NEHRU COLLEGE OF ENGINEERING AND RESEARCH CENTRE
(Accredited by NAAC,ISO 9001-2015 certified, Approved by AICTE New Delhi, Affiliated to APJKTU) **Pampady, Thiruvilwamala(PO), Thrissur(DT), Kerala 680 588**

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

SYLLABUS BOOK FOR STUDENTS

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY SYLLABUS
FOR
M. Tech Cyber Security

VISION OF THE INSTITUTION
To mould true citizens who are millennium leaders and catalysts of change through excellence in education.

MISSION OF THE INSTITUTION

NCERC is committed to transform itself into a center of excellence in Learning and Research in Engineering and Frontier Technology and to impart quality education to mould technically competent citizens with moral integrity, social commitment and ethical values.

We intend to facilitate our students to assimilate the latest technological know-how and to imbibe discipline, culture and spiritually, and to mould them in to technological giants,

dedicated research scientists and intellectual leaders of the country who can spread the beams of light and happiness among the poor and the underprivileged.

ABOUT DEPARTMENT

♦ Established in: 2002

♦ Courses offered : B.Tech in Computer Science and Engineering

  M.Tech in Computer Science and Engineering

  M.Tech in Cyber Security

♦ Approved by AICTE New Delhi and Accredited by NAAC

♦ Certified by ISO 9001-2015.

♦ Affiliated to the A P J Abdul Kalam Technological University.

DEPARTMENT VISION

Producing Highly Competent, Innovative and Ethical Computer Science and Engineering

Professionals to facilitate continuous technological advancement.

DEPARTMENT MISSION

1. To Impart Quality Education by creative Teaching Learning Process
2. To Promote cutting-edge Research and Development Process to solve real world problems with emerging technologies.
3. To Inculcate Entrepreneurship Skills among Students.
4. To cultivate Moral and Ethical Values in their Profession.

PROGRAMME EDUCATIONAL OBJECTIVES

PEO1: Graduates will be able to Work and Contribute in the domains of Computer Science and Engineering through lifelong learning.

PEO2: Graduates will be able to Analyse, design and development of novel Software Packages, Web Services, System Tools and Components as per needs and specifications.

PEO3: Graduates will be able to demonstrate their ability to adapt to a rapidly changing environment by learning and applying new technologies.

PEO4: Graduates will be able to adopt ethical attitudes, exhibit effective communication skills, Teamworkand leadership qualities.

PROGRAM OUTCOMES (POs)

Engineering Graduates will be able to:

1. Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

2. Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

3. Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

4. Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

5. Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

6. The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

7. Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

8. Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

9. Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

10. Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write

effective reports and design documentation, make effective presentations, and give and receive clear instructions.

11. Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one"s own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

12. Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PROGRAM SPECIFIC OUTCOMES (PSO)

PSO1: Ability to Formulate and Simulate Innovative Ideas to provide software solutions for Real-time Problems and to investigate for its future scope.

PSO2: Ability to learn and apply various methodologies for facilitating development of high quality System Software Tools and Efficient Web Design Models with a focus on performance optimization.

PSO3: Ability to inculcate the Knowledge for developing Codes and integrating hardware/software products in the domains of Big Data Analytics, Web Applications and Mobile Apps to create innovative career path and for the socially relevant issues.

SYLLABUS
FOR
M. Tech
Cyber Security

M.Tech. Degree Course
In

CYBER SECURITY

Scheme and Syllabi

M.Tech. Cyber Security

Scheme

Semester: 1

Exam Slot	Course No:	Name	L-T-P	Internal Marks	End Semester Exam		Credits
					Marks	**Duration (Hrs)**	
A	08CS 6211	Mathematical Foundations of Computer Science	3-0-0	40	60	3	3
B	08CS 6221	Internetworking – Protocols and Security	3-0-0	40	60	3	3
C	08CS 6231	Advanced Cryptography	4-0-0	40	60	3	4
D	08CS 6241	Advanced Computer Architecture	3-0-0	40	60	3	3
E	08CS 6251	Elective I	3-0-0	40	60	3	3
	08GN 6001	Research Methodology	0-2-0	100	0	0	2
	08CS 6271	Seminar I		100	0	0	2
	08CS 6281	Advanced Networking Lab	0-0-2	100	0	0	2
						Credits	**22**

