POOJYADODDAPPAAPPACOLLEGEOFENGINEERING,KALABURAGI
ChoiceBasedCreditSystem (CBCS)
SchemeofTeachingandExamination2021–22-(Effectivefromtheacademicyear2021–22)
ArtificialIntelligenceandMachineLearning

V Semester

Sl. No.	Course and CourseCode		Course Title	TeachingDepartment	TeachingHours/Week				Examination					Credits
					Theory Lecture	Tutorial	Practical/Dra	Self-Study	Duration in	CIE Marks	SEE Marks	Total Marks	
1.	PC	21AI51	AutomataTheoryandComputability	Respective Dept.	2	2	0		3	50	50	100	3
2.	IPCC	21AI52	DatabaseManagementSystem	Respective Dept.	3	0	2		3	50	50	100	4
3.	PC	21AI53	MachineLearning	Respective Dept.	2	2	0		3	50	50	100	3
4.	PC	21AI54	SoftwareEngineering	Respective Dept.	2	2	0		3	50	50	100	3
5.	PCL	21AIL55	AIMLLab	Respective Dept.	0	0	2		3	50	50	100	1
6.	AEC	21RMI56	ResearchMethodologyandIPR	Respective Dept.	1	2	0		3	50	50	100	2
7.	HSMS	21CIV57	EnvironmentalStudies	Civil/Mech	0	2	0		2	50	50	100	1
8.	AEC	21AIAE581	AbilityEnhancementCourse(PrinciplesofOperating System)	Respective Dept.	0	0	2		2	50	50	100	1
Total										400	400	800	18

AbilityEnhancementCourse		
Sl.No.	Coursecode	CourseTitle
1	21AIAE581	PrinciplesofOperating System

Note: **HSMC: Humanity and Social Science & ManagementCourses: The course is made mandatory for the Non Circuit Branches during the ODD Cycle and for the Circuit BranchesduringtheEVENCycle.**.,IPCC:IntegratedProfessional Core Course, AEC–AbilityEnhancementCourse,INT –Internship,L –Lecture, T –Tutorial,P-Practical/Drawing, S – Self Study Component, CIE: Continuous Internal Evaluation, SEE: Semester End Examination.

IntegratedProfessional CoreCourse(IPCC):refers toProfessionalTheoryCore CourseIntegratedwithPracticalofthesamecourse. CreditforIPCC canbe04 andits Teaching–Learninghours (L :T :P) canbeconsideredas (3: 0: 2) or (2: 2 :2). TheorypartoftheIPCC shall be evaluated both byCIE andSEE. Thepractical partshall beevaluated byCIE only and there shall be no SEE.

FormoredetailstheregulationgoverningtheDegreeofBachelorofEngineering/Technology(BE/B.Tech.)2021-22maybereferred.

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ArtificialIntelligenceandMachineLearning

VISemester

Sl. No.	Coursean d CourseCode		Course Title	TeachingDepartment	TeachingHours/Week				Examination				Credits
					Theory Lecture	Tutorial	Practical/Drawing	Self-Study	Durationin hours	CIEMarks	SEEMarks	TotalMarks	
1.	HSMC	21HU61	Entrepreneurship,Management and Finance	Respective Dept.	2	2	0		3	50	50	100	3
2.	IPCC	21AI62	DeepLearning	Respective Dept.	3	0	2		3	50	50	100	4
3.	PC	21AI63	DataScienceandits Applications	Respective Dept.	2	2	0		3	50	50	100	3
4.	PEC	21AI64X	ProfessionalElective-I	Respective Dept.	2	2	0		3	50	50	100	3
5.	OEC	21AI65OEX	OpenElective–I	Respective Dept.	2	2	0		3	50	50	100	3
6.	PCCL	21AIL66	DataScienceandApplicationLab	Respective Dept.	0	0	2		3	50	50	100	1
7.	MP	21AIMP67	MiniProject	Respective Dept.	Two contact hours /week for interactionbetweenthefaculty andstudent					50		50	2
8.	INT	21INT68	Innovation/Entrepreneurship /SocietalInternship		Completed during the interveningperiodofIVandV semesters.					50		50	3
Total										**400**	**300**	**700**	**22**

PROFESSIONAL ELECTIVE–1		
Sl.No.	Course	Course-ID
1	CG and Fundamentals of Image Processing	21AI641
2	Business Intelligence	21AI642

OPEN ELECTIVE-1		
Sl.No.	Course	Course-ID
1	Software Testing & Tools	21AI65OE1
2	Management Information System	21AI65OE2
3	Cyber Security	21AI65OE3

Note: HSMC: (Humanity and Social Science & Management Courses) The course is made mandatory for the Non Circuit Branches during the ODD Cycle and for the Circuit Branches during the EVEN Cycle.

IPCC: Integrated Professional Core Course, **PCC:** Professional Core Course,

PEC: Professional Elective Courses, OEC – Open Elective Course, **MP** – Mini Project, INT – Internship.

L – Lecture, T – Tutorial, P - Practical /Drawing, S – Self Study Component,

CIE: Continuous Internal Evaluation, SEE: Semester End Examination.

Integrated Professional Core Course (IPCC): Refers to Professional Theory Core Course Integrated with Practical of the same course. Credit for IPCC can be 04 and its Teaching – Learning hours (L : T : P) can be considered as (3 : 0 : 2) or (2 : 2 : 2). The theory part of the IPCC shall be evaluated both by CIE and SEE. The practical part shall be evaluated by CIE only and there shall be no SEE. For more details, the regulation governing the Degree of Bachelor of Engineering /Technology (BE/B.Tech) 2021-22 may be referred.

Professional Elective Courses (PEC): A professional elective (PEC) course is intended to enhance the depth and breadth of educational experience in the Engineering and Technology curriculum. Multidisciplinary courses that are added supplement the latest trend and advanced technology in the selected stream of engineering. Each group will provide an option to select one course out of five courses. The minimum students' strength for offering professional electives is 10.

However, this conditional shall not be applicable to cases where the admission to the programme is less than 10.

Open Elective Courses: Students belonging to a particular stream of Engineering and Technology are not entitled for the open electives offered by their parent Department. However, they can opt an elective offered by other Departments, provided they satisfy the prerequisite condition if any. Registration to open electives shall be documented under the guidance of the Program Coordinator/ Advisor/Mentor.

Selection of an open elective shall **not be allowed** if,

(i) The candidate has studied the same course during the previous semesters of the program.

(ii) The syllabus content of open electives is similar to that of the Departmental core courses or professional electives.

(iii) A similar course, under any category, is prescribed in the higher semesters of the program.

In case, any college is desirous of offering a course (not included in the Open Elective List of the University) from streams such as Law, Business.

Mini-project work: Mini Project is a laboratory-oriented course which will provide a platform to students to enhance their practical knowledge and skills by the development of small systems/applications.

Based on the ability/abilities of the student/s and recommendations of the mentor, a single discipline or a multidisciplinary Mini-project can be assigned to an individual student or to a group having not more than 4 students.

CIE procedure for Mini-project:

(i) **Single discipline:** The CIE marks shall be awarded by a committee consisting of the Head of the concerned Department and two faculty members of the Department, one of them being the Guide. The CIE marks awarded for the Mini-project work shall be based on the evaluation of project report, project presentation skill, and question and answer session in the ratio of 50:25:25. The marks awarded for the project report shall be the same for all the batchmates.

(ii) Interdisciplinary: Continuous Internal Evaluation shall be group-wise at the college level with the participation of all the guides of the project.

The CIE marks awarded for the Mini-project, shall be based on the evaluation of project report, project presentation skill, and question and answer session in the ratio 50:25:25. The marks awarded for the project report shall be the same for all the batchmates. **No SEE component for Mini-Project.**

AUTOMATATHEORYAND COMPUTABILITY		
SubjectCode	**21AI51**	Credits:3
CIE:50	SEE:50	SEE:03hrs
Hours/Week:3hrs(Theory)		Total Hours:42Hrs

Prerequisite: The primary prerequisite forthis course is reasonable "mathematical sophistication."Thatis,youshouldfeelcomfortablewithmathematicsandproofs.

CourseObjectives:

- Proveordisprovetheoremsinautomatatheoryusingitsproperties.Determinethe decidability and intractability of computational problems.

Modules	TeachingHours
ModuleI **WhystudytheTheoryofComputation,LanguagesandStrings:** Strings,Languages.ALanguageHierarchy,Computation, **FiniteStateMachines(FSM):**DeterministicFSM,Regularlanguages,Designing FSM, Nondeterministic FSMs, From FSMs to Operational Systems, Simulators for FSMs, Minimizing FSMs, Canonical form of Regular languages, Finite State Transducers, Bidirectional Transducers. Textbook1: Ch1,2,3,4,5.1to5.10 RBT:L1, L2	**8Hours**

ModuleII	
RegularExpressions (RE): what is a RE?, Kleene's theorem, Applications of REs, Manipulating and Simplifying REs. Regular Grammars: Definition, Regular Grammars and Regular languages. Regular Languages (RL) and Non-regular Languages: How many RLs, To show that a language is regular, Closure properties of RLs, to show some languagesarenotRLs.Textbook 1:Ch6,7,8:6.1to6.4,7.1,7.2,8.1to8.4RBT: L1, L2, L3	**8Hours**
ModuleIII	
Context-FreeGrammars(CFG): IntroductiontoRewriteSystemsandGrammars,CFGsandlanguages,designing CFGs,simplifyingCFGs,provingthataGrammaris correct,DerivationandParse trees,Ambiguity,NormalForms.PushdownAutomata(PDA):Definition of non-deterministicPDA,DeterministicandNon-deterministicPDAs,Nondeterminism and Halting, alternative equivalent definitions of a PDA, alternatives that are not equivalent to PDA. Textbook1:Ch11,12:11.1to11.8,12.1,12.2,12,4,12.5,12.6 RBT: L1, L2, L3	**9Hours**
ModuleIV	
AlgorithmsandDecisionProceduresforCFLs: Decidablequestions,Un-decidablequestions. **TuringMachine:** Turingmachinemodel,Representation,LanguageacceptabilitybyTM,designof TM, Techniques for TM construction. Variants of Turing Machines (TM), The model of Linear Bounded automata. Textbook 1: Ch 14: 14.1, 14.2, Textbook2:Ch9.1to9.8 RBT: L1, L2, L3	**8Hours**

ModuleV	
Decidability: Definitionofanalgorithm,decidability,decidablelanguages,Undecidable languages, halting problem of TM, Post correspondence problem. **Complexity:** Growthrateoffunctions,theclassesofPandNP,QuantumComputation: quantum computers, ChurchTuring thesis. **Applications:** Definingsyntaxofprogramminglanguage,AppendixJ: Security Textbook2:10.1to10.7,12.1,12.2,12.8,12.8.1,12.8.2Textbook1:Appendix: G.1(only), J.1 & J.2 RBT: L1, L2, L3	**9Hours**

CourseOutcomes:

Thestudentwillbeable to:

• Acquirefundamentalunderstandingofthecoreconceptsinautomatatheory and Theory of Computation

• LearnhowtotranslatebetweendifferentmodelsofComputation(e.g., Deterministic and Non-deterministic and Software models).

