Togettheknowledge aboutanalyticalskillforsolvingtheselected task.
* Togetconfidencefor implementingthetaskandsolvingthe realtimeproblems.
 |
| **ExpectedCourseOutcomes** |
| Onthesuccessful completionofthecourse,student willbe ableto: |
| 1 | Illustrate arealworld problemand identifythelistofprojectrequirements | **K3** |
| 2 | Compareexistingsystemwiththeproposedsystemandextracttheinnovative ideas | **K4** |
| 3 | Judgethefeaturesoftheprojectincludingforms, databasesandreports | **K5** |
| **K1–Remember K2 –Understand K3 –applyK4-AnalyzeK5–evaluateK6-Create** |
|  |
| **Aimoftheproject work** |
| 1. Theaimof theprojectworkis toacquirepracticalknowledgeonthe implementationoftheprogrammingconcepts studied.
2. Each student should carry out individually one project work and it may be a work using thesoftwarepackages that theyhavelearned or theimplementation of concepts from thepapers studiedorimplementation of anyinnovative ideafocusing on application oriented concepts.
3. Theproject work should be compulsorilydoneinthecollegeonlyunderthe supervision of thedepartmentstaff concerned.

**VivaVoce**1. Viva-Voce will be conducted at the end of the year by both Internal (Respective Guides) andExternalExaminers,after dulyverifyingtheAnnexureReportavailable inthe College,foratotal of75marks at the last dayof thepractical session.
2. Outof75marks, 45 marksforproject reportand 30 MarksforVivaVoce.
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| **ProjectWork Format** |
| **PROJECTWORK****TITLEOFTHEDISSERTATION**Bonafide Work Done bySTUDENTNAME |



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| REG.NO.Dissertationsubmittedin partialfulfillmentofthe requirementsfor theawardof<NameoftheDegree>of Bharathiar University, Coimbatore-46.College LogoSignatureof theGuide Signature of the HODSubmittedfortheViva-VoceExaminationheldon InternalExaminer External ExaminerMonth– Year |
| **CONTENTS****AcknowledgementContents****Synopsis**1. **Introduction**
	1. OrganizationProfile
	2. SystemSpecification
		1. HardwareConfiguration
		2. SoftwareSpecification
2. **SystemStudy**
	1. ExistingSystem
		1. Drawbacks
	2. ProposedSystem
		1. Features
3. **SystemDesign**
	1. FormDesign
	2. InputDesign
	3. OutputDesign
	4. DatabaseDesign

**ConclusionBibliographyAppendices**1. DataFlow Diagram
2. TableStructure
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|  | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** |
| **CO1** | **S** | **S** | **S** | **M** | **L** | **L** | **L** | **L** | **L** | **L** |
| **CO2** | **S** | **S** | **S** | **M** | **L** | **L** | **L** | **L** | **L** | **L** |
| **CO3** | **S** | **S** | **S** | **M** | **M** | **L** | **L** | **L** | **L** | **L** |

\*S-Strong;M-Medium;L-Low



Fifth Semester



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| **CourseCode** |  | **RProgramming** | **L** | **T** | **P** | **C** |
| **Core/elective/Supportive** | **Core:8** | **6** | **0** | **0** | **4** |
| **Pre- requisite** | **None** | **Syllabusversion** | **I** |
| **CourseObjectives** |
| * Toexposethestudent sotthefundamentalconcepts ofRProgramming
 |
| **ExpectedCourseOutcomes** |
| 1 | UnderstandthebasicsinRprogrammingintermsofconstructs,controlstatements,stringfunctions | **K2** |
| 2 | UnderstandtheuseofRforBigDataanalytics | **K2** |
| 3 | ApplyR programmingfor Text processing | **K3** |
| 4 | Appreciateandapplythe Rprogrammingfromastatistical perspective | **K3** |
| **K1–Remember K2 –Understand K3 –applyK4-AnalyzeK5–evaluateK6-Create** |
|  |
| **UNITI** | **IntroductiontoR** | **18** |
| Introducing to R – R Data Structures – Help Functions in R – Vectors – Scalars – Declarations –Recycling–CommonVector Operations–Using allandany–Vectorizedoperations – NAandNULLvalues–Filtering–Victoriesedif-thenelse– VectorElementnames. |
| **UNITII** | **Matricesandoperations** | **18** |
| Creating matrices – Matrix Operations – Applying Functions to Matrix Rows and Columns – Addinganddeletingrowsandcolumns-Vector/MatrixDistinction – AvoidingDimensionReduction –HigherDimensional arrays – lists – Creating lists – General list operations – Accessing list components andvalues– applyingfunctions to lists– recursive lists. |
| **UNITIII** | **DataFrames** | **18** |
| Creating Data Frames – Matrix-like operations in frames – merging Data frames – Applying functionsto Data Frames – Factors and Tables – Factors and levels – Common Functions used with factors –Working with tables – Other factors and table related functions – Control statements – Arithmetic andBoolean operators and values – Default Values for arguments – Returning Boolean Values – Functionsareobjects–Environment andscopeissues – WritingUpstairs–Recursion–Replacement functions–ToolsforComposingfunction code– Math and Simulation inR. |
| **UNITIV** | **ClassesandObjects** | **18** |
| S3 Classes – S4 Classes – Managing your objects – Input/output – accessing keyboard and monitor –readingandwritingfiles–accessingtheinternet–StringManipulation –Graphics –CreatingGraphs–CustomizingGraphs –SavingGraphstofiles –CreatingThree-Dimensionalplots. |
| **UNITV** | **ModellinginR** | **18** |
| InterfacingRtootherlanguages –ParallelR– BasicStatistics–LinearModel–Generalized Linearmodels–Non-linearModels –TimeSeriesandAuto-Correlation–Clustering. |
| **TotalLectureHours** | **90****Hours** |

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| **TextBook(s)** |
| **1** | NormanMatloff, “TheArtofRProgramming:ATourofStatisticalSoftwareDesign”,NoStarchPress,2011. |
| **2** | JaredP. Lander,“RforEveryone:AdvancedAnalyticsand Graphics”,Addison-WesleyData&AnalyticsSeries,2013. |
| **ReferenceBook(s)** |
| **1** | MarkGardner,“BeginningR –TheStatisticalProgrammingLanguage”, Wiley,2013. |
| **2** | RobertKnell,“IntroductoryR:ABeginner‟sGuidetoDataVisualisation,StatisticalAnalysisandprogramminginR”,AmazonDigitalSouthAsiaServicesInc,2013.RichardCotton(2013).LearningR,O‟ReillyMedia. |
| **3** | GarretGrolemund(2014).Hands-onProgrammingwithR.O‟ReillyMedia,Inc. |
| **4** | RogerD.Peng(2018).R ProgrammingforDataScience. LeanPublishing. |
|  | **RelatedOnlineContents(MOOC,SWAYAM,NPTEL,Websitesetc)** |  |
| **1** | [**https://onlinecourses.swayam2.ac.in/aic20\_sp06/preview**](https://onlinecourses.swayam2.ac.in/aic20_sp06/preview) |  |
| **2** | [**https://onlinecourses.swayam2.ac.in/arp19\_ap79/preview**](https://onlinecourses.swayam2.ac.in/arp19_ap79/preview) |  |
| **CourseDesignedby :** |

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|  | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** |
| **CO1** | **M** | **L** | **L** | **L** | **L** | **L** | **L** | **L** | **L** | **L** |
| **CO2** | **M** | **L** | **L** | **L** | **L** | **L** | **L** | **L** | **L** | **L** |
| **CO3** | **S** | **M** | **L** | **L** | **L** | **L** | **L** | **L** | **L** | **L** |
| **CO4** | **S** | **S** | **M** | **L** | **L** | **L** | **L** | **L** | **L** | **L** |

\*S-Strong;M-Medium;L-Low



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| **CourseCode** |  | **RProgrammingLab** | **L** | **T** | **P** | **C** |
| **Core/elective/Supportive** | **CoreLab:6** | **0** | **0** | **6** | **4** |
| **Pre- requisite** | **None** | **Syllabus****version** | **I** |
| **CourseObjectives** |
| * Toexposethestudent sotthefundamentalconcepts ofRProgramming
 |
| **ExpectedCourseOutcomes** |
| 1 | Understandthebasicsin Rprogrammingin termsofconstructs, controlstatements,stringfunctions | **K2** |
| 2 | UnderstandtheuseofRforBigDataanalytics | **K2** |
| 3 | ApplyR programmingfor Text processing | **K3** |
| 4 | Appreciateandapplythe Rprogrammingfromastatistical perspective | **K3** |
| **K1–RememberK2 –Understand K3–applyK4-AnalyzeK5–evaluateK6-Create** |
|  |
| **ListofPrograms** |
| 1. RExpressionsandDataStructures
2. Manipulationofvectorsandmatrix
3. OperatorsonFactorsinR
4. DataFramesinR
5. ListsandOperators
6. Workingwith loopingstatements.
7. GraphsinR
8. 3D plotsin R
 |
| **TotalLectureHours** | **90****Hours** |
| **TextBook(s)** |
| **1** | NormanMatloff,“TheArtofRProgramming:A TourofStatisticalSoftwareDesign”,NoStarchPress,2011. |
| **2** | JaredP. Lander,“RforEveryone:AdvancedAnalyticsand Graphics”,Addison-WesleyData&AnalyticsSeries,2013. |
| **ReferenceBook(s)** |
| **1** | MarkGardner,“BeginningR –TheStatisticalProgrammingLanguage”, Wiley,2013. |
| **2** | RobertKnell,“IntroductoryR:ABeginner‟sGuidetoDataVisualisation,StatisticalAnalysisandprogramminginR”,Amazon DigitalSouth AsiaServicesInc,2013. RichardCotton(2013).LearningR,O‟ReillyMedia. |
| **3** | GarretGrolemund(2014).Hands-onProgrammingwithR.O‟ReillyMedia,Inc. |
| **4** | RogerD.Peng(2018).R ProgrammingforDataScience. LeanPublishing. |
|  | **RelatedOnlineContents(MOOC,SWAYAM,NPTEL,Websitesetc)** |  |
| **1** | [**https://onlinecourses.swayam2.ac.in/aic20\_sp06/preview**](https://onlinecourses.swayam2.ac.in/aic20_sp06/preview) |  |
| **2** | [**https://onlinecourses.swayam2.ac.in/arp19\_ap79/preview**](https://onlinecourses.swayam2.ac.in/arp19_ap79/preview) |  |
| **CourseDesignedby :** |