Elective I

08CS 6251(A): High Speed Networks

08CS 6251(B): Advanced Distributed Computing

08CS 6251(C) : Computational Intelligence

Semester 2

Exam Slot	Course No:	Name	L-T-P	Internal Marks	End Semester Exam		Credits
					Marks	Duration (Hrs)	
A	08CS 6212	Mobile and Wireless Network Security	3-0-0	40	60	3	3
B	08CS 6222	Secure Coding	3-0-0	40	60	3	3
C	08CS 6232	Digital Forensics	3-0-0	40	60	3	3
D	08CS 6242	Elective II	3-0-0	40	60	3	3
E	08CS 6252	Elective III	3-0-0	40	60	3	3
	08CS 6262	Mini Project	0-0-4	100	0	0	2
	08CS 6272	Cyber Security Lab	0-0-2	100	0	0	2
						Credits	**19**

Elective II

08CS 6242(A): Data Compression

08CS 6242(B): Interactive Programming with PHYTHON

08CS 6242(C): Computer and Information Security Management

Elective III

08CS 6252(A): Computer Law and Ethics

08CS 6252(B): Bio-Informatics

08CS 6252(C): Soft Computing

Semester 3

Exam Slot	Course No:	Name	L-T-P	Internal Marks	End Semester Exam		Credits
					Marks	Duration (Hrs)	
A	08CS 7213	Elective IV	3-0-0	40	60	3	3
B	08CS 7223	Elective V	3-0-0	40	60	3	3
	08CS 7233	Seminar II	0-0-2	100	0	0	2
	08CS 7243	Project (Phase 1)	0-0-12	50	0	0	6
						Credits	**14**

Elective IV

08CS 7213(A) :Digital Watermarking

08CS 7213(B): Mathematical Models of Internet

08CS 7213(C): Database Security

Elective V

08CS 7223(A) :Cloud and Utility Computing

08CS 7223(B) : Crypto Complexity

08CS 7223(C) :Security Policies and Assurance

Semester 4

Exam Slot	Course No:	Name	L-T-P	Internal Marks	End Semester Exam		Credits
					Marks	**Duration (Hrs)**	
	08CS 7214	Project (Phase 2)	0-0-21	70	30	0	12
						Credits	**12**

Total Credits: 22+19+14+12 = 67

COURSE NO: 08CS 6211 COURSE TITLE:

MATHEMATICALFOUNDATIONSOFCOMPUTERSCIENCE

CREDITS: 3-0-0

Pre-requisites: Nil

Course Objectives:

- To familiarize the students with the fundamental theorems, group and subgroups properties.

- To gain knowledge about fundamental principles of counting and graphs.

- Will help the students in their master research project work.

Syllabus

Divisibility,gcd, prime numbers,fundamental theorem of arithmetic, Congruences, Fermat'stheorem,Groups and subgroups, homomorphism theorems.

Course Outcome:

After the completion of the Course, the students,

- Will have clear knowledge about the fundamental principle of counting and graphs.

- Understand the fundamental theorems groups and subgroup properties.