• Design Grammars and Automata (recognizers) for different language classes andbecomeknowledgeableaboutrestrictedmodelsofComputation(Regular, Context Free) and their relative powers.

• Developskills informalreasoningandreductionofaproblemtoaformal model, with an emphasis on semantic precision and conciseness.

• ClassifyaproblemwithrespecttodifferentmodelsofComputation.

Questionpaperpattern:

1. ThequestionpaperwillhaveTENquestions.
2. TherewillbeTWO questionsineachmodule,coveringallthetopics.
3. ThestudentneedtoanswerFIVEfullquestions,selectingONEfullquestionfrom each module.

Textbooks:

1. ElaineRich,Automata,ComputabilityandComplexity,1stEdition,Pearson education,2012/2013

2. KLPMishra,NChandrasekaran,3rdEdition,TheoryofComputerScience,PhI, 2012.

ReferenceBooks:

1. JohnEHopcroft,RajeevMotwani,JefferyDUllman,IntroductiontoAutomataTheory, Languages, and Computation, 3rd Edition, Pearson Education, 2013

2. MichaelSipser:Introductionto theTheoryofComputation,3rdedition,Cengage learning,2013

3. JohnCMartin,IntroductiontoLanguagesandTheTheoryofComputation,3rdEdition,Tata McGraw –Hill Publishing Company Limited, 2013

4. PeterLinz,"AnIntroductiontoFormalLanguagesandAutomata",3rdEdition,Narosa Publishers, 1998

5. BasavarajS.Anami,KaribasappaKG,FormalLanguagesandAutomatatheory,WileyIndia,2012

6. CKNagpal,FormalLanguagesandAutomata Theory,OxfordUniversitypress,2012.

Facultycanutilizeopensourcetools(likeJFLAP)tomaketeachingandlearningmore interactive.

DATABASEMANAGEMENTSYSTEM		
SubjectCode	**21AI52**	Credits:4
CIE:50	SEE:50	SEE:03hrs
Hours/Week:3hrs(Theory) Practical :2Hrs/week		TotalHours: 40Hrs Hours:12Hrs

Prerequisite: TheStudentsshouldhavetheknowledgeofDataStructures,Computer Organization and C++ Programming Principles.

CourseObjectives:

Toenablethestudentstoobtaintheknowledge ofDataBaseManagementSysteminthe following topics.

- UnderstandtheDataBaseManagementPrinciplesandrelationalmodels.
- Understandtherelationalalgebraicapproachand databaseimplementationand interaction techniques using SQL.
- UnderstandthefunctionaldependencyandNormalizationTechniques.
- Understandtheonlinetransactionprocessingandrecoverymethods.

Modules	TeachingHours
ModuleI **Introduction:** Introduction; An example; Characteristics of Database approach; Actors on the screen; Workers behind the scene; Advantages of using DBMS approach; A brief history of database applications; when not to useaDBMS.Datamodels,schemasandinstances;Three-schemaarchitecture and data independence; Database languages and interfaces; The database system environment; Centralized and client-server architectures; Classification of Database Management systems.	**8Hours**
ModuleII **Entity-Relationship Model:** Using High-Level Conceptual Data Models for Database Design; An Example Database Application; Entity Types, Entity Sets, Attributes and Keys; Relationship types, Relationship Sets, Roles and Structural Constraints; Weak Entity Types; Refining the ER Design; ER Diagrams, Naming Conventions and Design Issues; Relationship types of degree higher than two.	**8`Hours**

ModuleIII **Relational Model and Relational Algebra:** Relational Model Concepts; Relational Model Constraints and Relational Database Schemas; Update Operations, Transactions and dealing with constraint violations; Unary Relational Operations: SELECT and PROJECT; Relational Algebra Operations from SetTheory;BinaryRelational.Operations:JOINandDIVISION;Additional Relational Operations; Examples of Queries in Relational Algebra; Relational Database Design Using ER- to-Relational Mapping. **SQL:** SQL Data Definition and Data Types; Specifying basic constraints in SQL; Schema change statements in SQL; Basic queries in SQL; More complex SQL Queries .Insert, Delete andUpdate statements inSQL;Specifying constraints as Assertion and Trigger; Views (Virtual Tables) in SQL.	**8Hours**
ModuleIV **Database Design:** Informal Design Guidelines for Relation Schemas;Functional Dependencies; Normal Forms Based on Primary Keys; General Definitions of Second and Third Normal Forms; Boyce-Codd Normal Form. Properties of Relational Decompositions; Algorithms for Relational Database SchemaDesign;MultivaluedDependenciesandFourthNormalForm;Join DependenciesandFifthNormalForm.	**8Hours**
ModuleV **Transaction Management:** The ACID Properties; Transactions and Schedules;Concurrent Execution of Transactions; Lock –BasedConcurrency Control;Performance oflocking;TransactionsupportinSQL.Introductionto Crash Recovery; 2PL, Serializability and Recoverability; Lock Management; IntroductiontoARIES;Thelog;Otherrecovery-relatedstructures;Thewrite-ahead log protocol; Check pointing; Recovering from a System Crash.	**8Hours**

Questionpaperpattern: 4. ThequestionpaperwillhaveTENquestions. 5. TherewillbeTWO questionsineachmodule,coveringallthetopics. 6. ThestudentneedtoanswerFIVEfullquestions,selectingONEfullquestionfromeach module.

Textbooks:
 	
   1. FundamentalsofDatabaseSystems-Elmasriand Navathe,5[th]Edition, Addison- Wesley,2007
   2. DatabaseManagementSystems-RaghuRamakrishnanandJohannes Gehrke – 3rd Edition. McGraw-Hill, 2014.

ReferenceBooks:

1. Data Base System Concepts- Silberschatz, Korth and Sudharshan,6thEdition,   Mc-GrawHill,2010.
2. AnIntroductiontoDatabaseSystems -C.J.Date,A.Kannan,S. Swamynatham, 8th Edition, Pearson Education, 2006.

Courseoutcomes:

Oncompletionof thecourse,thestudentwillhavetheabilityto:

CourseCode	CO#	CourseOutcome(CO)
	CO1	Expressthefundamentalsandapplicationsofdata base management system.
	CO2	Applygooddatabasedesignprinciplesforthedesign of ER diagram and relational models.
	CO3	ImplementandinteractdatabaseusingSQL and relational algebra.
	CO4	Designdatabasebyapplyingthefunctional dependency and Normalization techniques
	CO5	Demonstratethedatabasetransactionand recovery management process.

DATABASEMANAGEMENTSYSTEMSLABORATORY
Prerequisite: TheStudentsshould havetheknowledgeofDatastructureand C++
CourseObjectives: Toenablethestudentstoobtaintheknowledgeof Databasemanagement systems in the following topics. • UnderstandtheDataBaseManagementSystemEnvironment • Understandthetechniquestodesignthedatabaseandpopulatetherecords • UnderstandtheDMLoperations. • Understandthequeryoptimizationanderrorhandling techniques. • UnderstandtheDCLand TCLstatements

DATABASELABORATORY

PART-A

Considerthefollowingrelations:

Student (Stud_number: integer, class: integer,

major:char)Course (Course_name: Char,

Course_number: varchar, Credit_hours:int,

Department: char) Section(Secton_id:varchar,

Course_number:varchar,Semester:char,Year:int,

Instructor:char)

Grade_Report(Stud_number:varchar,Section_id:int,Grade:char)

Writethefollowingqueries inSQL. Noduplicatesshould beprintedinanyofthe answers.

i) Whatarethereferentialintegrityconstraintsthat should hold ontheschema.

ii) Retrievethenamesofallseniorstudentsmajoringin'CS'

iii) Retrievethenamesofallcoursesthought byparticular professor inyear2017 and2018

iv) For each section taught by particular professor, retrieve the course

   number,semester,yearandnumberofstudentswhotookthesection.

v) Retrievethenamesandmajorofallstudentswhodo nothaveagradeofAinany of theircourses

vi)Insertanewstudentinthe database

vii)   Changetheclassofparticularstudent.

viii)Insert a new course to the database

   ix) Deletetherecordofthestudentwhosenamestart with'S'

      x) Deletethe recordofthe studentswhose namecontains'a' and'e'

   xi)   Deletetherecordofthe studentswhosenameendswith'a'

   xii)   CountthetotalnumberofstudentswithGrade andMajorwise.

   xiii)   Removeallthe referentialintegrityconstraintsonthe schema

   xiv)   Deletealltherowsfromthetables

   xv)   Dropallthetables.