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|  | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** |
| **CO1** | **M** | **L** | **L** | **L** | **L** | **L** | **L** | **L** | **L** | **L** |
| **CO2** | **M** | **L** | **L** | **L** | **L** | **L** | **L** | **L** | **L** | **L** |
| **CO3** | **S** | **M** | **L** | **L** | **L** | **L** | **L** | **L** | **L** | **L** |
| **CO4** | **S** | **S** | **M** | **L** | **L** | **L** | **L** | **L** | **L** | **L** |

\*S-Strong;M-Medium;L-Low



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| **CourseCode** |  | **BigDataAnalytics** | **L** | **T** | **P** | **C** |
| **Core/elective/Supportive** | **Core:9** | **6** | **0** | **0** | **4** |
| **Pre- requisite** | None | **Syllabusversion** | **I** |
| **CourseObjectives** |
| * TointroducetheconceptofBigdata analytics
 |
| **ExpectedCourseOutcomes** |
| 1 | Understandthekeyissuesinbigdatamanagementanditsassociatedapplicationsinintelligentbusinessandscientificcomputing. | **K2** |
| 2 | UnderstandtheconceptsofHadoopDistributedfilesystemandhadoopfilesysteminterfaces. | **K2** |
| 3 | Illustratetheconceptsof PIG andHIVE | **K2** |
| 4 | Identifythecharacteristicsofdatasetsandcomparethetrivialdataandbigdataforvariousapplications. | **K3** |
| **K1–Remember K2 –Understand K3–applyK4-AnalyzeK5–evaluateK6-Create** |
|  |
| **UNITI** | **IntroductiontoData** | **17** |
| Types of Digital Data, Introduction to Big Data, Big Data Analytics, History of Hadoop, ApacheHadoop,AnalysingDatawithUnix tools,AnalysingDatawithHadoop,HadoopStreaming, HadoopEchoSystem,IBMBigDataStrategy,Introductionto InfosphereBigInsightsandBigSheets. |
| **UNITII** | **IntroductiontoHDFS** | **19** |
| HDFS(Hadoop Distributed File System) The Design of HDFS, HDFS Concepts, Command LineInterface,Hadoopfilesysteminterfaces,Dataflow,DataIngestwithFlumeandScoopandHadooparchives,HadoopI/O:Compression, Serialization,AvroandFile-BasedDatastructures. |
| **UNITIII** | **Jobs & Tasks** | **17** |
| MapReduceAnatomyof aMapReduceJobRun,Failures, JobScheduling,Shuffleand Sort,TaskExecution,Map ReduceTypesand Formats, MapReduceFeatures. |
| **UNITIV** | **HadoopEcoSystemPig** | **18** |
| Hadoop Eco System Pig : Introduction to PIG, Execution Modes of Pig, Comparison of Pig withDatabases, Grunt, Pig Latin, User Defined Functions, Data Processing operators. Hive : Hive Shell,Hive Services, Hive Metastore, Comparison with Traditional Databases, HiveQL, Tables, QueryingData and User Defined Functions. Hbase :HBasics, Concepts, Clients, Example, Hbase VersusRDBMS.BigSQL:Introduction |
| **UNITV** | **DataAnalyticswithR MachineLearning** | **19** |
| DataAnalyticswithRMachineLearning:Introduction,Supervised Learning,UnsupervisedLearning,CollaborativeFiltering.BigDataAnalyticswithBigR. |
| **TotalLectureHours** | **90** |

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|  | **Hours** |
| **TextBook(s)** |
| **1** | TomWhite“Hadoop:TheDefinitiveGuide”ThirdEditon,O‟reilyMedia,2012. |
| **2** | SeemaAcharya,SubhasiniChellappan,"BigData Analytics"Wiley2015.References. |
| **3** | MichaelBerthold,DavidJ.Hand,"IntelligentDataAnalysis”,Springer,2007. |
| **4** | JayLiebowitz,“BigData andBusinessAnalytics”AuerbachPublications,CRCpress(2013) |
| **5** | TomPlunkett,MarkHornick,“UsingRtoUnlocktheValueofBigData:BigDataAnalyticswith Oracle R Enterprise and Oracle R Connector for Hadoop”, McGraw-Hill/Osborne Media(2013),Oracle press. |
| **6** | AnandRajaramanandJefreyDavidUlman, “MiningofMassiveDatasets”,CambridgeUniversityPress, 2012. |
| **ReferenceBook(s)** |
| **1** | BillFranks,“TamingtheBigDataTidalWave:FindingOpportunitiesinHugeDataStreamswithAdvancedAnalytics”,JohnWiley&sons,2012. |
| **2** | GlenJ.Myat, “MakingSense ofData”, JohnWiley& Sons,2007 |
| **3** | PeteWarden,“BigDataGlossary”,O‟Reily,2011. |
| **4** | MichaelMineli,MicheleChambers,AmbigaDhiraj,"BigData,BigAnalytics:EmergingBusiness IntelligenceandAnalyticTrendsforToday's Businesses",WileyPublications,2013. |
| **5** | ArvindSathi,“BigDataAnalytics:DisruptiveTechnologiesforChangingtheGame”,MCPress,2012 |
| **6** | PaulZikopoulos,DirkDeRoos,KrishnanParasuraman,ThomasDeutsch,JamesGiles,DavidCorigan,"HarnessthePowerofBigDataTheIBMBigDataPlatform",TataMcGrawHill Publications,2012 |
|  | **RelatedOnlineContents(MOOC,SWAYAM,NPTEL,Websitesetc)** |  |
| **1** | [**https://onlinecourses.swayam2.ac.in/aic20\_sp06/preview**](https://onlinecourses.swayam2.ac.in/aic20_sp06/preview) |  |
| **2** | [**https://onlinecourses.swayam2.ac.in/arp19\_ap79/preview**](https://onlinecourses.swayam2.ac.in/arp19_ap79/preview) |  |
| **CourseDesignedby :** |

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|  | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** |
| **CO1** | **L** | **L** | **L** | **L** | **L** | **L** | **L** | **L** | **L** | **L** |
| **CO2** | **M** | **L** | **L** | **L** | **L** | **L** | **L** | **L** | **L** | **L** |
| **CO3** | **S** | **M** | **L** | **L** | **L** | **L** | **L** | **L** | **L** | **L** |
| **CO4** | **S** | **M** | **L** | **L** | **L** | **L** | **L** | **L** | **L** | **L** |
| **CO5** | **S** | **M** | **L** | **L** | **L** | **L** | **L** | **L** | **L** | **L** |

\*S-Strong;M-Medium;L-Low



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| **CourseCode** |  | **CapstoneProjectWorkPhaseII** | **L** | **T** | **P** | **C** |
| **Core/elective/Supportive** | **SkillBasedSubject3** | **0** | **0** | **6** | **3** |
| **Pre- requisite** | * StudentsshouldhavecompletedCapstoneProjectWork Phase –I
* Strong coding skills in any oneprogrammingpaper
 | **Syllabusversion** | **I** |
| **CourseObjectives** |
| Themain objectives ofthis courseareto:* Tounderstandand selectthetask basedontheircoreskills.
* Togettheknowledge aboutanalyticalskillforsolvingtheselectedtask.
* Togetconfidenceforimplementingthetaskandsolvingtherealtimeproblems.
 |
| **ExpectedCourseOutcomes** |
| Onthesuccessful completionofthecourse,student willbe ableto: |
| 1 | Selectappropriateinput,output,formandtabledesign | **K3** |
| 2 | Designcodetomeettheinputrequirementsandtoachievetherequiredoutput | **K6** |
| 3 | Composeaprojectreport incorporatingthe featuresoftheproject | **K6** |
| **K1–Remember K2 –Understand K3–applyK4-AnalyzeK5–evaluateK6-Create** |
|  |
| **Aimoftheprojectwork** |
| 1. Theaimof theprojectworkis toacquirepracticalknowledgeonthe implementationoftheprogrammingconcepts studied.
2. Each student should carry out individually one project work and it may be a work using thesoftware packages that they have learned or the implementation of concepts from the papers studiedorimplementation of anyinnovative ideafocusing on application oriented concepts.
3. Theprojectwork should be compulsorilydonein thecollegeonlyunderthe supervision of thedepartmentstaff concerned.