References

1. Niven,H.S.ZuckermanandMontgomery,anIntroductiontotheTheoryof Numbers,3/e,JohnWileyandSons,NewYork, 1992.

2. R. P. Grimaldi, Discreteand Combinatorial Mathematics: An AppliedIntroduction,3/e,Addison-Wesley,NewDelhi,1994.

3. B.KolmanandR.C.Busby,DiscreteMathematicalStructuresforComputerScience,PHI,New Delhi,1994.

4. J.ClarkandD.A.Holton,AFirstLookatGraphTheory,AlliedPublishers(WorldScientific),New Delhi,1991.

5. C.L.Liu,ElementsofDiscreteMathematics,McGrawHill,2/e,Singapore,1985.

COURSE PLAN

MODULES	Contact Hours	Sem.Exam Marks;%
COURSE NO: 08 CS6 211 COURSE TITLE: MATHEMATICALFOUNDATIONSOFCOMPUTERSCIENCE (L-T-P: 3-0-0) CREDITS:3		
MODULE: 1 Divisibility, gcd, prime numbers, fundamental theorem of arithmetic, Congruences, Fermat'stheorem,Eulerfunction,Primalitytesting, solutionofcongruences, Chineseremaindertheorem,Wilson'stheorem.	7	15
MODULE: 2 Groups and subgroups, homomorphism theorems, cosets and normal subgroups.	7	15
FIRST INTERNAL TEST		
MODULE: 3 Lagrange's theorem, rings, finite fields, polynomial arithmetic, quadratic residues, reciprocity, discrete logarithms, elliptic curve arithmetic.	7	15
MODULE: 4 Fundamental principles of counting, pigeonhole principle, countable and uncountable sets, principle of inclusion and exclusion, derangements, equivalence relations and partitions, partial order, lattices and Boolean algebra, generating functions, recurrence relations, solution of recurrences.	7	15
SECOND INTERNAL TEST		
MODULE: 5 Graphs, Euler tours, planar graphs, Hamiltonian graphs, Euler's formula, applications of Kuratowski's theorem, graph coloring,	6	20
MODULE: 6 Chromatic polynomials, trees, weighted trees, shortest path algorithms, spanning trees, the max-flow min-cut theorem.	5	20

COURSE NO: 08CS 6221COURSE TITLE: INTERNETWORKING: PROTOCOLS AND SECURITY

(L-T-P:3-0-0) CREDITS:3

Prerequisite:Computer Networks

Course Objectives:

- Toprovidethestudentswiththeconceptsof networkservicesandarchitectures.
- Also to gain basic knowledge aboutnetworkmanagementsecurityissues.

Syllabus

Networkservicesandapplications:DNS,HTTP,SMTP,peer-to-peersystems,Network   transport

architecture,Routingandforwarding,Network measurement,Security.

Course Outcome:

After the completion of the Course, the students,

- Would completely understand the various networking protocols.
- Understand the concept of various network services and architecture.
- Will have the ability to understand the fundamentals of several networking attacks.

References

1. James FKuroseand KeithW.Ross,"ComputerNetworking- AtopDown Approach",FifthEdition,Addison-Wesley,2010.
2. L.PetersonandB.Davie,"ComputerNetworks:ASystems Approach",FifthEdition,ElsevierInc.,2011.
3. W.RichardStevens,"TCP/IPIllustrated,Volume1: TheProtocols",Addison- Wesley, 1994.

COURSE PLAN

MODULES	Contact Hours	Sem.Exam Marks;%
COURSE NO: 08CS 6221 COURSE TITLE:INTERNETWORKING: PROTOCOLS AND SECURITY (L-T-P: 3-0-0) CREDITS:3		
MODULE: 1 Networkservicesandapplications:DNS,HTTP,SMTP,peer-to-peersystems.	**8**	**15**
MODULE: 2 Network transport architecture, TCP, UDP, ICMP, TCP ,Congestion control	**5**	**15**
FIRST INTERNAL TEST		
MODULE: 3 Routingandforwarding,intra-domainandinter-domainroutingalgorithms, Link layers andlocalareanetworks.	**7**	**15**
MODULE: 4 Ethernet, Wi-Fi,andmobility,Multimediacommunicationsandqualityofservice.	**6**	**15**
SECOND INTERNAL TEST		
MODULE: 5 Network measurement,inference,andmanagement,Networkexperimentation and performanceanalysis.	**6**	**20**
MODULE: 6 Security:ARPattacksandARPpoisoning, DNSattacks,SYNfloodattacksandits mitigation, UDPping-pongandfraggleattacks,TCPportscanningandreflection attacks.	**7**	**20**

COURSE NO: 08CS 6231   COURSE TITLE: ADVANCED CRYPTOGRAPHY

(L-T-P: 4-0-0) CREDITS: 4

Pre-requisites: Nil

Course Objectives:

- To provide the students with the concepts of cryptography algorithms andschemes tohandlethesecurity issues.

- Also to gain basic knowledge aboutwebsecurityand messageauthentication.

Syllabus

Reviewofnumbertheoryandalgebra,computationalcomplexity,probabilityandinformationtheory,primalitytesting,Cryptographyandcryptanalysis,Publickeyencryption,Messageauthentication.

Course Outcome:

After the completion of the Course, the students,

- Gain an idea related to Different kinds of Encryption and Decryption.

- Detailed Knowledge related to Different types of Cryptosystems.

- Values and Necessities of a digital Signature.