PART-B

   1. Consider thefollowingrelations:

Student(snum:integer,sname:string,major:string,level: string,
age: integer)Class (name: string, meets at: string, room:
string, d: integer)

Enrolled(snum:integer,cname:string)

Faculty (fid: integer, fname: string, deptid: integer) The meaning of
these relations is straightforward; for example, Enrolled has one
recordperstudent-classpairsuchthatthestudent isenrolled inthe
class. Level is a two character code with 4 different values
(example: Junior: JR etc) Write the following queries in SQL. No
duplicatesshould beprinted inanyoftheanswers. Find thenames of
all Juniors (level = JR) whoare enrolled in a class taught by Prof.
Harshith.

i. Findthenamesofallclassesthat either meet inroomR128orhave five
or more Studentsenrolled.

ii. Findthenamesofallstudentswho areenrolled intwoclasses that
meet at the sametime.

iii. Findthenamesoffacultymemberswho teachineveryroomin
which some class istaught.

iv. Findthenamesoffacultymembersforwhomthecombined
enrollment of the coursesthat they teach is less than five

2. The following relations keep track of airline flight information:Flights (no:
integer,from:string,to:string,distance:integer,Departs:time,arrives:time,price: real)

Aircraft (aid: integer, name: string, cruising range:

Certified(eid: integer,aid:integer)

Employees(eid:integer,ename:string,salary:integer)

Notethatthe Employeesrelationdescribespilotsandotherkindsof
employees as well;bbnmbcfEvery pilot is certified for
someaircraft, and only pilots are certified to fly.Write each of
the following queries in SQL.

i. Findthenamesofaircraft suchthatallpilotscertifiedtooperate them
have salaries morethan Rs.80,000.

ii. Foreachpilot who iscertified formorethanthreeaircrafts,
findtheeidandthemaximumcruisingrangeofthe aircraft for
which she or he iscertified.

iii. Findthenamesofpilotswhosesalaryis   lessthanthepriceofthe
cheapest route fromBengaluru toFrankfurt.

iv. For all aircraft with cruising range over 1000 Kms, .find the nameoftheaircraft andtheaveragesalaryofallpilotscertified for thisaircraft.

v. Findthenamesofpilotscertifiedforsome Boeingaircraft.

vi. Findtheaidsofallaircraft that canbeusedonroutes fromBengaluruto NewDelhi.

3. Considerthefollowingdatabaseofstudentenrollmentincourses & books adopted foreachcourse.

STUDENT (regno: string, name: string, major:string,bdate:date)COURSE(course #:int, cname:string, dept:string)

ENROLL (regno:string, course#:int, sem:int,marks:int)BOOK_ADOPTION (course# :int, sem:int, book-ISBN:int)

TEXT(book-ISBN:int,book-title:string,publisher:string, author:string)

i. Createtheabovetables byproperlyspecifyingtheprimarykeysandthe foreignkeys.

ii. Enteratleastfivetuplesforeachrelation.

iii. Demonstratehowyouaddanewtext booktothedatabase and make this book beadopted by some department.

iv. Produce a list of text books (include Course #, Book-ISBN, Book-title) inthealphabeticalorderforcoursesofferedbythe 'CS' department that use more than twobooks.

v. List anydepartmentthathasallitsadoptedbookspublished bya specificpublisher.

vi. Generatesuitablereports.

vii. Createsuitable frontendforqueryinganddisplayingthe results

4. Thefollowingtablesaremaintainedbyabookdealer. AUTHOR(author-id:int, name:string, city:string,country:string)

PUBLISHER (publisher-id:int, name:string, city:string, country:string)CATALOG(book-id:int,title:string,author-id:int, publisher-id:int,category-id:int, year:int,price:int)

CATEGORY(category-id:int,description:string)

ORDER-DETAILS(order-no:int,book-id:int,quantity:int)

i. Createtheabovetables byproperlyspecifyingtheprimarykeysandtheforeign keys.

ii. Enteratleastfivetuplesforeachrelation.

iii. Give the details of the authors who have 2 or more books in the catalog and the price ofthe books is greater than the average price ofthebooksinthecatalogandthe yearofpublication isafter2000.

iv. Findtheauthorofthe bookwhich hasmaximumsales.

v. Demonstratehowyouincreasethepriceofbookspublished bya specific publisher by10%.

vi. Generatesuitablereports.

vii. Createsuitablefrontendforqueryinganddisplayingtheresults.

5. Consider the following database for a banking enterprise BRANCH(branch-name:string, branch-city:string, assets:real)ACCOUNT(accno:int, branch-name:string, balance:real) DEPOSITOR(customer-name:string, accno:int)

CUSTOMER(customer-name:string,customer-street:string,customer-city:string)

LOAN(loan-number:int, branch-name:string, amount:real)

BORROWER(customer-name:string, loan-number:int)

i. Createtheabovetables byproperlyspecifyingtheprimarykeysandtheforeign keys

ii. Enteratleastfivetuplesforeachrelation

iii. Findallthecustomerswhohaveatleast twoaccountsattheMainbranch.

iv. Findallthecustomerswho haveanaccount atallthebranches locatedina specificcity.

v. Demonstratehowyoudeleteallaccounttuplesat everybranchlocatedina specificcity.

vi. Generatesuitablereports.

vii. Createsuitablefront endforqueryinganddisplayingtheresults.

MACHINELEARNING		
SubjectCode	**21AI53**	Credits:3
CIE:50	SEE:50	SEE:03hrs
Hours/Week:3hrs(Theory)		Total Hours:42Hrs

Prerequisite:MachineLearningCrashCoursedoesnotpresumeorrequireanypriorknowledge in machine learning. However, to understand the concepts presented and complete the

exercises,werecommendthatstudentsmeetthefollowingprerequisites:

Youmustbecomfortablewithvariables,linearequations,graphsoffunctions,histograms, and statistical means.

Youshouldbeagoodprogrammer.Ideally,youshouldhavesomeexperienceprogramming in Python because the programming exercises are in Python. However, experienced programmers without Python experience can usually complete the programming exercises anyway.

CourseObjectives:

The main objective of this course is to enabling the student with basic knowledge on the techniques to build an intellectual machine for making decisions behalf of humans. This course coversthetechniquesonhowtomake learningbyamodel,how itcanbeevaluated,whatareall different algorithms to construct a learning model.

Modules	TeachingHours
ModuleI Wellposedlearningproblems,DesigningaLearningsystem,PerspectiveandIssuesin Machine Learning. **ConceptLearning:** Conceptlearningtask,Conceptlearningassearch,Find-Salgorithm,Version space, Candidate Elimination algorithm, Inductive Bias. TextBook1,Sections:1.1– 1.3,2.1-2.5,2.7	**8Hours**
ModuleII **DecisionTreeLearning:** Decision tree representation, Appropriate problems for decision tree learning, Basic decision tree learning algorithm, hypothesis space search in decision tree learning,Inductivebias indecisiontreelearning,Issuesindecisiontreelearning. Text Book1, Sections: 3.1-3.7	**8Hours**

ModuleIII **ArtificialNeuralNetworks:** Introduction,NeuralNetworkrepresentation,Appropriateproblems, Perceptrons, Backpropagation algorithm. Textbook1,Sections:4.1–4.6	**9Hours**
ModuleIV **BayesianLearning:** Introduction,Bayestheorem,Bayestheoremand conceptlearning,MLandLS error hypothesis, ML for predicting probabilities, MDL principle, Naive Bayes classifier, Bayesian belief networks, EM algorithm Textbook1,Sections:6.1–6.6,6.9,6.11, 6.12	**8Hours**
ModuleV **EvaluatingHypothesis:** Motivation, Estimating hypothesis accuracy, Basics of sampling theorem, Generalapproachforderivingconfidenceintervals,Differenceinerroroftwo hypothesis, Comparing learning algorithms. **InstanceBasedLearning:** Introduction,k-nearestneighborlearning,locallyweightedregression,radial basis function, cased-based reasoning, **ReinforcementLearning:** Introduction,LearningTask,QLearning Textbook1,Sections:5.1-5.6,8.1-8.5,13.1-13.3	**9Hours**

CourseOutcomes:

Afterstudyingthiscourse,studentswillbeableto

• Identifytheproblemsformachinelearning.Andselecttheeithersupervised, unsupervised or reinforcement learning.

• Explaintheoryofprobabilityandstatisticsrelatedtomachine learning

• Investigateconceptlearning,ANN,Bayesclassifier,knearestneighbor,Q,

Questionpaperpattern:

1. ThequestionpaperwillhaveTENquestions.
2. TherewillbeTWO questionsineachmodule,coveringallthetopics.
3. ThestudentneedtoanswerFIVEfullquestions,selectingONEfullquestionfromeach module.

Textbooks:

1.TomM.Mitchell,MachineLearning,IndiaEdition2013,McGrawHill Education.

ReferenceBooks:

1. TrevorHastie,Robert Tibshirani,JeromeFriedman,hTheElementsofStatisticalLearning,2nd edition, springer series in statistics.

2. EthemAlpaydın,Introductiontomachinelearning,secondedition,MITpress.

Courseoutcomes:

Oncompletionofthecourse,thestudentwillhavetheabilityto:

CourseCode	CO#	CourseOutcome(CO)
	CO1	Demonstratethedesigningofalearningsystemand issues in machine learning
	CO2	Applydecisiontreelearningtosolvemachine learning problems
	CO3	Applyneuralnetworktechniqueforsolvecomplex problems

	CO4	AnalysisBayesianlearningtechniquepredicting probabilities
	CO5	Analyzeandevaluatethehypothesisaccuracyusing sampling and probability theory

SOFTWAREENGINEERING

SubjectCode	21AI54		Credits:3
CIE:50	SEE:50		SEE:03hrs
Hours/Week:3hrs(Theory)			TotalHours:42 hrs

Prerequisite: ThestudentsshouldhavetheknowledgeofComputerOrganization, C,Programming Principles, Data Structure and Algorithms.

CourseObjectives:

Toenablethestudentstoobtaintheknowledge on.
- Softwareengineeringprinciplesandactivitiesinvolvedinbuildinglargesoftware programs.
- Identifyethicalandprofessionalissuesandexplainwhytheyareofconcerntosoftware engineers.
- Recognizetheimportanceofsoftwaremaintenanceanddescribetheintricacies involved in software evolution.
- Applyestimationtechniques,scheduleprojectactivitiesandcomputepricing.