**VivaVoce**1. Viva-Voce will be conducted at the end of the year by both Internal (Respective Guides) andExternalExaminers,afterdulyverifyingtheAnnexureReport availableinthe College,foratotal of75 marks at the lastdayof thepractical session.
2. Outof75marks, 45 marksforproject reportand 30 MarksforVivaVoce.
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| **ProjectWork Format** |
| **PROJECTWORK****TITLEOFTHEDISSERTATION**Bonafide Work Done bySTUDENT NAMEREG.NO.Dissertationsubmitted inpartialfulfillment oftherequirementsfor theaward of<NameoftheDegree>ofBharathiar University,Coimbatore-46.CollegeLogoSignatureof theGuide Signature of the HODSubmittedfortheViva-VoceExaminationheldon InternalExaminer External ExaminerMonth– Year |
| **CONTENTS****AcknowledgementContents****Synopsis**1. **Introduction**
	1. OrganizationProfile
	2. SystemSpecification
		1. HardwareConfiguration
		2. SoftwareSpecification
2. **SystemStudy**
	1. ExistingSystem
		1. Drawbacks
	2. ProposedSystem
		1. Features
3. **SystemDesign andDevelopment**
	1. FileDesign
	2. InputDesign
	3. OutputDesign
	4. DatabaseDesign
	5. SystemDevelopment
		1. DescriptionofModules(Detailedexplanation abouttheprojectwork)

**4SoftwareTestingandImplementationConclusion****BibliographyAppendices**1. DataFlow Diagram
2. TableStructure
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| 1. SampleCoding
2. Sample Input
3. SampleOutput
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|  | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** |
| **CO1** | **S** | **S** | **S** | **S** | **S** | **L** | **L** | **L** | **L** | **L** |
| **CO2** | **S** | **S** | **S** | **S** | **S** | **M** | **M** | **L** | **L** | **L** |
| **CO3** | **S** | **S** | **S** | **S** | **S** | **M** | **M** | **L** | **L** | **L** |

\*S-Strong;M-Medium;L-Low



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| **CourseCode** |  | **BusinessDataAnalytics** | **L** | **T** | **P** | **C** |
| **Core/elective/Supportive** | **Elective:I** | **6** | **0** | **0** | **4** |
| **Pre- requisite** | **None** | **Syllabusversion** | **I** |
| **CourseObjectives** |
| * Tointroducethefundamentalconcepts ofBusinessdataanalytics and associatedmethodologies
 |
|  |
| **ExpectedCourseOutcomes** |
| 1 | Understandandcriticallyapplytheconceptsand methods ofbusiness analytics | **K2** |
| 2 | Demonstrationthevariousmethodologiesofdescriptivestatistics | **K2** |
| 3 | Understandingof modelinguncertaintyand statisticalinference | **K2** |
| 4 | Understandingofanalyticalframeworks | **K2** |
| **K1–Remember K2 –Understand K3–applyK4-AnalyzeK5–evaluateK6-Create** |
|  |
| **UNITI** | **OVERVIEWOFBUSINESS ANALYTICS** | **18** |
| Introduction – Drivers for Business Analytics – Applications of Business Analytics: Marketing andSales, Human Resource, Healthcare, Product Design, Service Design, Customer Service and Support –SkillsRequiredforaBusinessAnalyst– Frameworkfor BusinessAnalyticsLifeCycleforBusinessAnalyticsProcess. |
| **UNITII** | **ESSENTIALSOFBUSINESSANALYTICS** | **17** |
| Descriptive Statistics – Using Data – Types of Data – Data Distribution Metrics: Frequency, Mean,Median,Mode,Range,Variance,StandardDeviation,Percentile,Quartile,z-Score,Covariance,Correlation–DataVisualization:Tables,Charts,LineCharts,BarandColumnChart,BubbleChart,HeatMap–DataDashboards. |
| **UNITIII** | **MODELINGUNCERTAINTYANDSTATISTICALINFERENCE** | **19** |
| Modeling Uncertainty: Events and Probabilities – Conditional Probability – Random Variables –Discrete Probability Distributions – Continuous Probability Distribution – Statistical Inference: DataSampling–SelectingaSample–PointEstimation–SamplingDistributions–IntervalEstimation–HypothesisTesting. |
| **UNITIV** | **ANALYTICSUSING HADOOPAND MAPREDUCEFRAMEWOR**K | **19** |
| Introducing Hadoop – RDBMS versus Hadoop – Hadoop Overview – HDFS (Hadoop Distributed FileSystem) – Processing Data with Hadoop – Introduction to MapReduce – Features of MapReduce –AlgorithmsUsingMap-Reduce:Matrix-VectorMultiplication,RelationalAlgebraOperations,Groupingand Aggregation– Extensions to MapReduce. |
| **UNITV** | **OTHERDATAANALYTICALFRAMEWORKS** | **17** |
| OverviewofApplicationdevelopmentLanguagesforHadoop–PigLatin–Hive–HiveQueryLanguage(HQL)–IntroductiontoPentaho,JAQL– IntroductiontoApache:Sqoop,DrillandSpark,ClouderaImpala–IntroductiontoNoSQLDatabases–Hbase andMongoDB. |
| **TotalLectureHours** | **90****Hours** |
| **TextBook(s)** |
| **1** | VigneshPrajapati,“BigDataAnalytics withRandHadoop”,PacktPublishing,2013. |

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| **2** | UmeshRHodeghatta,UmeshaNayak,“BusinessAnalyticsUsingR–APracticalApproach”,Apress,2017. |
| **ReferenceBook(s)** |
| **1** | AnandRajaraman,JeffreyDavidUllman,“MiningofMassiveDatasets”, CambridgeUniversityPress, 2012. |
| **2** | JeffreyD. Camm,James J.Cochran, MichaelJ. Fry,JeffreyW.Ohlmann, DavidR. Anderson,“EssentialsofBusiness Analytics”,CengageLearning,secondEdition,2016 |
| **3** | U.DineshKumar, “BusinessAnalytics:TheScienceofData-DrivenDecisionMaking”,Wiley,2017. |
| **4** | A.Ohri,“RforBusiness Analytics”,Springer,20127.RuiMiguelForte,“MasteringPredictiveAnalyticswithR”,PacktPublication,2015. |
|  | **RelatedOnlineContents(MOOC,SWAYAM,NPTEL,Websitesetc)** |  |
| **1** | [**https://onlinecourses.swayam2.ac.in/aic20\_sp06/preview**](https://onlinecourses.swayam2.ac.in/aic20_sp06/preview) |  |
| **2** | [**https://onlinecourses.swayam2.ac.in/arp19\_ap79/preview**](https://onlinecourses.swayam2.ac.in/arp19_ap79/preview) |  |
| **CourseDesigned by :** |

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|  | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** |
| **CO1** | **L** | **L** | **L** | **L** | **L** | **L** | **L** | **L** | **L** | **L** |
| **CO2** | **M** | **M** | **L** | **L** | **L** | **L** | **L** | **L** | **L** | **L** |
| **CO3** | **S** | **M** | **M** | **L** | **L** | **L** | **L** | **L** | **L** | **L** |
| **CO4** | **S** | **S** | **S** | **L** | **L** | **L** | **L** | **L** | **L** | **L** |

\*S-Strong;M-Medium;L-Low



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| **CourseCode** |  | **SocialNetworkAnalysis** | **L** | **T** | **P** | **C** |
| **Core/elective/Supportive** | **Elective:I** | **6** | **0** | **0** | **4** |
| **Pre- requisite** | **None** | **Syllabusversion** | **I** |
| **CourseObjectives** |
| * Toexplainthemethodologiesusedinsocialnetworkanalysis
 |
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| **ExpectedCourseOutcomes** |
| 1 | Understandabroad rangeof network conceptsand theories. | **K2** |
| 2 | Appreciatehow network analysiscan contribute toincreasingknowledgeaboutdiverseaspectsofsociety. | **K2** |
| 3 | Usearelationalapproachtoanswerquestionsofinteresttothem(i.e.beabletoapply'networkthinking'). | **K3** |
| 4 | Analysesocial network datausingvarious softwarepackages. | **K3** |
| 5 | Presentresultsfromsocialnetworkanalysis,bothorallyandinwriting. | **K5** |
| **K1–Remember K2 –Understand K3–applyK4-AnalyzeK5–evaluateK6-Create** |
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| **UNITI** | **CLUSTERINGANDCLASSIFICATION** | **17** |
| Supervised Learning–Decisiontree- Naïve BayesianTextClassification-SupportVectorMachines- Ensemble of Classifiers – Unsupervised Learning – K-means Clustering – Hierarchical Clustering –PartiallySupervisedLearning–Markov Models –Probability-BasedClustering–VectorSpaceModel |
| **UNITII** | **SOCIALMEDIAMINING** | **17** |
| Data Mining Essentials –Data Mining Algorithms - Web Content Mining –Latent semantic Indexing –AutomaticTopicExtraction–OpinionMiningandSentimentAnalysis–DocumentSentimentClassification |
| **UNITIII** | **EXTRACTION AND MINING COMMUNITIES IN WEB SOCIALNETWORKS** | **18** |
| Extracting evolution of Web Community from a Series of Web Archive – Detecting Communities inSocial Networks – Definition of Community – Evaluating Communities – Methods for CommunityDetection&Mining–ApplicationsofCommunityMiningAlgorithms–ToolsforDetectingCommunities–SocialNetworkInfrastructureandCommunities–DecentralizedOnlineSocialNetworks–Multi-RelationalCharacterizationofDynamicSocialNetworkCommunities |
| **UNITIV** | **HUMANBEHAVIORANALYSIS AND PRIVACYISSUES** | **19** |
| Understanding and Predicting Human Behavior for Social Communities – Use Data Management,InferenceandDistribution–EnablingNewHumanExperiences–RealityMining–ContextAwareness–PrivacyinOnlineSocialNetworks–TrustinOnlineEnvironment–TrustModelsBasedon Subjective Logic – Trust Network Analysis – Trust Transitivity Analysis – Combining Trust andReputation–TrustDerivationBasedonTrustComparisons–AttackSpectrumandCountermeasures. |