References

1.   W.Mao,ModernCryptography:Theory&Practice,PearsonEducation,2004.
2.   C. Kaufman, R. Perlman andM. Speciner, Network Security: PrivateCommunicationinapublicWorld,2/e, PrenticeHall,2002.
3.   W.Stallings,CryptographyandNetworkSecurityPrinciplesandpractice,3/e, PearsonEducationAsia,2003.
4.   H. DelfsandH. Knebl, Introduction to Cryptography: Principles and Applications,Springer-Verlag,2002

COURSE PLAN

MODULES	Contact Hours	Sem.Exam Marks;%
COURSE NO: 08CS 6231 COURSE TITLE:ADVANCED CRYPTOGRAPHY (L-T-P: 4-0-0) CREDITS: 4		
MODULE: 1 Reviewofnumbertheoryandalgebra,computationalcomplexity,probabilityand informationtheory,primalitytesting.	13	15
MODULE: 2 Cryptographyandcryptanalysis,symmetrickeyencryption,DES,TripleDES,AES, RC4,modesofoperation.	13	15
FIRST INTERNAL TEST		
MODULE: 3 Publickeyencryption,RSAcryptosystem,Diffie-Hellman, ellipticcurve cryptography.	7	15
MODULE: 4 Rabin, ElGamal, Goldwasser-Micali, Blum-Goldwassercryptosystems.	6	15
SECOND INTERNAL TEST		
MODULE: 5 Messageauthentication,digitalsignaturealgorithms.	7	20
MODULE: 6 Securityhandshakepitfalls, Strongpasswordprotocols.	6	20

COURSE NO: 08CS 6241COURSE TITLE: ADVANCED COMPUTER ARCHITECTURE

(L-T-P: 3-0-0) CREDITS: 3

Prerequisite: Computer Organization and Design

Course Objectives:

- Tofamiliarizethestudentswiththeconceptsof processorarchitecture,support for parallelismandmultiprocessorssystems.

Syllabus

Performance evaluation,pipelinehazards, issuesinpipelinedprocessorimplementation, Instruction levelparallelism, Instructionanddatacacheorganizations, Interconnectionnetworks, Newprogrammingparadigms

Course Outcome:

After the completion of the Course, the students,

- Able to gain complete knowledge about the concepts of computer architecture and the various processors used in the recent past.
- Would have a clear knowledge of VLIV, RISCand CISC.
- Will have the ability to solve the problems related to efficiency, performance and various methods.

References

1. HennessyJ.L.,D.Patterson,ComputerArchitecture–AquantitativeApproach, MorganKoffman(3/e),2003
2. JohnPaulShen,MikkoLipasti.ModernProcessorDesign– FundamentalsofSuperscalarProcessors.McGrawHillInternationalEdition,2005.
3. DezsoSima,TerenceFountain,PeterKacsuk.AdvancedComputer Architecture– ADesignSpaceApproach,AddisonWesley,2000.
4. FayezGebali,AlgorithmsandParallelComputing John wiley and sons, Inc. Publication 2011

COURSE PLAN

MODULES	Contact Hours	Sem.Exam Marks;%
COURSE NO:08CS 6241COURSE TITLE:ADVANCEDCOMPUTER ARCHITECTURE (L-T-P: 3-0-0) CREDITS: 3		
MODULE: 1 Performance evaluation, processor architecture, pipelining, pipeline hazards, issuesinpipelinedprocessorimplementation.	10	15
MODULE: 2 Instruction level parallelism, hardware and compiler support for branch prediction,out-of-orderInstructionissue, speculativeexecutionandother techniquesforhigh-performance	10	15
FIRST INTERNAL TEST		
MODULE: 3 Instructionanddatacacheorganizations,multi-levelcaches, parallelmemory systems,Supportforvirtualmemory.	5	15
MODULE: 4 Inter-connectionnetworks, sharedmemory system,memory models,cachecoherence.	5	15
SECOND INTERNAL TEST		
MODULE: 5 Multipleprocessorsystems,Parallelalgorithmsarchitecture,Multicoreprocessing.	5	20
MODULE: 6 Newprogrammingparadigms- Hadoop,mapreduce.	4	20

COURSE NO: 08CS 6251(A):COURSE TITLE:HIGH SPEED NETWORKS

(L-T-P: 3-0-0) Credits: 3

Prerequisite: Nil

Course Objectives:

- Tofamiliarizethestudentswiththeconceptsof highspeednetworkslikeframe relays,ATMsetc.