Modules	Teaching Hours
Module I Overview Introduction: FAQ's about software engineering, Professional and ethical responsibility. Socio-Technical systems: Emergent system properties; Systemsengineering;Organizations,peopleandcomputersystems. CriticalSystem,SoftwareProcesses:CriticalSystems:Asimplesafety-critical system;Systemdependability;Availabilityandreliability.	**9Hours**
ModuleII Software Processes: Models, Process iteration, Process activities; The Rational Unified Process; Computer-Aided Software Engineering. Requirements: Software Requirements: Functional and Non-functional requirements; User requirements; System requirements; Interfacespecification; the software requirements document. Requirements Engineering Processes: Feasibility studies; Requirements elicitation and analysis; Requirements validation	**8Hours**

ModuleIII	
System models, Project Management: System Models: Context models; Behavioral models; Data models; Object models; Structured methods. Project Management: Management activities; Project planning. Software Design: Architectural Design: Architectural design decisions; System organization; Modular decomposition styles; Control styles.	**8Hours**
ModuleIV	
Object-Orienteddesign:ObjectsandObjectClasses;AnObject-Orienteddesign process. Development: Rapid Software Development: Agile methods; Extreme programming;Rapidapplicationdevelopment.SoftwareEvolution:Program evolution dynamics; Software maintenance; Evolution processes**.**	**8Hours**
ModuleV	
Verification and Validation: Verification and Validation: Planning: Software inspections; Automated static analysis; Verification and formal methods. Software testing: System testing; Component testing. Management:Managing People: Selecting staff; Motivating people; Managing people; The People CapabilityMaturityModel.SoftwareCostEstimation: Productivity; Estimation techniques;Algorithmiccostmodeling.	**9Hours**

Questionpaperpattern:

1. ThequestionpaperwillhaveTENquestions.
2. TherewillbeTWO questionsineachmodule,coveringallthetopics.
3. ThestudentneedtoanswerFIVEfullquestions,selectingONEfullquestionfromeach module.

Textbooks:
   1. SoftwareEngineeringbyIanSommerville,9thEdition,PearsonEducation,2012

ReferenceBooks:
   1. **Roger.S.Pressman:**SoftwareEngineering-APractitionersapproach,7thEdition,Tata McGrawHill
   2. **PankajJalote**:AnIntegratedApproachtoSoftwareEngineering, WileyIndia

Courseoutcomes:
Oncompletionofthecourse,thestudentwillhavetheabilityto:

Course Code	CO#	CourseOutcome(CO)
	CO1	Describesoftwaredevelopmentlifecycleprocesses.
	CO2	Analyzesoftwarerequirementsandgenerate SRS.
	CO3	Describedesignconceptsanddevelopdesigndocument
	CO4	DescribeSQAtasks,goals,andmetrics,andteststrategies.
	CO5	DemonstrateProjectmanagementconceptsandmetrics.

AIMLLABORATORY		
SubjectCode	**21AIL55**	Credits:1
CIE:50	SEE:50	SEE:03hrs
Hours/Week:2hrs (LABORATORY)		TotalHours:28Hrs

Experiments

1. Implementbreathfirstsearchalgorithm.

2. Implementdepthfirstsearchalgorithm.

3. Implementtravelsalesmanproblem.

4. Implementwaterjagproblem.

5. ImplementA*searchalgorithm.

6. ImplementAO*Searchalgorithm.

7. ImplementanddemonstratetheFIND-Salgorithmfor findingthemostspecifichypothesisbased on a given set of training data samples. Read the training data from a . CSV file.

8. Foragivensetoftrainingdataexamplesstoredina.CSVfile,implementanddemonstratethe Candidate-Elimination algorithm. Output a description of the set of all hypotheses consistent with the training examples.

9. WriteaprogramtodemonstratetheworkingofthedecisiontreebasedID3algorithm.Usean appropriate data set for building the decision tree and apply this knowledge to classify a new sample.

Courseoutcomes:
Oncompletionofthecourse,thestudentwillhavetheabilityto:

	CO1	Understand artificial intelligence, its characteristicsanditsapplicationareas.
	CO2	Formulate real-world problems as state space problems,optimizationproblemsorconstraint Satisfactionproblems.
	CO3	Selectandapplyappropriatealgorithmsand AI techniquestosolvecomplexproblems.
	CO4	Designandimplementusingvarioussearch algorithms.
	CO5	Designanddevelopanexpertsystembyusing appropriate tools and techniques.

ResearchMethodologyandIPR		
SubjectCode	**21RMI56**	Credits:2
CIE:50	SEE:50	SEE:03hrs

Hours/Week:2hrs	Total Hours:28Hrs

Prerequisite: Amongthenofgreatimportancearefirst,theactualityofthetheme ofthe research;second-thechoiceofadequateresearchinstrumentsandtaxonomytothechosen object field, and third, availability of a research capacity of the author.

CourseObjectives:

- Togiveanoverviewoftheresearchmethodology andexplainthetechniqueof defining a research
- problem
- •Toexplainthefunctionsoftheliteraturereview inresearch.
- •Toexplaincarryingoutaliteraturesearch,itsreview,developingtheoreticaland conceptual frameworks
- andwritingareview.
- •Toexplainvariousresearchdesignsandtheir characteristics.
- •Toexplainthedetails ofsamplingdesigns,measurementandscalingtechniquesand also different
- methodsofdatacollections.
- •ToexplainseveralparametrictestsofhypothesesandChi-square test.
- •Toexplaintheartofinterpretationandtheartofwritingresearch reports.
- •Toexplainvariousforms oftheintellectualproperty,itsrelevanceandbusiness impact in the changing
- globalbusinessenvironment.
- •TodiscussleadingInternationalInstrumentsconcerningIntellectualPropertyRights.

Modules	TeachingHours
ModuleI Introduction: Meaning of Research, Objectives of Engineering Research, and Motivation in Engineering Research, Types of Engineering Research, Finding and Solving a Worthwhile Problem. Ethics in Engineering Research, Ethics in Engineering Research Practice, Types of Research Misconduct, Ethical Issues Related to Authorship.	6Hrs.
ModuleII Defining the researchproblem- Selecting the problem. Necessityofdefining the problem Techniques involved in defining the problem- Importance of literature review in defining a problem Literature Review and Technical Reading, Newand Existing Knowledge, Analysis and Synthesis of Prior Art Bibliographic Databases, Web of Science, Google and Google Scholar, Effective Search: The WayForwardIntroductiontoTechnicalReadingConceptualizingResearch, Critical and Creative Reading, Taking Notes While Reading, Reading Mathematics and Algorithms, Reading a Datasheet.	5Hrs.

ModuleIII	6Hrs.
Research design and methods - Research design - Basic principles. Need of research design Features ofgood design- Important concepts relating to research design -Observation and Facts Attributions and Citations: Giving Credit Wherever Due, Citations: Functions and Attributes, Impact of Title and Keywords on Citations, Knowledge Flow through Citation, Citing Datasets, Styles for Citations, Acknowledgments and Attributions, What Should Be Acknowledged, Acknowledgments in, Books Dissertations, Dedication or Acknowledgments.	
Module IV	5Hrs.
Basic Concepts of Intellectual Property (IP), Classification of IP, Need for Protection of IP, International regime of IPRs - WIPO , TRIPS. Patents: Meaning of a Patent – Characteristics/ Features . Patentable and Non-Patentable Invention. Procedure for obtaining Patent. Surrender of Patent, revocation &restoration of Patents, Infringement of Patents and related remedies (penalties) . Different prescribed forms used in Patent Act. Patent agents qualifications and disqualificationsCasestudiesonpatents - Case studyofNeem petent,Curcuma(Turmeric)patentand Basmatiricepatent,Appleinc.v Samsung electronicsco.Ltd	
Module V	5Hrs.
Industrial Design: Introduction to Industrial Designs. Essential requirements of Registration. Designs which are not registrable, who is entitled to seek Registration, Procedure for Registration of Designs Copy Right Meaning of Copy Right. Characteristics of Copyright. Who is Author, variousrightsofownerofCopyright.Procedurefor registration. Termof copyright, Infringement of Copyright and Its remedies. Software Copyright.	

Questionpaperpattern:

1. ThequestionpaperwillhaveTENquestions.

2. TherewillbeTWO questionsineachmodule,coveringallthetopics.

3. ThestudentneedtoanswerFIVEfullquestions,selectingONEfullquestionfromeach module.

Textbooks:

1. ResearchMethodology:Methods andTechniquesC.R.Kothari,GauravGargNewAgeInternational4th Edition,2018
2. ResearchMethodologyastep-bystepguideforbeginners.(ForthetopicReviewingtheliteratureunder module 2) Ranjit Kumar SAGE PublicationsLtd 3rd Edition, 2011
3. Study Material (For the topic Intellectual Property under module 5) Professional Programme IntellectualPropertyRights,LawandPractice,TheInstituteofCompanySecretariesofIndia,Statutory Body Under an Act of Parliament, September 2013

ReferenceBooks:
1. ResearchMethods:theconciseknowledgebaseTrochimAtomicDogPublishing 2005
2. ConductingResearchLiteratureReviews:From theInternettoPaperFinkASagePublications 2009

EnvironmentalStudies		
SubjectCode	**21CIV57**	Credits:01
CIE:50	SEE:50	SEE:02hrs
Hours/Week:02hrs(Theory)		Total Hours:25 Hrs

Prerequisite:

CourseObjectives:
- To identify the major challenges in environmental issues and evaluate possible solutions. 2. Developanalyticalskills,criticalthinkinganddemonstratesocio-economicskillsforsustainable development. 3. To analyze an overall impact of specific issues and develop environmental management plan.