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| **UNITV** | **VISUALIZATIONANDAPPLICATIONSOFSOCIALNETWORKS** | **19** |
| Graph Theory – Centrality – Clustering – Node-Edge Diagrams – Matrix representation – VisualizingOnline Social Networks – Visualizing Social Networks with Matrix-Based Representations – Node-Link Diagrams – Hybrid Representations – Applications – Covert Networks – Community Welfare –Collaboration Networks – Co-Citation Networks – Recommendation in Social Media: Challenges –ClassicalRecommendationAlgorithms–RecommendationUsingSocialContext–EvaluatingRecommendations |
| **TotalLectureHours** | **90****Hours** |
| **TextBook(s)** |
| **1** | 1.PeterMika,“SocialnetworksandtheSemanticWeb”,Springer,2007. |
| **2** | 2.BorkoFurht,“HandbookofSocialNetworkTechnologies andApplications”,Springer,2010. |
| **ReferenceBook(s)** |
| **1** | Bing Liu, “WebDataMining:ExploringHyperlinks,Contents,andUsageData(DataCentricSystemsandApplications)”,Springer;SecondEdition,2011. |
| **2** | RezaZafarani,MohammadAliAbbasi,HuanLiu,”SocialMediaMining”,CambridgeUniversityPress,2014. |
| **3** | GuandongXu,Yanchun Zhangand Lin Li,“Web MiningandSocialNetworkingTechniquesandapplications”,Springer,2011 |
| **4** | DionGohandSchubertFoo,“Socialinformationretrievalsystems:emergingtechnologiesandApplicationsforsearchingtheWebeffectively”,IdeaGroup,2007. |
|  | **RelatedOnlineContents(MOOC,SWAYAM,NPTEL,Websitesetc)** |  |
| **1** | [**https://onlinecourses.swayam2.ac.in/aic20\_sp06/preview**](https://onlinecourses.swayam2.ac.in/aic20_sp06/preview) |  |
| **2** | [**https://onlinecourses.swayam2.ac.in/arp19\_ap79/preview**](https://onlinecourses.swayam2.ac.in/arp19_ap79/preview) |  |
| **CourseDesignedby :** |

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|  | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** |
| **CO1** | **L** | **L** | **L** | **L** | **L** | **L** | **L** | **L** | **L** | **L** |
| **CO2** | **M** | **L** | **L** | **L** | **L** | **L** | **L** | **L** | **L** | **L** |
| **CO3** | **S** | **M** | **L** | **L** | **L** | **L** | **L** | **L** | **L** | **L** |
| **CO4** | **S** | **M** | **M** | **L** | **L** | **L** | **L** | **L** | **L** | **L** |
| **CO5** | **S** | **S** | **S** | **L** | **L** | **L** | **L** | **L** | **L** | **L** |

\*S-Strong;M-Medium;L-Low



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| **CourseCode** |  | **ArtificialNeuralNetworkandFuzzySystems** | **L** | **T** | **P** | **C** |
| **Core/elective/Supportive** | **Elective:I** | **6** | **0** | **0** | **4** |
| **Pre- requisite** | **None** | **Syllabusversion** | **I** |
| **CourseObjectives** |
| * Tointroducetheconcepts ofartificial neuralnetworks andfuzzysystems
* To explain thebasic mathematical elements ofthetheoryof fuzzysets.
 |
| **ExpectedCourseOutcomes** |
| 1 | Explaintheconceptsof neuralnetworksand ,fuzzylogic | **K2** |
| 2 | Understandingof the basic mathematicalelements ofthe theoryoffuzzysets. | **K2** |
| 3 | Understandingthe differencesandsimilaritiesbetween fuzzysetsand classicalsetstheories | **K2** |
| 4 | Solveproblems that areappropriatelysolved byneural networksand fuzzylogic | **K3** |
| **K1–Remember K2 –Understand K3–applyK4-AnalyzeK5–evaluateK6-Create** |
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| **UNITI** | **BasicConcepts** | **17** |
| Basicconcepts-singlelayerperceptron-Multilayerperceptron-Adaline-Madaline-Learningrules-Supervisedlearning-Backpropagationnetworks-Trainingalgorithm,Advancedalgorithms-Adaptivenetwork-Radial basis network modular network-Applications |
| **UNITII** | **UnsupervisedLearning** | **19** |
| Introduction-unsupervisedlearning–Competitivelearningnetworks-Kohonenselfuantizatinetworks-Learning vectoruantization – Hebbian learning – Hopfield network-Content addressablenature,BinaryHopfieldnetwork,ContinuousHopfieldnetworkTravellingSalespersonproblem–Adaptiveresonancetheory–BidirectionalAssociativeMemory-PrinciplecomponentAnalysis |
| **UNITIII** | **FuzzyLogic** | **18** |
| Introduction–crispsetsanoverview–thenotionoffuzzysets–Basicconceptsoffuzzysets–classicallogicanoverview–Fuzzylogic.Operationsonfuzzysets-fuzzycomplement–fuzzyunion–fuzzyintersection –combinationsofoperations–generalaggregationoperations |
| **UNITIV** | **FuzzyLogicContd..** | **17** |
| Crispandfuzzyrelations –binaryrelations–binaryrelationsonasingleset–equivalenceandsimilarityrelations–Compatibilityortolerancerelations–orderings–Membershipfunctions–methodsofgeneration–defuzzificationmethods |
| **UNITV** | **NeuroFuzzySystems** | **19** |
| Adaptive Neuro Fuzzy based inference systems – classification and regression trees: decision tress,Cart algorithm – Data clustering algorithms: K means clustering, Fuzzy C means clustering, Mountainclustering, Subtractive clustering – rule base structure identification – Neuro fuzzy control: FeedbackControlSystems,ExpertControl,InverseLearning,SpecializedLearning,BackpropagationthroughReal–TimeRecurrentLearning. |
| **TotalLectureHours** | **90****Hours** |
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| **TextBook(s)** |
| **1** | “NeuroFuzzyandSoftcomputing”,JangJ.S.R.,SunC.TandMizutaniE–Pearson education,2004 |
| **2** | ”FundamentalsofNeuralNetworks”, LaureneFauseett,PrenticeHall India,NewDelhi,1994. |
| **ReferenceBook(s)** |
| **1** | ”FuzzyLogicEngineeringApplications”,TimothyJ.Ross,McGrawHill,NewYork,1997. |
| **2** | “Neuralnetworks, Fuzzylogics,and Geneticalgorithms”,S.RajasekaranandG.A.VijayalakshmiPaiPrenticeHallofIndia,2003 |
| **3** | ”FuzzySetsandFuzzyLogic”,GeorgeJ.KlirandBoYuan,PrenticeHall Inc.,NewJersey,1995 |
| **4** | “PrinciplesofSoftComputing”S.N.Sivanandam, S.N.DeepaWileyIndiaPvt Ltd. |
|  | **RelatedOnlineContents(MOOC,SWAYAM,NPTEL,Websitesetc)** |  |
| **1** | [**https://onlinecourses.swayam2.ac.in/aic20\_sp06/preview**](https://onlinecourses.swayam2.ac.in/aic20_sp06/preview) |  |
| **2** | [**https://onlinecourses.swayam2.ac.in/arp19\_ap79/preview**](https://onlinecourses.swayam2.ac.in/arp19_ap79/preview) |  |
| **CourseDesignedby :** |

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|  | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** |
| **CO1** | **L** | **L** | **L** | **L** | **L** | **L** | **L** | **L** | **L** | **L** |
| **CO2** | **M** | **L** | **L** | **L** | **L** | **L** | **L** | **L** | **L** | **L** |
| **CO3** | **S** | **M** | **L** | **L** | **L** | **L** | **L** | **L** | **L** | **L** |
| **CO4** | **S** | **M** | **L** | **L** | **L** | **L** | **L** | **L** | **L** | **L** |

\*S-Strong;M-Medium;L-Low



SixthSemester



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| **CourseCode** |  | **LinuxandShellProgramming** | **L** | **T** | **P** | **C** |
| **Core/elective/Supportive** | **Core:10** | **6** | **0** | **0** | **4** |
| **Pre- requisite** | **BasicknowledgeaboutOperatingSystems** | **Syllabusversion** | **I** |
| **CourseObjectives** |
| * TointroducetheconceptsofLinuxoperatingsystem
* ToexplainthevariousconstructsassociatedwithLinux
 |
| **ExpectedCourseOutcomes** |
| 1 | IllustratethevariousdirectoryandfiecommandsinLINUX | **K2** |
| 2 | ExplainthemethodsofsecuringfilesinLinux | **K2** |
| 3 | ExplainthevariouskernelcomponentsofLinux | **K2** |
| 4 | Applythevariouscommandsof Linuxtoperformseveraloperations | **K3** |
| 5 | SolvevariousnetworkadministrativeissuesbywritingLinuxshellscripts | **K3** |
| **K1–Remember K2 –Understand K3–applyK4-AnalyzeK5–evaluateK6-Create** |
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| **UNITI** | **IntroductiontoLinux** | **15** |
| IntroductiontoLINUXOperatingSystem:Introduction-TheLINUXOperatingSystem-Basiccommandsin Linux |
| **UNITII** | **ManagingFiles&Directories** | **18** |
| ManagingFilesandDirectories:Introduction–Directory CommandsinLINUX–FileCommandsinLINUX.Creatingfilesusingthevieditor:Texteditors–Thevieditor.ManagingDocuments:Locatingfilesin LINUX–Standardfiles–Redirection–Filters–Pipes. |
| **UNITIII** | **Shellscript** | **20** |
| SecuringfilesinLINUX:Fileaccesspermissions–viewingFileaccesspermissions–ChangingFileaccesspermissions.AutomatingTasksusingShellScripts:Introduction–Variables-LocalandGlobalShellvariables–CommandSubstitution. |
| **UNITIV** | **Conditional&LoopingStatements** | **19** |
| Using Conditional Execution in Shell Scripts: Conditional Execution – The case…esac Construct.Managing repetitive tasks using Shell Scripts: Using Iteration in Shell Scripts – The while construct –untilconstruct–forconstruct–breakandcontinuecommands–SimpleProgramsusingShellScripts. |
| **UNITV** | **Kernel&SystemRecovery** | **18** |
| LinuxKernel-KernelComponents-compilingakernel-Customizingakernel–systemstartup-Customizingthebootprocess-SystemRecovery |
| **TotalLectureHours** | **90****Hours** |
| **TextBook(s)** |
| **1** | OperatingSystemLINUX,NIIT,PHI,2006,EasternEconomyEdition. |
| **ReferenceBook(S)** |
| **1** | RichardPetersen,Linux:TheComplete Reference,SixthEdition,TataMcGraw-HillPublishingCompanyLimited, NewDelhi, Edition2008. |
|  | **RelatedOnlineContents(MOOC,SWAYAM,NPTEL,Websitesetc)** |  |