- Givesdetailsaboutcongestioncontrolinhighspeednetworks, discussesintegratedanddifferentiatedservicesetc.

Syllabus

FrameRelay Networks, Asynchronoustransfermode,ATM ProtocolArchitecture, ATMlogicalConnection,ATMCell, ATMServiceCategories, TCPFlowcontrol.

Course Outcome:

After the completion of the Course, the students,

- Describe and interpret the basics of high speed networking technologies.

- Optimize and troubleshoot high speed networks.

- Demonstrate the knowledge of network planning and optimization.

References

1. WilliamStallings,-HIGHSPEEDNETWORKSANDINTERNET‖,PearsonEducation, SecondEdition,2002.
2. Warland&PravinVaraiya,-HIGHPERFORMANCECOMMUNICATIONNETWORKS‖,JeanHar courtAsiaPvt.Ltd.,IIEdition,2001.
3. IrvanPepelnjk,JimGuichardandJeffApcar,-MPLSandVPNarchitecture‖,Cisco Press,Volume1and2,2003.

COURSE PLAN

<table>
<tr><td colspan="3">COURSE NO:08CS 6251(A):COURSE TITLE:HIGH SPEED NETWORKS
(L-T-P: 3-0-0) CREDITS: 3</td></tr>
<tr><td>MODULES</td><td>Contact Hours</td><td>Sem.Exam Marks;%</td></tr>
<tr><td>**MODULE: 1**
FrameRelay Networks–Asynchronoustransfermode–ATM ProtocolArchitecture, ATMlogicalConnection,ATMCell– ATMServiceCategories–AAL.HighSpeed LAN's:FastEthernet,GigabitEthernet,FibreChannel–WirelessLAN's.</td><td>8</td><td>15</td></tr>
<tr><td>**MODULE: 2**
Queuing Analysis- Queuing Models – Single Server Queues – Effects of Congestion – Congestion Control – Traffic Management – Congestion Control in Packet Switching Networks –Frame Relay Congestion Control.</td><td>7</td><td>15</td></tr>
<tr><td colspan="3">FIRST INTERNAL TEST</td></tr>
<tr><td>**MODULE: 3**
TCPFlowcontrol–TCPCongestionControl–Retransmission– TimerManagement–ExponentialRTObackoff –KARN'sAlgorithm– Windowmanagement– Performance of TCPoverATM.TrafficandCongestioncontrolinATM– Requirements– Attributes.</td><td>8</td><td>15</td></tr>
<tr><td>**MODULE: 4**
Traffic ManagementFramework, Traffic Control–ABR trafficManagement–ABR ratecontrol, RMcellformats, ABRCapacityallocations– GFRtrafficmanagement.</td><td>8</td><td>15</td></tr>
<tr><td colspan="3">SECOND INTERNAL TEST</td></tr>
<tr><td>**MODULE: 5**
IntegratedServicesArchitecture–Approach,Components, Services-Queuing Discipline,FQ,PS,BRFQ, GPS, WFQ– RandomEarlyDetection,Differentiated Services.</td><td>8</td><td>20</td></tr>
<tr><td>**MODULE: 6**
RSVP– Goals&Characteristics,DataFlow,RSVPoperations,ProtocolMechanisms– MultiprotocolLabelSwitching–Operations,LabelStacking,Protocoldetails– RTP–ProtocolArchitecture,DataTransferProtocol,RTCP.</td><td>9</td><td>20</td></tr>
</table>

COURSE NO: 08CS 6251(B): COURSE TITLE: ADVANCED DISTRIBUTED COMPUTING

(L-T-P: 3-0-0) CREDITS: 3

Prerequisite: Distributed Systems

Course Objectives:

- To familiarize the concepts of distributed systems and models.

- To Study the issues concerning Remote procedure call and distributed file systems.

- An introduction to issues concerning distributed transaction process in detail.

Syllabus

Characterization of Distributed Systems, System Models, Networking and Internetworking, Inter Process communication, Distributed Objects and Remote Invocation, RPC, Processes and threads.

Course Outcome:

After the completion of the Course, the students,

- Common scenarios & protocols in distributed system.

- Implementation issues and its feasible solutions.

- Implementation of various distributed algorithms.

- Concept of grid computing.