Modules	Teaching Hours
Module-I Introduction: Environment - Components of Environment Ecosystem: Types & Structure of Ecosystem, Balanced ecosystem Human Activities – Food, Shelter, And Economic & Social Security. 2 Hours Impacts of Agriculture & Housing Impacts of Industry, Mining & Transportation Environmental Impact Assessment, Sustainable Development. 3 Hours	**5Hours**
Module-II Natural Resources, Water resources – Availability & Quality aspects,Water borne diseases & water induced diseases, Fluoride problem in drinking water Mineral resources,ForestWealthMaterialCycles –CarbonCycle,NitrogenCycle&Sulphur Cycle. 2 Hours Energy – Different types of energy, Conventional sources &Non Conventional sourcesofenergySolarenergy,Hydroelectricenergy,WindEnergy,Nuclearenergy, Biomass & Biogas Fossil Fuels, Hydrogen as an alternative energy. 3 Hours	5Hours
Module-III EnvironmentalPollution–WaterPollution,Noisepollution,LandPollution,Public Health Aspects. 2 Hours GlobalEnvironmentalIssues:PopulationGrowth,Urbanization,LandManagement, Water & Waste Water Management3 Hours	5Hours
Module-IV AirPollution&AutomobilePollution:Definition,Effects –GlobalWarming,Acidrain &Ozonelayerdepletion,controllingmeasures.3HoursSolidWasteManagement,E -WasteManagement&BiomedicalWasteManagement-Sources,Characteristics& Disposal methods. 2 Hours	**5Hours**

Module-V	
IntroductiontoGIS&Remotesensing,Applicationsof GIS&RemoteSensingin Environmental Engineering Practices. 2 Hours Environmental Acts &Regulations,Role of government,Legal aspects, Role of NongovernmentalOrganizations(NGOs),EnvironmentalEducation&Women Education. 3 Hours	**5Hours**

CourseOutcome:Studentswillbeableto,
1. Understandthe principlesofecologyandenvironmentalissuesthatapplytoair,land,andwaterissuesona global scale,
2. Developcriticalthinkingand/orobservationskills,andapplythemtotheanalysisofa problem orquestion related to the environment,
3. Demonstrateecologyknowledgeofacomplexrelationshipbetweenbioticandabioticcomponents
4. Applytheirecologicalknowledgetoillustrateandgraphaproblemanddescribetherealitiesthat managers face when dealing with complex issues.

TextBooks:1.BennyJoseph(2005),"EnvironmentalStudies",TataMcGraw–HillPublishing Company Limited.2.R.J.RanjitDanielsandJagadishKrishnaswamy,(2009),"EnvironmentalStudies",WileyIndiaPrivate Ltd., New Delhi. 3. R Rajagopalan, "Environmental Studies – From Crisis to Cure", Oxford University Press, 2005, 4. Aloka Debi, "Environmental Science and Engineering", Universities Press (India) Pvt. Ltd. 2012.

ReferenceBooks:1.RamanSivakumar,"Principals ofEnvironmentalScienceandEngineering",SecondEdition, Cengage learning Singapore, 2005 2. P. Meenakshi, "Elements of Environmental Science and Engineering", Prentice Hall of India Private Limited, New Delhi, 2006 3. S.M. Prakash, "Environmental Studies", Elite Publishers Mangalore, 2007 4.ErachBharucha, "Text Book of Environmental Studies", for UGC, University press,20055.G.TylerMillerJr.,"EnvironmentalScience – working withthe Earth", TenthEdition, Thomson Brooks/Cole,20046.G.TylerMillerJr.,"EnvironmentalScience –workingwiththe Earth",EleventhEdition, Thomson Brooks /Cole, 2006 7.Dr.Pratiba Sing, Dr.AnoopSingh and Dr.PiyushMalaviya, "Text Book of Environmental and Ecology", Acme Learning Pvt. Ltd. New Delhi.

PRINCIPLESOFOPERATINGSYSTEM		
Subject Code:	21AIAE581	Credits:1
CIE:50Marks	SEE:50Marks	SEE:02Hrs.
Hours/Week:02Hrs(Practical)		Total Hours:28Hrs.

Prerequisite:
StudentsshouldhavetheknowledgeofC,DataStructureand Algorithm.

CourseLearningObjectives
ToenablethestudentstoobtaintheknowledgeofOperatingSystemlaboratoryinthe following topics.
- Toimplement CPUschedulingalgorithms
- Todevelopbankersalgorithmusedfordeadlockavoidanceand prevention.
- Toimplement pagereplacementandmemorymanagement algorithms.

Sl.No	Experiments
1.	Writethecommandsforthefollowing: a) Concatenateortypeoutafile b) Changecurrent directory

	c) Listthefilesinthecurrent directory	
	d) Createdirectory	
2.	Writethecommandsforthefollowing:	
	a) Printthenumberoffiles	
	b) Tosaveandexitfromvieditor	
	c) Changefileprotection	
	d) Deletedirectory	
3.	Writethecommandsforthefollowing:	
	a) Displaydateandtime	
	b) Renamefile	
	c) findstringinafile	
	d) get help	
4.	Writeashellscript todisplaythecalendarforcurrentmonthwithcurrentdatereplaced by *or**dependingonwheltherthedatehasonedigitortwodigits.	
5.	Write a shell script takes a valid directory name as an argument and recursively descend allthesubdirectories.Findthemaximumlengthofanyfileinthathierarchyandwrite thismaximumvaluetothestandardoutput.	
6.	Writeashellscriptthatacceptstwofilenamesasarguments,checksifthepermissions forthesefilesareidenticalandifthepermissionsareidentical,outputcommon permissions and otherwise output each file name followed by its permissions.	
7.	WriteaCprogramto computeaveragewaiting timeand averageturnaroundtime forFirst-ComeFirst-Served(FCFS)Schedulingalgorithm,theprogramshould accept the arrival time and burst time as input.	
8.	Write a C programto compute average waiting time and average turnaroundtime forShortest-Job-FirstSchedulingalgorithm,theprogramshouldacceptthearrival timeandbursttimeasinput.	
9.	WriteaCprogramtocomputeaveragewaitingtimeandaverageturnaroundtime for PriorityScheduling algorithm, the programshould accept the arrivaltime and burst Timeand priorityasinput.	
10.	WriteaCprogramtocomputeaveragewaitingtimeandaverageturnaroundtime for Round- Robin Scheduling algorithm, the program should accept the arrival timeandbursttimeandassumesuitabletimequantumasinput.	
11	WriteaprogramfortheBanker'salgorithm.	
12	SimulatepagereplacementalgorithmLRU.	

Questionpaperpattern:
InSEE,studentswillbeaskedtoexecutetheprogramswhichmayberelatedtotheabove topics.

Course Outcome
Attheend ofthecoursethestudentwillbeableto:

CO#	Course Outcome
CO1	WriteacprogramtoimplementprocessSchedulingalgorithms.
CO2	Implement processsynchronizationtechniquesusingCProgram.
CO3	Writeacprogramtoimplementdeadlockhandling techniques.
CO4	ImplementpagereplacementalgorithmsusingCprogram.

CO5	WriteaCprogramtoimplementdiskschedulingtechniques, Thread synchronizationusingmutualexclusionand conditionvariables..

ENTREPRENEURSHIP MANAGEMENTANDFINANCE		
SubjectCode	**21HU61**	Credits:03
CIE:50	SEE:50	SEE:03hrs
Hours/Week:03hrs(Theory)		TotalHours:42hrs
Prerequisite: None		

CourseObjectives: Toenablethestudentstoobtaintheknowledgeof Entrepreneurship Management And Finance in the following topics.
- TheMeaning,Functions,Characteristics,Types,RoleandBarriersofEntrepreneurship,. Government Support for Entrepreneurship
- Management–Meaning,nature,characteristics,scope,functions,roleetc and
- Engineerssocialresponsibilityandethics
- PreparationofProjectandSourceofFinance
- FundamentalsofFinancialAccounting
- PersonnelandMaterialManagement,Inventory Control

Modules	Teaching Hours
Module-I **ENTREPRENEUR** : Meaning of Entrepreneur; Functions of an Entrepreneur; Characteristics of an entrepreneur , Types of Entrepreneur; Intrapreneurs – an emerging class ; Role of Entrepreneursineconomicdevelopment; Barriers to entrepreneurship, Government Support for Innovation and Entrepreneurship in India -Startup-India, Make-in-India, PMMY, AIM , STEP, BIRAC, Stand-up India, TREAD	**8Hours**
Module-II **MANAGEMENT:** Introduction – Meaning – nature andcharacteristics of Management, Scope and functional areas of management, Roles of Management, Levels of Management, Henry Fayol-14Principles toManagement , Engineers Social responsibility and Ethics	**8Hours**
Module-III **PREPARATIONOFPROJECTANDSOURCEOFFINANCE:** **PREPARATION OF PROJECT:** Meaning of project; Project Identification; Project Selection; Project Report; Need and Significance of Report; Contents;	**8Hours**

SOURCE OF FINANCE: Long Term Sources(Equity, Preference, Debt Capital, Debentures, loan from Financial Institutions etc) and Short Term Source(Loan from commercial banks, Trade Credit, Customer Advances etc)	
Module-IV **FUNDAMENTALSOFFINANCIALACCOUNTING:**Definition,Scope and Functions of Accounting , Accounting Concepts and Conventions: Golden rules of Accounting, Final Accounts - Trading and Profit and Loss Account, Balance sheet	**9Hours**
Module-V PERSONNEL MANAGEMENT, MATERIAL MANAGEMENT AND INVENTORY CONTROL: **PERSONNEL MANAGEMENT:**Functionsof Personnel Management, Recruitment, Selection and Training, Wages, Salary and Incentives **MATERIALMANAGEMENTANDINVENTORYCONTROL**:Meaning, Scope and Objects of Material Management. Inventory Control-Meaning and Functions of Inventory control ; Economic Order Quantity(EOQ) and various stock level (Re-order level, Minimum level, Maximum level,Average level and Danger level)	**9Hours**

Questionpaperpattern:

1.ThequestionpaperwillhaveTENquestions.
2.TherewillbeTWOquestionsineachmodule,coveringallthetopics.
3.ThestudentneedtoanswerFIVEfullquestions,selectingONEfullquestionfromeachmodule.

ReferenceBooks:
1.IndustrialOrganization&EngineeringEconomics-TRBanga&SCSharma-KhannaPublishers,Dehli.