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| **1** | [**https://onlinecourses.swayam2.ac.in/aic20\_sp06/preview**](https://onlinecourses.swayam2.ac.in/aic20_sp06/preview) |  |
| **2** | [**https://onlinecourses.swayam2.ac.in/arp19\_ap79/preview**](https://onlinecourses.swayam2.ac.in/arp19_ap79/preview) |  |
| **CourseDesignedby :** |

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|  | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** |
| **CO1** | **L** | **L** | **L** | **L** | **L** | **L** | **L** | **L** | **L** | **L** |
| **CO2** | **M** | **L** | **L** | **L** | **L** | **L** | **L** | **L** | **L** | **L** |
| **CO3** | **S** | **M** | **L** | **L** | **L** | **L** | **L** | **L** | **L** | **L** |
| **CO4** | **S** | **S** | **M** | **L** | **L** | **L** | **L** | **L** | **L** | **L** |
| **CO5** | **S** | **S** | **S** | **L** | **L** | **L** | **L** | **L** | **L** | **L** |

\*S-Strong;M-Medium;L-Low



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| **CourseCode** |  | **LinuxandShellProgrammingLab** | **L** | **T** | **P** | **C** |
| **Core/elective/Supportive** | **CoreLab:7** | **0** | **0** | **5** | **4** |
| **Pre- requisite** | * Basicknowledge Linux commands
 | **Syllabus****version** | **I** |
| **CourseObjectives** |
| Tointroduceheconceptsof Linux operatingsystemcommandsexecutionandvariousprogrammingconstructionin Linux shellscript. |
|  |
| **ExpectedCourseOutcomes** |
| 1 | Tocreatethedirectory,howtochange andremovethedirectory. | **K1** |
| 2 | ToevaluatetheconceptofshellscriptingprogramsbyusinganAWKandSEDcommands | **K2** |
| 3 | TodemonstratethebasicknowledgeofLinuxcommandsandfilehandlingutilitiesbyusingLinuxshellenvironment. | **K3** |
| **K1–Remember K2 –Understand K3–applyK4-AnalyzeK5–evaluateK6-Create** |
|  |
| **EXERCISE1** |  | **6** |
| WriteaShell scriptthat displayslist ofall thefiles inthecurrentdirectorytowhich theuserhasread,writeand executepermissions. |
| **EXERCISE2** |  | **6** |
| Writeanawk scriptto findthe numberofcharacters,words andlines inafile? |
| **EXERCISE3** |  | **9** |
| WriteaShellscriptthataccepts a filename,startingandendinglinenumbersasargumentsanddisplaysallthelinesbetween the givenlinenumbers? |
| **EXERCISE4** |  | **9** |
| Writeashellscript to sortnumber inascendingorder. |
| **EXERCISE5** |  | **12** |
| Writeashellscript(smallcalculator)thatadds, subtracts,multipliesanddividesthetwogivennumbers. |
| **EXERCISE6** |  | **9** |
| Writeashellscript to determinewhether a givennumberisa primenumberor not. |
| **EXERCISE7** |  | **12** |
| Writeashell scriptto printthe firstn Fibonaccinumbers. |
| **EXERCISE8** |  | **9** |
| Writeashellscript tofind theGCD oftwogivennumbers. |
| **EXERCISE9** |  | **9** |
| Writeashellscript tocheck whether given stringis palindromeor not. |
| **EXERCISE****10** |  | **9** |
| Writeashell scriptto findthefactorialofgiveninteger. |
| **TotalLectureHours** | **90****Hours** |
| **TextBook(s)** |

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| **1** | OperatingSystemLINUX,NIIT,PHI,2006,EasternEconomyEdition. |
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| **ReferenceBook(S)** |
| **1** | RichardPetersen,Linux:TheCompleteReference,SixthEdition,TataMcGraw-HillPublishingCompanyLimited, NewDelhi, Edition2008. |
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| **CourseDesignedby :** |

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|  | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** |
| **CO1** | **S** | **M** | **L** | **L** | **L** | **L** | **L** | **L** | **L** | **L** |
| **CO2** | **S** | **S** | **M** | **L** | **L** | **L** | **L** | **L** | **L** | **L** |
| **CO3** | **S** | **S** | **S** | **L** | **L** | **L** | **L** | **L** | **L** | **L** |

\*S-Strong;M-Medium;L-Low



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| **CourseCode** |  | **ProjectWorkLab** | **L** | **T** | **P** | **C** |
| **Core/elective/Supportive** | **Core-11** | **0** | **0** | **3** | **6** |
| **Pre- requisite** | Studentsshouldhavethestrongknowledgeinanyone of theprogramminglanguagesin thiscourse. | **Syllabusversion** | **I** |
| **CourseObjectives** |
| Themain objectives ofthis courseareto:* Tounderstandand selectthetask basedontheircoreskills.
* Togettheknowledge aboutanalyticalskillforsolvingtheselectedtask.
* Togetconfidenceforimplementingthe taskand solvingthereal timeproblems.
* Expresstechnicalandbehavioralideasandthoughtinoralsettings.
* Prepareandconductoralpresentations
 |
| **ExpectedCourseOutcomes** |
| Onthesuccessfulcompletion ofthe course, studentwill beable to: |
| 1 | Formulate a real world problemanddevelopitsrequirementsdevelopa designsolutionforasetofrequirements | **K3** |
| 2 | Testandvalidatetheconformanceofthedevelopedprototypeagainsttheoriginalrequirementsof theproblem | **K5** |
| 3 | Workasaresponsiblememberandpossiblyaleaderofateamindevelopingsoftwaresolutions | **K3** |
| 4 | Expresstechnicalideas,strategiesandmethodologiesinwrittenform.Self-learn newtools,algorithmsandtechniquesthatcontributetothesoftwaresolutionof theproject | **K1-K4** |
| 5 | Generatealternativesolutions,comparethemandselecttheoptimumone | **K6** |
| **K1–Remember K2 –Understand K3–applyK4-AnalyzeK5–evaluateK6-Create** |
|  |
| **Aimoftheprojectwork** |
| 1. The aim of the project work is to acquire practical knowledge on the implementation of theprogrammingconcepts studied.
2. Each student should carry out individually one project work and it may be a work using thesoftware packages that they have learned or the implementation of concepts from the papers studiedorimplementation of anyinnovative ideafocusingon application oriented concepts.
3. Theprojectwork should be compulsorilydonein thecollegeonlyunderthe supervision of thedepartmentstaff concerned.

**VivaVoce**1. Viva-Voce will be conducted at the end of the year by both Internal (Respective Guides) andExternalExaminers,afterdulyverifyingtheAnnexureReport availableinthe College,foratotal of200marks at the last dayofthe practical session.
2. Outof200 marks,160marksforproject reportand 40marksfor VivaVoce.
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| **ProjectWork Format** |
| **PROJECTWORK****TITLEOFTHEDISSERTATION**Bonafide Work Done bySTUDENT NAMEREG.NO.Dissertationsubmitted inpartial fulfillmentoftherequirementsfor theaward of<NameoftheDegree>ofBharathiar University,Coimbatore-46.CollegeLogoSignatureof theGuide Signature of the HODSubmittedfortheViva-VoceExaminationheldon InternalExaminer External ExaminerMonth– Year |
| **CONTENTS****Acknowledgement** |



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| **ContentsSynopsis**1. **Introduction**
	1. OrganizationProfile
	2. SystemSpecification
		1. HardwareConfiguration
		2. SoftwareSpecification
2. **SystemStudy**
	1. ExistingSystem
		1. Drawbacks
	2. ProposedSystem
		1. Features
3. **SystemDesign andDevelopment**
	1. FileDesign
	2. InputDesign
	3. OutputDesign
	4. DatabaseDesign
	5. SystemDevelopment
		1. DescriptionofModules(Detailedexplanation abouttheprojectwork)
4. **TestingandImplementation**
5. **ConclusionBibliographyAppendices**
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| 1. DataFlow Diagram
2. TableStructure
3. SampleCoding
4. Sample Input
5. SampleOutput
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|  | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** |
| **CO1** | **S** | **S** | **S** | **S** | **M** | **L** | **L** | **L** | **L** | **L** |
| **CO2** | **S** | **S** | **S** | **S** | **M** | **L** | **L** | **L** | **L** | **L** |
| **CO3** | **S** | **S** | **S** | **S** | **M** | **M** | **M** | **L** | **L** | **L** |
| **CO4** | **S** | **S** | **S** | **S** | **M** | **M** | **M** | **L** | **L** | **L** |
| **CO5** | **S** | **S** | **S** | **S** | **M** | **M** | **M** | **L** | **L** | **L** |

\*S-Strong;M-Medium;L-Low



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| **CourseCode** |  | **MachineLearning** | **L** | **T** | **P** | **C** |
| **Core/elective/Supportive** | **Skillbasedsubject:4** | **4** | **0** | **0** | **3** |
| **Pre- requisite** | **None** | **Syllabusversion** | **I** |
| **CourseObjectives** |
| * Toexplain aboutthebasics ofmachine learning
 |
| **ExpectedCourseOutcomes** |
| 1 | Understandingofthefundamentalissuesandchallengesofmachinelearning:data,modelselection,modelcomplexity,etc. | **K2** |
| 2 | Understandingofthestrengthsandweaknessesofmanypopularmachinelearningapproaches. | **K2** |
| 3 | Explainabouttheconceptsofcomputationallearningtheoryanddimensionalityreduction | **K2** |
| 4 | AppreciatetheunderlyingmathematicalrelationshipswithinandacrossMachineLearningalgorithmsandtheparadigmsofsupervised andun-supervisedlearning. | **K3** |
| **K1–Remember K2 –Understand K3–applyK4-AnalyzeK5–evaluateK6-Create** |
|  |
| **UNITI** | **IntroductiontoLearning** | **12** |
| Algorithmicmodelsoflearning,Learningclassifiers,functions,relations,grammars,probabilisticmodels,valuefunctions,behaviorsandprogramsforexperience.Bayesian,maximumsomeposterior,andminimumdescriptionlengthframeworks. |
| **UNITII** | **LearningModels** | **12** |
| Parameter Estimation, sufficient statistics, decision trees, neural networks, support vector machines,Bayesian networks, bag of words classifiers, N-gram models; Markov and Hidden Markov models,probabilisticrelationalmodels,associationrules,nearestneighborclassifiers,locallyweightedregression,ensembleclassifiers. |
| **UNITIII** | **ComputationalLearning** | **12** |
| Computational Learning theory, mistake bound analysis, sample complexity analysis, VC dimension,Occam learning, accuracy and confidence boosting, Dimensionality reduction: Principal componentAnalysis,featureselection and visualization. |
| **UNITIV** | **UnsupervisedLearning** | **12** |
| UnsupervisedLearning:Clustering,mixturemodels,k-meansclustering,hierarchicalclustering,distributional clustering, Reinforcement learning; Learning from heterogeneous, distributed, data andknowledge. |