References

1. Coulouris G., Dollimore J. &Kindberg T., "Distributed Systems Concepts And Design", 3/e, Addison Wesley 2004
2. Tanenbaum S, Maarten V.S., Distributed Systems Principles and Paradigms, Pearson Education 2004
3. Chow R. & Johnson T., "Distributed Operating Systems and Algorithms", Addison Wesley 2003
4. Tanenbaum S., "Distributed Operating Systems", Pearson Education 2005
5. Frederic Magoules , Jie Pan , Kiat An Tan , Abhinit Kumar ," Introduction to Grid Computing", Chapman & Hall/CRC press 2009.

COURSE PLAN

COURSE NO: 08CS 6251(B):TITLE:ADVANCED DISTRIBUTED COMPUTING(L-T-P: 3-0-0) CREDITS: 3		
MODULES	**Contact Hours**	**Sem.Exam Marks;%**
MODULE: 1 Characterization of Distributed Systems, System Models, Networking and Internetworking.	**7**	**15**
MODULE: 2 Inter Process communication, Distributed Objects and Remote Invocation, RPC, Processes and threads.	**6**	**15**
FIRST INTERNAL TEST		
MODULE: 3 Name Services and Domain Name System, Directory and Discovery Systems, Distributed File systems.	**6**	**15**
MODULE: 4 Transactions and Concurrency Control, Distributed Transactions, Distributed Deadlocks, Transaction Recovery, Fault-tolerant Services, Distributed Shared Memory.	**7**	**15**
SECOND INTERNAL TEST		
MODULE: 5 Synchronizing physical clocks, logical time and logical clocks, Distributed Mutual Exclusion, Elections.	**6**	**20**
MODULE: 6 Grid Computing – motivation, comparison, Grid Architecture, GRID standards – OGSA, OGSI, WSRF Data management, Grid Scheduling and Information Services, Grid Workflow , Fault Tolerance in Grids , Security in Grid Computing.	**7**	**20**

COURSE NO: 08CS 6251(C): COURSE TITLE: COMPUTATIONAL INTELLIGENCE

(L-T-P: 3-0-0) CREDITS: 3

Prerequisite: Nil

Course Objectives:

- To provide the students with the concepts of Artificial Intelligence and representation of knowledge.

- To familiarize fundamental models of machine learning and expert systems.

- Discuss various Languages and Programming Techniques for Artificial Intelligence.

Syllabus:

Artificial Intelligence: History and Applications, Production Systems, Structures and Strategies for state space search- Data driven and goal driven search.Depth First and Breadth First Search,Knowledge representation - Propositional calculus, Predicate Calculus, Theorem proving by Resolution, Answer Extraction.

Course Outcome:

After the completion of the Course, the students,

- The students can able to understand the basic concepts of Artificial Intelligence, Knowledge representations, Machine Learning in terms Genetic algorithm.

- They can also able understand the basic functionalities of artificial Intelligence tools.

References

1. GEORGE.F.LUGER, Artificial Intelligence- Structures and Strategies for Complex Problem Solving, 4/e, 2002, Pearson Education.
2. E. RICH, K.KNIGHT, Artificial Intelligence, 2/e, Tata McGraw Hill WINSTON. P. H, LISP, Addison Wesley
3. IVAN BRATKO, Prolog Programming for Artificial Intelligence, 3/e, Addison Wesley, 2000
4. Online documentation for Octave.

COURSE PLAN

MODULES	Contact Hours	Sem.Exam Marks;%
COURSE NO: 08CS 6251(C):COURSE TITLE:COMPUTATIONAL INTELLIGENCE (L-T-P: 3-0-0) CREDITS: 3		
MODULE: 1 Artificial Intelligence: History and Applications, Production Systems, Structures and Strategies for state space search- Data driven and goal driven search.	7	15
MODULE: 2 Depth First and Breadth First Search, DFS with Iterative Deepening, Heuristic Search- Best First Search, A* Algorithm, AO* Algorithm, Constraint Satisfaction, Using heuristics in games- Minimax Search, Alpha Beta Procedure.	6	15
FIRST INTERNAL TEST		
MODULE :3 Knowledge representation - Propositional calculus, Predicate Calculus, Theorem proving by Resolution, Answer Extraction	5	15
MODULE: 4 AI Representational Schemes- Semantic Nets, Conceptual Dependency, Scripts, Frames, Introduction to Agent based problem solving.	6	15
SECOND INTERNAL TEST		
MODULE :5 Machine Learning- Symbol based and Connectionist, Social and Emergent models of learning, The Genetic Algorithm- Genetic Programming, Overview of Expert System Technology- Rule based Expert Systems, Introduction to Natural Language Processing.	9	20
MODULE: 6 Languages and Programming Techniques for AI- Introduction to PROLOG and LISP. Search strategies and Logic Programming in LISP, Production System examples in PROLOG[Programming in Octave/Matlab].	9	20