Courseoutcomes:
Oncompletionofthecourse,thestudentwillhavetheabilityto:

CourseCode	CO#	CourseOutcome(CO)
	CO1	DevelopEntrepreneurshipskills
	CO2	ApplytheconceptsofmanagementandEngineersSocial responsibility & Ethics practice
	CO3	Prepareprojectreport&choosedifferentSourceof Finance.
	CO4	ApplyFundamentalsofFinancialAccountingand interpret the final accounts
	CO5	Applypersonnelmanagementskills,Materialand inventory control techniques

DEEP LEARNING		
SubjectCode	**21AI62**	Credits:4
CIE:50	SEE:50	SEE:03hrs
Hours/Week:3hrs(Theory)		Total Hours:52Hrs

Prerequisite: MachineLearning

CourseObjectives: Toenablethe studentstoobtaintheknowledgeof DEEPLEARNINGinthe following topics.
- UnderstandcomplexityofDeepLearningalgorithmsandtheirlimitations.
- BecapableofperformingexperimentsinDeepLearningusingreal-worlddata

Modules	TeachingHours
ModuleI **Introductionto Deep Learning**:Introductiontodeep learning, Biological&artificial neurons ANN & its layer, Exploring activation functions, Forward propagation in ANN, How does ANN learn ,Debugging gradient descent with gradient checking. Getting to Know TensorFlow: Introduction to TensorFlow, Understanding computational graphs and sessions, Variables, constants and placeholders, Introducing TensorBoard , Handwritten digit classification using TensorFlow , Introducing eager execution,MathoperationsinTensorFlow,TensorFlow2.0andKeras,Kerasor TensorFlow	**10Hours**
ModuleII **IntroductiontoRNN:**GeneratingSongLyricsUsingRNN, IntroducingRNNs Generating song lyrics using RNNs, Different types of RNN architectures. **Improvements to the RNN**: Improvements to the RNN, LSTM to the rescue, Gated recurrent units, BidirectionalRNN,Goingdeep withdeep RNN,Languagetranslation using the seq2seq model.	**10Hours**
ModuleIII **Demystifying Convolutional Network**s: Demystifying Convolutional Networks, Introduction to CNNs ,The architecture of CNNs ,The math behind CNNs , Implementinga CNN inTensorFlow, CNNarchitectures, Capsulenetworks, Building Capsule networks in TensorFlow. Case study	**9Hours**

ModuleIV	
Learning Text Representations: Learning Text Representations ,Understanding the word2vec model ,Building the word2vec model using gensim, Visualizing word embeddingsinTensorBoard,Doc2vecUnderstanding,skip-thoughtsalgorithm ,Quickthoughtsforsentenceembeddings.	**9Hours**

ModuleV	
Generating Images Using GANs: Generating Images Using GANs, Differences betweendiscriminativeandgenerativemodels. DCGAN –Addingconvolutiontoa GAN, Deconvolution generator, convolutional discriminator. **Learning More about GANs**: Conditional GAN, Loss Function of CGAN, GeneratingspecificdigitsusingCGAN,UnderstandingInfoGAN,ExploringMutual Information, Architecture of InfoGAN, Translating images using CycleGAN, Role ofgenerators,Roleofdiscriminators,LossFunction,CycleConsistencyLoss,Stack GAN, Architecture of StackGANs. Introduction to auto encoder.	**9Hours**

Questionpaperpattern:

1. ThequestionpaperwillhaveTEN questions.

2. TherewillbeTWO questionsineachmodule,coveringallthetopics.

3. ThestudentneedtoanswerFIVEfullquestions,selectingONEfullquestionfromeach module.

Textbooks:

CosmaRohillaShalizi,AdvancedDataAnalysisfromanElementaryPointofView,2015.

Courseoutcomes:

Oncompletionofthecourse,thestudentwillhavetheabilityto:

1. UnderstandtheconceptsofDeepLearning,TensorFlow,itsmainfunctions, operationsandtheexecution pipeline.
2. UnderstandRecurrentNeuralNetworks(RNN),ImplementdifferentarchitecturesofRNNinTensorflow
3. Learnconvolutionalneuralnetworks,ImplementdifferentarchitecturesofCNNinTensorflow.
4. DemonstrateTextRepresentationsandBuildtheword2vecmodelusinggensimandinterprettheresults.
5. BuilddifferentarchitecturesofGANSinTensorflow

Deep-Learning-Lab-Programs

Week-1:PerceptronLearningImplementation

Week-2:MultilayerPerceptronanditsHyperparameterTuning

Week-3 : Hyperparameter Tuning

Week-4 :ImplementationofMultilayerNeuralNetworkusing Keras andDataAugmentationonMNISTdataset.

Week-5 : CNN Implementation on MNIST Dataset.

Week-6:TransferLearningofpretrainedmodelsonMNISTdataset

Week-7 :TransferLearningonPlantVillagedatasetforPlantDiseaseDetection

Week-8 : Sentiment Analysis using Recurrent Neural Networks(RNN)

Week-9:TextGenerationusingLSTM

Week-10:DenoisingandDimensionalityReductionforMedicalMNISTdatasetusingAutoencoders

DATASCIENCEANDITS APPLICATIONS			
SubjectCode	21AI63	**CIE Marks**	50
NumberofContactHours/Week	3:2:0	**SEEMarks**	50
TotalNumberofContactHours	42	**ExamHours**	03
CREDITS–3			

CourseObjectives: Thiscoursewillenablestudentsto
- Anunderstandingofthedataoperations
- Anoverviewofsimplestatisticalmodelsandthebasicsofmachinelearningtechniquesofregression.
- Anunderstandinggoodpracticesofdatascience
- Skillsintheuseoftoolssuchaspython,IDE
- UnderstandingofthebasicsoftheSupervisedlearning

Module-1	**Contact Hours.**
Introduction, Toolboxes: Python, fundamental libraries for data Scientists. Integrated development environment (IDE). Data operations: Reading, selecting, filtering, manipulating, sorting, grouping, rearranging, ranking, and plotting.	9
Module-II	
Descriptive statistics, data preparation. Exploratory Data Analysis data summarization, data distribution, measuring asymmetry. Sample and estimated mean, variance and standard score. Statistical Inference frequency approach, variability of estimates, hypothesis testing using confidence intervals, using pvalues	9

Module-III	
SupervisedLearning:First step,learningcurves,training-validationandtest.Learning models generalities, support vector machines, random forest. Examples	8
Module-IV	
Regressionanalysis, Regression: linear regressionsimple linear regression, multiple & Polynomialregression,Sparsemodel.Unsupervisedlearning,clustering,similarityand distances, quality measures of clustering, case study.	8
Module-V	
NetworkAnalysis,Graphs,SocialNetworks,centrality,drawingcentralityofGraphs,PageRank, Ego-Networks, community Detection	8

CourseOutcomes: After studyingthiscourse, studentswillbeableto:

- 1.DescribewhatDataScienceis andtheskillsets neededtobeadata scientist
- Explainthesignificanceof exploratorydataanalysis(EDA) indata science
- Abilitytolearnthesupervisedlearning,SVM
- Applybasicmachinelearningalgorithms(LinearRegression)
- ExploretheNetworks,PageRank

QuestionPaperPattern:
Thequestionpaperwillhave TENquestions. TherewillbeTWO questionsineachmodule,coveringallthetopics. Thestudentneedtoanswer FIVEfullquestions,selectingONEfullquestionfromeachmodule.

Textbooks:
1. IntroductiontoDataScienceaPythonapproachtoconcepts,TechniquesandApplications, Igual, L;Seghi', S. Springer, ISBN:978-3-319-50016-4 2. DataAnalysiswithPythonAModernApproach,DavidTaieb,Packt Publishing,ISBN-9781789950069 3. PythonDataAnalysis,SecondEd.,ArmandoFandango,PacktPublishing,ISBN: 9781787127487
ReferenceBooks:

1. EmilyRobinsonandJacquelineNolis,**"BuildaCareerin DataScience",**1stEdition,ManningPublications,2020.ISBN:978-1617296246.
2. AurélienGéron,**"Hands-OnMachineLearningwithScikit-Learn,Keras,andTensorFlow:Concepts,Tools,andTechniquestoBuildIntelligentSystems",** 2ndEdition,O'ReillyPublications/ShroffPublishersandDistributorsPvt.Ltd.,2019.ISBN- 13:978-1492032649.
3. FrançoisChollet,**"DeepLearningwithPython**",1stEdition,ManningPublications, 2017.ISBN-13:978-1617294433
4. JeremyHowardandSylvainGugger,**"DeepLearningforCoderswithfastaiandPyTorch",** 1stEdition,O'ReillyPublications/ShroffPublishersandDistributorsPvt.Ltd.,2020.ISBN-13:978-1492045526.
5. SebastianRaschkaandVahidMirjalili,**"PythonMachineLearning:MachineLearningandDeepLearning withPython,scikit-learn,andTensorFlow2",**3rdEdition,PacktPublishing Limited,2019.ISBN-13:978-1789955750

CGANDFUNDAMENTALSOFIMAGEPROCESSING		
SubjectCode	**21AI641**	Credits:3

CIE:50	SEE:50	SEE:03hrs
Hours/Week:3hrs(Theory)		TotalHours:42Hrs

Prerequisite: None

CourseObjectives:
      CO1.OverviewofComputerGraphicsalongwithitsapplications.
      CO 2. Exploring 2D and 3D graphics mathematics along with OpenGL API's.
      CO3.UseofComputer graphicsprinciplesforanimationanddesignofGUI's. CO 4.
      Introduction to Image processing and Open CV.
      CO5.ImagesegmentationusingOpen CV.