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| **UNITV** | **LearningApplications** | **12** |
| Selectedapplicationsindatamining,automatedknowledgeacquisition,patternrecognition,programsynthesis,textandlanguageprocessing,internet-basedinformationsystems,humancomputerinteraction,semanticweb,andbioinformaticsand computationalbiology. |
| **TotalLectureHours** | **60****Hours** |
| **TextBook(s)** |
| **1** | Bishop,C.(2006).PatternRecognitionandMachineLearning. Berlin:Springer-Verlag. |
|  | **ReferenceBook(s)** |  |
| **1** | Russel,S.AndNorving,P.(2003).ArtificialIntelligence:AModern Approach.2ndEdition,NewYork:Prentice-Hall. |
| **2** | Baldi,P.,Frasconi,P.,Smyth,P.(2002).Bioinformatics:AMachineLearningApproach.Cambridge,MA:MITPress. |
| **3** | Baldi,P.,Frasconi,P.,Smyth,P.(2003).Modelingthe InternetandtheWeb–ProbabilisticMethodsandAlgorithms.NewYork:Wiley. |
| **4** | Bishop,C.M.NeuralNetworksforpatternrecognition.NewYork: OxfordUniversitypress(1995). |
| **5** | Hastie,T.,Tibshirani,R.,andFriedman,J.(2001).TheelementsofStatisticalLearning–Datamining,Inference,andPrediction,Berlin:Springer-Verlag. |
| **6** | Cohen,P.R.(1995)EmpiricalMethodsinArtificial Intelligence.Cambridge,MA:MITPress. |
| **7** | Cowell,R.G.,Dawid,A.P., Lauritzen,S.L., andSpiegelhalter.D.J.(1999). GraphicalModelsandExpertSyatems. Berlin:Springer. |
|  | **RelatedOnlineContents(MOOC,SWAYAM,NPTEL,Websitesetc)** |  |
| **1** | [**https://onlinecourses.swayam2.ac.in/aic20\_sp06/preview**](https://onlinecourses.swayam2.ac.in/aic20_sp06/preview) |  |
| **2** | [**https://onlinecourses.swayam2.ac.in/arp19\_ap79/preview**](https://onlinecourses.swayam2.ac.in/arp19_ap79/preview) |  |
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|  | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** |
| **CO1** | **M** | **L** | **L** | **L** | **L** | **L** | **L** | **L** | **L** | **L** |
| **CO2** | **M** | **L** | **L** | **L** | **L** | **L** | **L** | **L** | **L** | **L** |
| **CO3** | **S** | **M** | **L** | **L** | **L** | **L** | **L** | **L** | **L** | **L** |
| **CO4** | **S** | **S** | **M** | **L** | **L** | **L** | **L** | **L** | **L** | **L** |

\*S-Strong;M-Medium;L-Low



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| **CourseCode** |  | **WebApplicationSecurity** | **L** | **T** | **P** | **C** |
| **Core/elective/Supportive** | **Elective:II** | **5** | **0** | **0** | **4** |
| **Pre- requisite** | **None** | **Syllabus****version** | **I** |
| **CourseObjectives** |
| * Tointroducetheconcepts of securityinwebapplications
* Toexplainabout crimeprevention androutinedutiesinapolicestation
 |
| **ExpectedCourseOutcomes** |
| 1 | Illustrate abouttheconceptofHTML,DHTML,CSSandJavaScript | **K2** |
| 2 | Explainthehistory,characteristics,technologies,concepts,usageinweb2.0andweb3.0 | **K2** |
| 3 | Applythe core concepts ofwebapplicationstocreatewebpages | **K3** |
| 4 | Applytheconcepts ofservers sideprogramming | **K3** |
| **K1–Remember K2 –Understand K3–applyK4-AnalyzeK5–evaluateK6-Create** |
|  |
| **UNITI** | **Introductiontowebapplications** | **14** |
| DatawithURL-HTML-DHTML:CascadingStyleSheets,CommonGatewayInterface:ProgrammingCG!Scripts-HTMLForms-:-CustomDatabaseQueryScripts-ServerSideIncludes-Server\_securityissues. |
| **UNITII** | **IntroductiontoScriptingLanguages** | **14** |
| XHTML:Introduction,CSS-Scriptinglanguages-JavaScript:Controlstatements,Functions,Arrays,Objects-DOM- Aiaxenablerichinternetapplications. |
| **UNITIII** | **ServerSideProgramming** | **15** |
| ServersideProgramming-Activeserverpages-Javaserverpages-JavaServlets:Servletcontainer-Exceptions-SessionsandSessionTracking\_-UsingServletcontext-DynamicContentGeneration-ServletChainingand Communications. |
| **UNITIV** | **HTML5 &CSS3** | **15** |
| HTML review,Featuredetection,TheHTML5newElements,Canvas,Videoandaudio,Webstorage, Geo location, Offline Web pages , Micro data, HTML5 APLS, Migrating from HTML4 toHTML5,CSS3 . |
| **UNITV** | **Web2.0** | **17** |
| WEB2.0-HISTORY,characteristics,technologies,concepts,usage,web2.0ineducation,philanthropy,socialwork.Web3.0-Theory-andhistoryunderstanding.basicwebartifactsandapplications,implementation.MSsharepoint-Sharepoint2013overview,share(Putsocialtowork,Share your stuff, Take share point on the go), Discover (find experts, discover answers, find what youarelookingfor), Manage(cost, risk, time) |
| **TotalLectureHours** | **75****Hours** |
| **TextBook(s)** |
| **1** | Deitel,DeitelandNeita,-InternetandWorldWide\_Web-Howtoprogramll,PearsonEducation |

Asia,

|  |  |
| --- | --- |
|  | 4th Edition, 2009. |
| **2** | ElliotteRustyHerold,-JavaNetworkProgramming II,O'ReillyPublications, 3rdEdition,2004. |
| **ReferenceBook(s)** |
| **1** | JeffyDwight,MichaelErwinand RobertNikes-USINGCGIII,PH.IPublications,1997 |
| **2** | JasonHunter,WilliamCrawford -JavaServlet ProgrammingO'ReillyPublications,2ndEdition, 2001. |
| **3** | EricLaddandJimO'Donnell,etal,-USINGHTML4,XML, andJAVA1.2,PrenticeHall,2003 |
| **4** | JeremyKeith,-Html5forwebdesigners |
|  | **RelatedOnlineContents(MOOC,SWAYAM,NPTEL,Websitesetc)** |  |
| **1** | [**https://onlinecourses.swayam2.ac.in/aic20\_sp06/preview**](https://onlinecourses.swayam2.ac.in/aic20_sp06/preview) |  |
| **2** | [**https://onlinecourses.swayam2.ac.in/arp19\_ap79/preview**](https://onlinecourses.swayam2.ac.in/arp19_ap79/preview) |  |
| **CourseDesignedby :** |

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|  | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** |
| **CO1** | **L** | **L** | **L** | **L** | **L** | **L** | **L** | **L** | **L** | **L** |
| **CO2** | **M** | **L** | **L** | **L** | **L** | **L** | **L** | **L** | **L** | **L** |
| **CO3** | **S** | **M** | **L** | **L** | **L** | **L** | **L** | **L** | **L** | **L** |
| **CO4** | **S** | **M** | **L** | **L** | **L** | **L** | **L** | **L** | **L** | **L** |

\*S-Strong;M-Medium;L-Low



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| **CourseCode** |  | **SoftwareAgents** | **L** | **T** | **P** | **C** |
| **Core/elective/Supportive** | **Elective:II** | **5** | **0** | **0** | **4** |
| **Pre- requisite** | **None** | **Syllabusversion** | **I** |
| **CourseObjectives** |
| * Toexplainthefundamentalsofagentsandagentprogrammingparadigms.
* Toexplainabout agentsandsecurity
 |
| **ExpectedCourseOutcomes** |
| 1 | Understandingthe fundamentalsof agents and agent programmingparadigms. | **K2** |
| 2 | Discussingthe basics ofjavaagents. | **K2** |
| 3 | Learningtheconceptsof multivalentsystems. | **K2** |
| 4 | Understandingtheconceptsofintelligentsoftwareagents. | **K2** |
| 5 | Understandingtheagentsandsecurity. | **K2** |
| **K1–Remember K2 –Understand K3–applyK4-AnalyzeK5–evaluateK6-Create** |
|  |
| **UNITI** | **AGENTS–OVERVIEW** | **15** |
| **UNITI**AgentDefinition–AgentProgrammingParadigms–AgentVsObject–Aglet–MobileAgents–AgentFrameworks–AgentReasoning |
| **UNITII** | **JAVAAGENTS** | **15** |
| **UNITII**Processes–Threads–Daemons–Components–JavaBeans–ActiveX–Sockets–RPCs–DistributedComputing–AgletsProgramming–JiniArchitecture–ActorsandAgents–TypedandProactiveMessages |
| **UNITIII** | **MULTIAGENTSYSTEMS** | **15** |
| InteractionbetweenAgents–ReactiveAgents–CognitiveAgents–InteractionProtocols–AgentCoordination–Agentnegotiation–AgentCooperation–AgentOrganization–Self-InterestedAgentsinElectronicCommerce Applications |
| **UNITIV** | **INTELLIGENTSOFTWAREAGENTS** | **15** |
| InterfaceAgents–AgentCommunicationLanguages–AgentKnowledgeRepresentation–AgentAdaptability–Belief DesireIntension–MobileAgentApplications |
| **UNITV** | **AGENTSANDSECURITY** | **15** |
| AgentSecurityIssues–MobileAgentsSecurity–ProtectingAgentsagainstMaliciousHosts–UntrustedAgent– BlackBoxSecurity–AuthenticationforAgents–SecurityIssues forAglets |
| **TotalLectureHours** | **75****Hours** |
| **TextBook(s)** |
| **1** | Bigus &Bigus,“ConstructingIntelligentagentswithJava”,Wiley,2010. |
| **2** | Bradshaw,“SoftwareAgents”,MITPress,2012. |
| **ReferenceBook(s)** |
| **1** | Russel&Norvig,“ArtificialIntelligenceamodernapproach”,PrenticeHall,1994. |
| **2** | RichardMurchandTonyJohnson,“IntelligentSoftwareAgents”,Prentice Hall,2000. |
| **3** | MichaelWooldridge, “An IntroductiontoMultiAgentSystems”,JohnWiley,2002. |