Modules	TeachingHours
ModuleI Overview: Computer Graphics hardware and software and OpenGL: Computer Graphics: Video Display Devices, Raster-Scan Systems Basics of computer graphics, Application of Computer Graphics. OpenGL: Introduction to OpenGL, coordinate reference frames, specifying two-dimensional world coordinate reference frames in OpenGL, OpenGL point functions, OpenGL line functions, point attributes, line attributes, curve attributes, OpenGL point attributefunctions, OpenGL line attribute functions, Line drawing algorithms(DDA, Bresenham's).	**9Hours**
ModuleII 2D and 3D graphics with OpenGL: 2D Geometric Transformations: Basic 2D GeometricTransformations,matrixrepresentationsandhomogeneouscoordinates, 2D Composite transformations, other 2D transformations, raster methods for geometric transformations, OpenGL raster transformations, OpenGL geometric transformations function, 3D Geometric Transformations: Translation, rotation, scaling, composite 3D transformations,other3Dtransformations,OpenGLgeometrictransformations functions	**9Hours**
ModuleIII InteractiveInputMethodsandGraphicalUserInterfaces:GraphicalInputData ,LogicalClassificationofInputDevices, InputFunctionsfor GraphicalData, Interactive Picture-Construction Techniques, Virtual-Reality Environments, OpenGL Interactive Input-Device Functions, OpenGL Menu Functions , Designing a Graphical User Interface. ComputerAnimation:DesignofAnimationSequences,Traditional Animation Techniques, General Computer-Animation Functions, Computer-Animation Languages, Character Animation, Periodic Motions, OpenGL Animation Procedures.	**8Hours**

ModuleIV	8Hours
Introductionto Imageprocessing:overview, NatureofIP, IPanditsrelatedfields, Digital Image representation, types of images. DigitalImageProcessingOperations:Basicrelationshipsanddistancemetrics, Classification of Image processing Operations. ComputervisionandOpenCV:Whatiscomputervision,Evolutionofcomputer vision, Application of Computer vision, Feature of OpenCV, OpenCV library modules, OpenCV environment, Reading, writing and storing images using OpenCV. OpenCV drawing Functions. OpenCV Geometric Transformations	

ModuleV	8Hours
ImageSegmentation:Introduction,classification,detectionofdiscontinuities, Edge detection (up to canny edge detection(included)). Image processing with Open CV: Resizing , Rotation/ Flipping, Blending, Creating region of Interest (ROI), Image Thresholding, Image Blurring and smoothing,EdgeDetection,ImagecontoursandFaceDetectiononimagesusing OpenCV	

CourseOutcomes: After studyingthiscourse, studentswillbeableto:

CO1.ConstructgeometricobjectsusingComputerGraphicsprinciplesandOpenGL APIs.
CO2. UseOpenGL APIsandrelatedmathematicsfor 2Dand3DgeometricOperationsontheobjects. CO 3. Design GUI with necessary techniques required to animate the created objects
CO4.ApplyOpenCVfordevelopingImageprocessingapplications.
CO5.ApplyImagesegmentationtechniquesalongwithprogramming,usingOpenCV,for developing simple applications.

QuestionPaperPattern:

ThequestionpaperwillhaveTENquestions.
TherewillbeTWO questionsineachmodule,coveringallthe topics.
ThestudentneedtoanswerFIVEfullquestions,selectingONEfullquestionfromeachmodule.

Textbooks:

1. DonaldDHearn,MPaulineBaker andWarrenCarithers:Computer GraphicswithOpenGL4thEdition, Pearson, 2014

2. S.Sridhar,DigitalImageProcessing,secondedition,OxfordUniversitypress 2016.

ReferenceBooks:

1. EdwardAngel:InteractiveComputer Graphics-ATopDownapproachwithOpenGL, 5thedition. Pearson Education, 2008

2. JamesDFoley,Andries VanDam, StevenKFeiner,JohnFHugesComputergraphicswithOpenGL: Pearson education

BUSINESSINTELLIGENCE		
SubjectCode	**21AI642**	Credits:3
CIE:50	SEE:50	SEE:03hrs
Hours/Week:3hrs(Theory)		TotalHours:42Hrs

Prerequisite:None

CourseObjectives:

Modules	TeachingHours
ModuleI Development Steps, BI Definitions, BI Decision Support Initiatives, Development Approaches, Parallel Development Tracks, BI Project Team Structure,BusinessJustification,BusinessDivers,BusinessAnalysisIssues, Cost – Benefit Analysis, Risk Assessment, Business Case Assessment Activities, Roles Involved In These Activities, Risks Of Not Performing Step, Hardware, Middleware, DBMS Platform, Non Technical Infrastructure Evaluation	**9Hours**
ModuleII Managing The BI Project, Defining And Planning The BI Project, Project PlanningActivities, Roles AndRisks InvolvedInThese Activities, General BusinessRequirement,ProjectSpecificRequirements,InterviewingProcess	**9Hours**
ModuleIII DifferencesinDatabaseDesignPhilosophies,LogicalDatabaseDesign,Physical Database Design, Activities, Roles And Risks Involved In These Activities, Incremental Rollout, Security Management, Database Backup And Recovery	**8Hours**
ModuleIV Growth Management, Application Release Concept, Post Implementation Reviews, Release Evaluation Activities, The Information Asset and Data Valuation,ActionableKnowledge–ROI,BIApplications,TheIntelligence Dashboard	**8Hours**
ModuleV Business ViewofInformationtechnologyApplications:BusinessEnterprise excellence, KeypurposeofusingIT,Typeofdigitaldata,basicsfenterprise reporting, BI road ahead.	**8Hours**

QuestionPaperPattern:

The question paper will have TEN questions.
There will be TWO questions in each module, covering all the topics.
The student need to answer FIVE full questions, selecting ONE full question from each module.

Textbooks:
1 Business Intelligence Roadmap: The Complete Project Lifecycle for Decision Support Applications Larissa T Moss and ShakuAtre Addison Wesley Information Technology Series 2003. 2 Fundamentals of Business Analytics RNPrasad, SeemaAcharya WileyIndia 2011.

ReferenceBooks:
1 Business Intelligence: The Savvy Manager's Guide David Loshin Morgan Kaufmann 2 Delivering Business Intelligence with Microsoft SQL Server 2005 Brian Larson McGraw Hill 2006 3 Foundations of SQL Server 2008 Business Intelligence Lynn Langit Apress 2011

SOFTWARE TESTING TOOLS & TECHNIQUES		
Subject Code	**21AI65OE1**	Credits:3
CIE:50	SEE:50	SEE:03hrs
Hours/Week:3hrs(Theory)		TotalHours:42Hrs

Prerequisite: The students should have the knowledge of Software Engineering Fundamentals and Object Oriented programming languages

Course Objectives: To enable the students to obtain the knowledge of Software Testing Tool s and Techniques
- To understand the Software Engineering processes and Models for Various test processes and continuous quality improvement.
- To understand the Verification and Validation techniques, Project planning and Cost Estimations techniques.
- To understand the Architectural Design decisions and Object Oriented Design Processes.
- To make use of various test tools and Application of software testing techniques in commercial environments.

Modules	TeachingHours
Module I **Overview:** Introduction: FAQ's about software engineering, Professional and ethical responsibility. **Software processes:** Software Processes: Models, Process iteration, Process activities; The Rational Unified Process; Computer-Aided Software Engineering. **Requirements:** Software Requirements: Functional and Non-functional requirements; User requirements; System requirements; Interface specification; The software requirements document. Requirements Engineering Processes: Feasibility studies; Requirements elicitation and analysis; Requirements validation; Requirements management.	**9Hours**

Module II **Software design:** Architectural Design: Architectural design decisions; System organization; Modular decomposition styles; Control styles. Object-Oriented design: Objects and Object Classes; An Object-Oriented design process; Design evolution. **Development:** Rapid Software Development: Agile methods; Extreme programming; Rapid application development. Software Evolution: Program evolution dynamics; Software maintenance; Evolution processes; Legacy system evolution.	9Hours
Module III **Verification and Validation:** Verification and Validation: Planning; Software inspections; Automated static analysis; Verification and formal methods. **Management**: managing People: Selecting staff; Motivating people; Managing people; The People Capability Maturity Model. **Software Cost Estimation:** Productivity; Estimation techniques.	**8Hours**
Module IV **A Perspective on Testing, Examples:** Basic definitions, Test cases, Insights from a Venn diagram, Identifying test cases, Error and fault taxonomies, Levels of testing. Examples: Generalized pseudocode, The triangle problem, The NextDate function, The commission problem, The SATM (Simple Automatic Teller Machine) problem, The currency converter, Saturn windshield wiper. **Boundary Value Testing:** Boundary value analysis, Robustness testing, Worst-case testing, Special value testing, Examples, Random testing, Guidelines for Boundary value Testing.	**8Hours**

	Module V	
	Path Testing: DD paths, Test coverage metrics, Basis path testing, guidelines and observations. Define/Use testing, Slice-based testing, Guidelines and observations. **Levels of Testing:** Traditional view of testing levels, Alternative life-cycle models, The SATM system, Separating integration and system testing. **Integration Testing:** A closer look at theSATMsystem, Decomposition-based Integration, calls graph-based Integration.	**8Hours**

Question paper pattern:
The question paper will have TEN questions. There will be TWO
questions in each module, covering all the topics.
The student need to answer FIVE full questions, selecting ONE full question from each module.

Textbooks:
Software Engineering – Ian Somerville, 8th Edition, Pearson Education, 2007.(Listedtopics only from Chapters 1, 4,6, 7, 11, 14, 17, 21, 22)
Software Testing, ACraftsman'sApproach-PaulC.Jorgensen:,3rdEdition, AuerbachPublications,2008.
(Listed topics only from Chapters1,2, 5,6,7, 9,12,13).

Reference Books:
 SoftwaretestingPrinciplesandPractices –GopalaswamyRamesh,SrinivasanDesikan,2 nd Edition, Pearson, 2007.
1. SoftwareTesting–RonPatton,2ndedition,PearsonEducation,2004.
 2. TheCraftofSoftwareTesting–BrianMarrick,PearsonEducation,1995.
3. AnirbanBasu,SoftwareQualityAssurance,TestingandMetrics,PHI,2015.
4. NareshChauhan,SoftwareTesting,OxfordUniversitypress.

Courseoutcomes:
Oncompletionofthecourse,thestudentwillhavetheabilityto:

Course Code	CO#	CourseOutcome(CO)

	CO1	Demonstrate Software Engineering processes models, Requirementcollectionandanalysis process.
	CO2	Illustrate Software Design for ArchitecturalDesign decisions and ObjectOrientedDesign Processes,
	CO3	Apply Verification and Validation,, Project Planning and Cost EstimationTechniques.
	CO4	DesigntestcasesandanalyzedifferentLevelsoffunctionalTesting.
	CO5	Designtest-casesandanalyzedifferentnon-functionaltestingprocedures

MANAGEMENTINFORMATIONSYSTEM		
SubjectCode	**21AI65OE2**	Credits:3
CIE:50	SEE:50	SEE:03hrs
Hours/Week:3hrs(Theory)		TotalHours:42Hrs

Prerequisite: ThestudentsshouldhavetheknowledgeofSoftwareEngineering FundamentalsandObject Oriented programming languages

CourseObjectives:

ToenablethestudentstoobtaintheknowledgeofSoftwareTestingToolsandTechniques

Modules	TeachingHours
ModuleI **Fundamentals of Information Systems:** Information systems in business, fundamentals of information systems solving business problems with information systems.	**9Hours**
ModuleII **Information Systems for Business Operations:** Business information systems, Transaction processing systems, management, informationsystems and decision support systems. Artificial intelligence technologies in business, information system for strategic applications and issues in information technology.	**9Hours**
ModuleIII **IssuesinManagingInformationTechnology:**Managinginformationresources and technologies global information technology, management, planning and implementing change, integrating business change with IT, security and ethical challenges in managing IT, social challenges of information technology	**8Hours**
ModuleIV **E-Business Model:** E-commerce frame work, Architectural frame work for e-commerce, Applicationservicesandtransaction, Models –B2CTransactions, B2B Transactions,Intra-OrganizationalTransactions,WWWArchitecture:Clientserver structure of the web, e-Commerce architecture, Technology behind the web.	**8Hours**

ModuleV		**8Hours**
Consumer Oriented E-Commerce: Consumer oriented Application: Finance and Home Banking, Homeshopping, Home Entertainment, MercantileProcess Models, Consumersperspective,Merchantsperspective.ElectronicsDataInterchange(EDI): EDI Concepts, Applications in business – components of international trade, Customs Financial EDI, Electronic fund transfer, Manufacturing using EDI, Digital Signatures and EDI.		

Questionpaperpattern:

ThequestionpaperwillhaveTEN questions.
TherewillbeTWO questionsineachmodule,coveringallthetopics.
ThestudentneedtoanswerFIVEfullquestions,selecting ONEfullquestion fromeach module.

Textbooks:

ManagementInformationsystems –managinginformationtechnologyintheinternetworkedenterprise–jams. AO'Brien–Tata McGrawHillpublishingcompanylimited–2002. 2.ManagementInformation Systems – Laaudon & Laudon – PHI – ISBN 81-203-1282-1.1998

ReferenceBooks:

ManagementInformationsystems –S.Sadogopan. –PHI–1998Edn.ISBN81-203-1180-9.2.Information systems for modern management – G.R. Murdick – PHI – 2nd Edition.

CYBERSECURITY		
SubjectCode	**21AI65OE3**	Credits:3
CIE:50	SEE:50	SEE:03hrs
Hours/Week:3hrs(Theory)		TotalHours:42Hrs

Prerequisite: None

CourseObjectives:

      ToenablethestudentstoobtaintheknowledgeofSoftwareTestingToolsandTechniques
    CO1.TofamiliarizecybercrimeterminologiesandACTs
    CO2. Understandingcybercrimeinmobilesandwirelessdevicesalongwith thetoolsfor
Cybercrime and prevention
    CO3.Understandthemotiveandcausesfor cybercrime,cybercriminals, andinvestigators CO 4.
    Understanding criminal case and evidence, detection standing criminal case and

Modules	**Teaching Hours**

ModuleI **Introduction to Cybercrime:** Cybercrime: Definition and Origins of the Word, Cybercrime and Information Security, Who are Cybercriminals? Classifications of Cybercrimes, **Cybercrime:**TheLegalPerspectives, **Cybercrimes**:AnIndianPerspective,CybercrimeandtheIndianITA2000. Textbook1:Ch1(1.1to1.8).	**9Hours**
ModuleII **Cyberoffenses**: **HowCriminals PlanThem**:Introduction,HowCriminalsPlantheAttacks, Social Engineering, Cyber stalking, Cybercafe and Cybercrimes. **Botnets:**TheFuelforCybercrime,AttackVector Textbook1: Ch2 (2.1 to 2.7).	**9Hours**
ModuleIII **Tools and Methods Used in Cybercrime:** Introduction, Proxy Servers and Anonymizers,Phishing,PasswordCracking,KeyloggersandSpywares,Virus and Worms, Trojan Horses and Backdoors, Steganography, DoS and DDoS Attacks, Attacks on Wireless Networks. Textbook1:Ch4(4.1to4.9,4.12).	**8Hours**
ModuleIV **Understandingthepeopleonthescene:**Introduction,understandingcyber criminals, understanding cyber victims, understanding cyber investigators. **TheComputerInvestigationprocess:**investigatingcomputer crime. **Understanding Cybercrime Prevention:** Understanding Network Security Concepts, UnderstandingBasicCryptographyConcepts,MakingtheMostof Hardware and Software Security. Textbook2:Ch3,Ch4,Ch7	**8Hours**
ModuleV **CybercrimeDetectionTechniques:**SecurityAuditingandLogFirewallLogs, Reports, Alarms, and Alerts, Commercial Intrusion Detection Systems, Understanding E-Mail Headers Tracing a Domain Name or IP Address. **CollectingandpreservingdigitalEvidence:** Introduction,understandingtherole of evidence in a criminal case, collecting digital evidence, preserving digital evidence, recovering digital evidence, documenting evidence. TextBook2:Ch9,Ch10	**8Hours**
Questionpaperpattern:	
ThequestionpaperwillhaveTEN questions. TherewillbeTWO questionsineachmodule,coveringallthe topics. ThestudentneedtoanswerFIVEfullquestions,selectingONEfullquestionfromeach module.	
Textbooks:	

1. SunitBelapureandNinaGodbole,"CyberSecurity:UnderstandingCyberCrimes,ComputerForensics And Legal Perspectives", Wiley India Pvt Ltd, ISBN: 978-81- 265-21791, 2013

2. DebraLittleJohnShinder andMichaelCross,"Sceneofthecybercrime", 2ndedition, Syngresspublishing Inc, Elsevier Inc, 2008

ReferenceBooks:

1. RobertMSlade,"SoftwareForensics",TataMcGrawHill,NewDelhi,2005.
2. BernadetteHSchell,ClemensMartin,"Cybercrime",ABC–CLIOInc,California, 2004.
3. NelsonPhillipsandEnfingerSteuart,"ComputerForensicsandInvestigations",CengageLearning,New Delhi, 2009.
4. KevinMandia,ChrisProsise,MattPepe,"IncidentResponseandComputer Forensics",TataMcGraw - Hill, New Delhi, 2006.

Courseoutcomes:
Oncompletionofthecourse,thestudentwillhavetheabilityto:

CourseCode	CO#	CourseOutcome(CO)
	CO1	Derivetestcasesforanygiven problem
	CO2	Comparethedifferenttesting techniques
	CO3	Classifytheproblem into suitable testing model
	CO4	Applytheappropriatetechnique for the design of flow graph
	CO5	Createappropriatedocument for the software artefact.

DataScienceandApplicationLab		
SubjectCode	**21AIL66**	Credits:1
CIE:50	SEE:50	SEE:03hrs
Hours/Week:2hrs(Practical)		TotalHours:28Hrs

CourseObjectives:
1. Recognizeandimplementvariouswaysofselectingsuitablemodelparametersfordifferent Data Science techniques.
2. Integratemachinelearning,deeplearninglibrariesandmathematicalandstatisticaltoolsthat are suitable for the Data Science applications under consideration

1.Pythonprogramtodisplaydetailsabouttheoperatingsystem, workingdirectory, filesanddirectoriesin the current directory, lists the files and all directories, scan and classify themas directories and files
2.Pythonprogramtoconvertanarraytoanarrayofmachinevalues and viceversa.
3.Pythonprogramtoget informationabout thefilepertainingtothefilemodeand toget timevalues with components using local time and gm time.
4.Pythonprogramtoconnect toGoogleusingsocketprogramming.
5.PythonprogramtoperformArrayoperationsusingNumpypackage.
6.PythonprogramtoperformDataManipulationoperationsusingPandaspackage.
7.PythonprogramtodisplaymultipletypesofchartsusingMatplotlibpackage.
8. PythonprogramtoperformFileOperation onExcelDataSet.
9. Pythonprogramtoimplement withPythonSciKit-Learn&NLTK.
10.PythonprogramtoimplementwithPythonNLTK/Spicy/PyNLPI.

Course Outcome
Attheend ofthecoursethestudentwillbeableto:

	CO1	ImplementsolutionstothegivenassignmentsinPython
	CO2	Use various Python packages for solving different programmingproblemsandDevisesolutionsforcomplex problemsofdataanalysisandmachinelearning.
	CO3	Evaluatetheoutputofdata analysisandmachinelearning models.

	CO4	Createlabrecordsofthesolutionsforthegivenassignments.
	CO5	Demonstratetheuseof ethicalpractices, self-learningandteam spirit.

MINI-PROJECT		
SubjectCode	**19ISMP63**	Credits:02
CIE:50	SEE:50	SEE:03hours
Hours/Week:--2hrs		Totalhrs: 28

Prerequisite:ThestudentsshouldhaveThoroughknowledgeofSoftwareEngineeringand Mastering any one programming language.

CourseObjectives:
- Tounderstandthe currentrequirementoftheIndustries.
- Tounderstandthedifferentsoftwaredevelopmentandtestingmethodologies.
- Tounderstandandapplyarchitecturalmodel,dataflowandcontrolflowdiagrams.
- Toacquiregooddocumentation,demonstrationskillsandimpactofapplicationon society.

	Teaching Hours

Projectcomprisesof:
 	
1. LiteratureSurvey
2. RequirementAnalysis
 	
   - S/wRequirement
 	
   - H/wRequirements
3. DesignModulepresentation
4. Application
5. SystemRequirementSpecificationdocument SRSdocumentcontainssynopsis,problemformulationandrequirement analysisbasedonabovefactors.Documentshouldbesubmittedbythe endofSemester	

Courseoutcomes:
Oncompletionofthecourse,thestudentwillhavetheabilityto:

	CO1	Demonstratetheskillsofperformingsurveysoncurrent industrial requirements.
	CO2	Analyzetherequirementsandapplyappropriatesoftware development methodology.

	CO3	ImplementandValidatethearchitecturalmodel,dataflow and control flow structures.
	CO4	Demonstratethedocumentationandpresentationskills
	CO5	ImplementtheSocietalandEthicalsystems.