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|  | **RelatedOnlineContents(MOOC,SWAYAM,NPTEL,Websitesetc)** |  |
| **1** | [**https://onlinecourses.swayam2.ac.in/aic20\_sp06/preview**](https://onlinecourses.swayam2.ac.in/aic20_sp06/preview) |  |
| **2** | [**https://onlinecourses.swayam2.ac.in/arp19\_ap79/preview**](https://onlinecourses.swayam2.ac.in/arp19_ap79/preview) |  |
| **CourseDesignedby :** |

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|  | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** |
| **CO1** | **L** | **L** | **L** | **L** | **L** | **L** | **L** | **L** | **L** | **L** |
| **CO2** | **M** | **L** | **L** | **L** | **L** | **L** | **L** | **L** | **L** | **L** |
| **CO3** | **S** | **M** | **L** | **L** | **L** | **L** | **L** | **L** | **L** | **L** |
| **CO4** | **S** | **M** | **L** | **L** | **L** | **L** | **L** | **L** | **L** | **L** |
| **CO5** | **S** | **M** | **L** | **L** | **L** | **L** | **L** | **L** | **L** | **L** |

\*S-Strong;M-Medium;L-Low



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| **CourseCode** |  | **EmbeddedSystems** | **L** | **T** | **P** | **C** |
| **Core/elective/Supportive** | **Elective:II** | **5** | **0** | **0** | **4** |
| **Pre- requisite** | **None** | **Syllabus****version** | **I** |
| **CourseObjectives** |
| * Tointroducetheconceptsofembeddedsystemsanditsarchitecture
 |
| **ExpectedCourseOutcomes** |
| 1 | Understandhardwareandsoftwaredesignrequirementsofembeddedsystems. | **K2** |
| 2 | Explainaboutthearchitectureofmicroprocessorandoperatingsystemsinembeddedsystems | **K2** |
| 3 | Analyzetheembeddedsystems‟specificationanddevelopsoftwareprograms. | **K4** |
| 4 | EvaluatetherequirementsofprogrammingEmbeddedSystems,relatedsoftwarearchitecturesandtoolchainforEmbeddedSystems. | **K5** |
| **K1–Remember K2 –Understand K3–applyK4-AnalyzeK5–evaluateK6-Create** |
|  |
| **UNITI** | **IntroductiontoEmbeddedSystems** | **15** |
| ExamplesofEmbeddedSystems–TypicalHardware–Memory–Microprocessors–Busses–DirectMemoryAccess– Introductionto8051Microcontroller –Architecture-Instructionset –Programming. |
| **UNITII** | **Microprocessors** | **16** |
| Microprocessor Architecture–InterruptBasics– The Shared-Data problem–InterruptLatency-Round–Robin Architecture - Round–Robin with Interrupts Architecture - Function-QueueSchedulingArchitecture– Real-TimeOperatingSystemsArchitecture– SelectionofArchitecture. |
| **UNITIII** | **Tasks&Semaphores** | **14** |
| TasksandTaskStates–TasksandData–SemaphoresandSharedData–SemaphoreProblems–Semaphorevariants. |
| **UNITIV** | **MessageQueues& RTOS** | **15** |
| MessageQueues–Mailboxes–Pipes–TimerFunctions–Events–MemoryManagement–InterruptRoutinesinRTOSEnvironment.RTOSdesign–Principles–EncapsulationSemaphoresandQueues–Hard Real-Time SchedulingConsiderations–SavingMemorySpace– SavingPower. |
| **UNITV** | **Host&Target Machines** | **15** |
| HostandTargetMachines–Linker/LocatorforEmbeddedSoftware-GettingEmbeddedSoftwareintotheTargetSystem.Testingonyour HostMachine –InstructionSetSimulators–LaboratoryToolsusedforDebugging. |
| **TotalLectureHours** | **75****Hours** |
| **TextBook(s)** |
| **1** | The8051Microcontroller Architecture,Programming&Applications,KennethJ.Ayala,PenramInternational. |
| **2** | AnEmbeddedSoftwarePrimer,DavidE.Simon,PearsonEducation,2005. |

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| **ReferenceBook(s)** |
| **1** | EmbeddedSystems:Architecture,ProgrammingandDesign,RajKamal,TataMcGraw-HillEducation,2008 |
|  | **RelatedOnlineContents(MOOC,SWAYAM,NPTEL,Websitesetc)** |  |
| **1** | [**https://onlinecourses.swayam2.ac.in/aic20\_sp06/preview**](https://onlinecourses.swayam2.ac.in/aic20_sp06/preview) |  |
| **2** | [**https://onlinecourses.swayam2.ac.in/arp19\_ap79/preview**](https://onlinecourses.swayam2.ac.in/arp19_ap79/preview) |  |
| **CourseDesignedby :** |

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|  | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** |
| **CO1** | **L** | **L** | **L** | **L** | **L** | **L** | **L** | **L** | **L** | **L** |
| **CO2** | **M** | **L** | **L** | **L** | **L** | **L** | **L** | **L** | **L** | **L** |
| **CO3** | **S** | **M** | **M** | **L** | **L** | **L** | **L** | **L** | **L** | **L** |
| **CO4** | **S** | **S** | **M** | **L** | **L** | **L** | **L** | **L** | **L** | **L** |

\*S-Strong;M-Medium;L-Low



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| **CourseCode** |  | **ClientServerComputing** | **L** | **T** | **P** | **C** |
| **Core/elective/Supportive** | **Elective:III** | **5** | **0** | **0** | **4** |
| **Pre- requisite** | **None** | **Syllabusversion** | **I** |
| **CourseObjectives** |
| * Tointroducetheconcepts ofclient andserver
* Todescribethevariouscomponents ofclientservercomputing
 |
| **ExpectedCourseOutcomes** |
| 1 | Explainaboutthe variouscomponentsof clientservercomputing | **K2** |
| 2 | Understandthe rolesof client andserverin anetwork | **K2** |
| 3 | AnalyzethecomponentsofClientServercomputingintermsofconnectivity,hardware/softwareandserviceandsupport | **K3** |
| 4 | Analyzethevarioustypesofwormsandviruses | **K3** |
| **K1–Remember K2 –Understand K3–applyK4-AnalyzeK5–evaluateK6-Create** |
|  |
| **UNITI** | **Introduction** | **14** |
| Client/ ServerComputing–Advantages ofClient /ServerComputing–TechnologyRevolution–Connectivity–Ways toimprovePerformance–How toreducenetworkTraffic. |
| **UNITII** | **ComponentsofClient/ServerApplications** | **16** |
| Components of Client / Server Applications–The Client: Role of a Client–Client Services– Requestfor Service. Components of Client / Server Applications – The Server: The Role of a Server – ServerFunctionalityinDetail–TheNetworkOperatingSystem–WhataretheAvailablePlatforms–TheServerOperatingsystem. |
| **UNITIII** | **Connectivity&IPC** | **15** |
| Components of Client / Server Applications–Connectivity: Open System Interconnect –CommunicationsInterfaceTechnology– Inter-processcommunication–WANTechnologies. |
| **UNITIV** | **ComponentsofC/Sapplication H/W&S/W** | **14** |
| ComponentsofClient/ServerApplications–Software.ComponentsofClient/ServerApplications–Hardware. |
| **UNITV** | **Service&Support** | **16** |
| ComponentsofClient/Serverapplications–ServiceandSupport:SystemAdministration.TheFutureofClient /Server Computing: EnablingTechnologies– TransformationalSystems. |
| **TotalLectureHours** | **75****Hours** |
| **TextBook(s)** |
| **1** | Client/ServerComputing,PatrickSmith,SteveGuenferich,2ndedition,PHI.*(Chapters1-8&**10)* |
|  | **ReferenceBook(s)** |  |
| **1** | RobertOrfali,DanHarkey, JeriEdwards:TheEssentialClient/ServerSurvivalGuide,2ndedition,GalgotiaPublications. |
| **2** | DewireandDawanaTravis,Client/ServerComputing,TMH |
|  | **RelatedOnlineContents(MOOC,SWAYAM,NPTEL,Websitesetc)** |  |

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| **1** | [**https://onlinecourses.swayam2.ac.in/aic20\_sp06/preview**](https://onlinecourses.swayam2.ac.in/aic20_sp06/preview) |  |
| **2** | [**https://onlinecourses.swayam2.ac.in/arp19\_ap79/preview**](https://onlinecourses.swayam2.ac.in/arp19_ap79/preview) |  |
| **CourseDesignedby :** |

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|  | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** |
| **CO1** | **L** | **L** | **L** | **L** | **L** | **L** | **L** | **L** | **L** | **L** |
| **CO2** | **M** | **L** | **L** | **L** | **L** | **L** | **L** | **L** | **L** | **L** |
| **CO3** | **S** | **M** | **M** | **L** | **L** | **L** | **L** | **L** | **L** | **L** |
| **CO4** | **S** | **S** | **M** | **L** | **L** | **L** | **L** | **L** | **L** | **L** |

\*S-Strong;M-Medium;L-Low



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| **CourseCode** |  | **OpenSourceSoftware** | **L** | **T** | **P** | **C** |
| **Core/elective/Supportive** | **Elective:III** | **5** | **0** | **0** | **4** |
| **Pre- requisite** | **None** | **Syllabusversion** | **I** |
| **CourseObjectives** |  |
| * Toexplain theneed andimportanceofopen sourcesoftware
* Tointroducethevariousopensourcesoftwareslike Linux,MySql,PHPandPython
 |
| **ExpectedCourseOutcomes** |
| 1 | Explainaboutthe needand importanceofopen sourcesoftware | **K2** |
| 2 | Demonstratethe conceptsofopensourcesoftwares | **K2** |
| 3 | Applytheprogrammingconstructsof MYSql,PHP,PythonandPERLtocreateprograms | **K3** |
| 4 | Developsmallprogramsusingopensourcesoftwares | **K3** |
| **K1–Remember K2 –Understand K3–applyK4-AnalyzeK5–evaluateK6-Create** |
|  |
| **UNITI** | **Introductiontoopensources** | **14** |
| Introduction to open sources–Need of open sources–advantages of open sources–application of opensources. Open source operating systems: LINUX: Introduction – general overview –Kernel mode andusermode–process–advancedconcepts–scheduling–personalities–cloning–signals–developmentwith Linux. |
| **UNITII** | **MySQL** | **16** |
| MySQL:Introduction–settingupaccount–starting,terminatingandwritingyourownSQLprograms-recordselectionTechnology–workingwithstrings–DateandTime–sortingQueryresults–generatingsummary–workingwith meta data–usingsequences– MySQLand Web. |
| **UNITIII** | **PHP** | **16** |
| PHP: Introduction–programming in web environment–variables- constants–data types –operators –statements – functions – arrays – OOP – string manipulations and regular expression – file handlinganddatastorage–PHPandSQLdatabase–PHPandLDAP–PHPconnectivity–sendingandreceivingE-mails –debugginganderror handling– security–templates |
| **UNITIV** | **Python** | **14** |
| Syntaxandstyle–pythonobjects–numbers–sequences–strings–listsandtuples–dictionaries–conditionalloops–files–inputandoutput–errorsandexceptions–functions–modules–classesandOOP–executionenvironment |
| **UNITV** | **Pearl** | **15** |
| Pearloverview–pearlparsingrules–variablesanddata–statementsandcontrolstructures–subroutines-,packagesandmodules–workingwithfiles–datamanipulation. |
| **TotalLectureHours** | **75****Hours** |
| **TextBook(s)** |
| **1** | TheLinuxKernelBook,RemyCard,EricandFrank Mevel,WileyPublications2003 |

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| **2** | MySQLBible, SteveSuchring, JohnWiley2002. |
|  | **ReferenceBook(s)** |  |
| **1** | ProgrammingPHP,RasmusLerdorfand LevinTatroe,O‗Reilly,2002 |
| **2** | CorePythonProgramming,WesleyJ.Chun, PrenticeHall,2001 |
| **3** | Perl:TheComplete Reference,2ndEdn,MartinC. Brown,TMH, 2009 |
| **4** | MySQL:TheComplete Reference,2ndEdn,VikramVaswani,TMH,2009 |
|  | **RelatedOnlineContents(MOOC,SWAYAM,NPTEL,Websitesetc)** |  |
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| **CourseDesignedby :** |

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|  | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** |
| **CO1** | **L** | **L** | **L** | **L** | **L** | **L** | **L** | **L** | **L** | **L** |
| **CO2** | **M** | **L** | **L** | **L** | **L** | **L** | **L** | **L** | **L** | **L** |
| **CO3** | **S** | **M** | **M** | **L** | **L** | **L** | **L** | **L** | **L** | **L** |
| **CO4** | **S** | **S** | **M** | **L** | **L** | **L** | **L** | **L** | **L** | **L** |

\*S-Strong;M-Medium;L-Low



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| **CourseCode** |  | **PrinciplesofSecureCoding** | **L** | **T** | **P** | **C** |
| **Core/elective/Supportive** | **Elective:III** | **5** | **0** | **0** | **4** |
| **Pre- requisite** | **None** | **Syllabus****version** | **I** |
| **CourseObjectives** |
| * Tounderstandthesecure softwaredevelopmentlifecycle
* Toexplain about thesecurecodingtechniques
 |
| **ExpectedCourseOutcomes** |
| 1 | Explainaboutthesecure softwaredevelopmentlifecycle | **K2** |
| 2 | Understandthesecurecodingtechniques | **K2** |
| 3 | Demonstratethethreatmodelingprocessand benefits | **K2** |
| 4 | Explainaboutthe databaseandweb specificissues | **K2** |
| **K1–Remember K2 –Understand K3–applyK4-AnalyzeK5–evaluateK6-Create** |
|  |
| **UNITI** | **Needforsecuresystems** | **14** |
| Need for secure systems: Proactive Security development process, Secure Software DevelopmentCycle (S-SDLC) , Security issues while writing SRS, Design phase security, Development Phase, TestPhase,MaintenancePhase,WritingSecureCode-BestPracticesSD3(Securebydesign,defaultanddeployment),Securityprinciplesand SecureProductDevelopmentTimeline |
| **UNITII** | **Threatmodellingprocessanditsbenefits** | **14** |
| Threatmodellingprocessanditsbenefits:IdentifyingtheThreatsbyUsingAttackTreesandratingthreatsusingDREAD,RiskMitigationTechniquesandSecurityBestPractices.Securitytechniques,authentication,authorization.DefenseinDepthandPrincipleof LeastPrivilege. |
| **UNITIII** | **SecureCodingTechniques** | **17** |
| SecureCodingTechniques:ProtectionagainstDoSattacks,ApplicationFailureAttacks,CPUStarvationAttacks,InsecureCodingPracticesInJavaTechnology.ARPSpoofinganditscountermeasures. Buffer Overrun- Stack overrun, Heap Overrun, Array Indexing Errors, Format StringBugs. Security Issues in C Language: String Handling, Avoiding Integer Overflows and UnderflowsandTypeConversionIssues-MemoryManagementIssues,CodeInjectionAttacks,Canarybasedcounter measures using Stack Guard and Pro police. Socket Security, Avoiding Server Hijacking,SecuringRPC. |
| **UNITIV** | **DatabaseandWeb-specificissues** | **16** |
| Database and Web-specific issues: SOL Injection Techniques and Remedies, Race conditions, Time ofCheckVersusTimeofUseanditsprotectionmechanisms.ValidatingInputandInterprocessCommunication,SecuringSignalHandlersandFileOperations.XSSscriptingattackanditstypes-PersistentandNonpersistentattackXSSCountermeasuresandBypassingtheXSSFilters. |
| **UNITV** | **TestingSecureApplications** | **14** |
| TestingSecureApplications: Securitycodeoverview, securesoftwareinstallation. TheRole oftheSecurityTester,Building theSecurityTest Plan. TestingHTTP-Based Applications, TestingFile-Based Applications,TestingClientswithRogue **Servers** |
| **TotalLectureHours** | **75****Hours** |

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| **TextBook(s)** |
| **1** | WritingSecureCode,MichaelHowardandDavid LeBlanc,MicrosoftPress,2ndEdition,2004 |
| **ReferenceBook(s)** |
| **1** | ProgrammingPHP,RasmusLerdorfandLevinTatroe,O‗Reilly,2002 |
| **2** | CorePythonProgramming,WesleyJ.Chun, PrenticeHall,2001 |
| **3** | Perl:TheComplete Reference,2ndEdn,MartinC. Brown,TMH, 2009 |
| **4** | MySQL:TheComplete Reference,2ndEdn,VikramVaswani,TMH,2009 |
|  | **RelatedOnlineContents(MOOC,SWAYAM,NPTEL,Websitesetc)** |  |
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| **2** | [**https://onlinecourses.swayam2.ac.in/arp19\_ap79/preview**](https://onlinecourses.swayam2.ac.in/arp19_ap79/preview) |  |
| **CourseDesignedby :** |

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|  | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** |
| **CO1** | **L** | **L** | **L** | **L** | **L** | **L** | **L** | **L** | **L** | **L** |
| **CO2** | **M** | **L** | **L** | **L** | **L** | **L** | **L** | **L** | **L** | **L** |
| **CO3** | **S** | **M** | **L** | **L** | **L** | **L** | **L** | **L** | **L** | **L** |
| **CO4** | **S** | **M** | **M** | **L** | **L** | **L** | **L** | **L** | **L** | **L** |

\*S-Strong;M-Medium;L-Low

Annexure

**B.Sc.ComputerSciencewithData Analytics**

**Syllabus**

(Witheffect from2020-21)

**ProgramCode:**



**DEPARTMENTOFCOMPUTERSCIENCE**

**BharathiarUniversity**

**(AStateUniversityAccreditedwith“a”byNAAACand13th Rank among Indian Universities by MHRD-NIRF)Coimbatore641046,INDIA**

**MISSION**

* TodevelopITprofessionalswithethicalandhumanvalues.
* To organize, connect, create and communicate mathematical ideas effectively, throughindustry4.0.
* Toprovide alearningenvironment to enhanceinnovations, problem solvingabilities,leadershippotentials, team-spirit and moral tasks.
* Tonurturetheresearch valuesin thedevelopingareas ofComputerScienceandinterdisciplinaryfields.
* Promote inter-disciplinary research among the faculty and the students to create state ofartresearch facilities.
* Topromotequalityand ethicsamongthe students.
* Motivatethestudentstoacquireentrepreneurialskillstobecomegloballeaders.