COURSE NO: 08GN 6001: COURSE TITLE: RESEARCH METHODOLOGY
(L-T-P: 0-2-0)

CREDITS: 2

Prerequisite: Nil

Course Objectives:

- The main objective of the course is to provide a familiarization with research methodology and to induct the student into the overall research process and methodologies. This course addresses:
- The scientific research process and the various steps involved formulation of research problem and research design, design of experiments, thesis preparation and presentation, research proposals, publications and ethics; Important research methods in engineering.
- As a tutorial type course, this course is expected to be more learner centric and active involvement from the learners are expected which encourages self-study and group discussions. The faculty mainly performs a facilitator's role.

Syllabus

Overview of research methodology - research process - scientific methods - research problem and design - research design process - formulation of research task, literature review and web as a source - problem solving approaches - experimental research - ex post facto research.
Thesis writing - reporting and presentation - interpretation and report writing - principles of thesis writing- format of reporting, oral presentation - seminars and conferences Research proposals - research paper writing - publications and ethics - considerations in publishing, citation, plagiarism and intellectual property rights. Research methods – modelling and simulation - mathematical modeling – graphs - heuristic optimization – simulation modeling - measurement design – validity – reliability – scaling - sample design – data collection methods and data analysis

Course Outcome

At the end of course, the student will be able to:
Discuss research methodology concepts, research problems, research designs, thesis preparations, publications and research methods.
Analyze and evaluate research works and to formulate a research problem to pursue research
Prepare a thesis or a technical paper, and present or publish them
Apply the various research methods followed in engineering research for formulation and design of own research problems and to utilize them in their research project.

Reference:
1.C. R. Kothari, (2004) "*Research Methodology, Methods and Techniques*", New Age International Publishers
2. R. Panneerselvam,(2014) *"Research Methodology"*, PHI Learning
3. K. N. Krishnaswamy, Appa Iyer Sivakumar, M. Mathirajan, (2006)) "*Management Research Methodology, Integration of principles", Methods and Techniques*, Pearson Education

4. Deepak Chawla, Meena Sondhi,(2011) *"Research Methodology – concepts & cases"*, Vikas Publishing House

5. J.W. Bames, *"Statistical Analysis for Engineers and Scientists"*, McGraw Hill, New York

6. Schank Fr.,(2008) *"Theories of Engineering Experiments"*, Tata Mc Graw Hill Publication.

7. John W Best, James V Kahan, (2010) *"Research in Education"*, PHI Learning

8. Sinha, S. C. and Dhiman, A. K. (2002), *"Research Methodology"*, ESS Publications. (2 volumes)

COURSE PLAN

Module	Contents	Contact Hours	Sem. Exam Marks: %
I	**Overview of Research Methodology:** Research concepts – meaning – objectives – motivation - types of research –research process – criteria for good research – problems encountered by Indian researchers - scientific method - research design process	5	15
II	**Research Problem and Design:** Formulation of research task – literature review –methods – primary and secondary sources – web as a source – browsing tools - formulation of research problems – exploration - hypothesis generation - problem solving approaches – Concepts of introduction To TRIZ-experimental research – principles – Laboratory experiment - experimental designs - ex post facto research- qualitative research	5	15
FIRST INTERNAL EXAM			

III	**Thesis writing, reporting and presentation:** significance of report writing-— principles of thesis writing- different steps in report writing Interpretation in writing – techniques of interpretation – precautions in interpretation - format of reporting - – layout and mechanics of research report -references – tables – figures – conclusions – oral presentation – preparation – making presentation – use of visual aids - effective communication - preparation for and presentation in seminars and conferences	4	15
IV	**Research proposals, publications, ethics and IPR:** Research proposals - development and evaluation – research paper writing – layout of a research paper - journals in engineering – considerations in publishing –concept of impact factor–citations - open access publication - ethical issues -plagiarism – software for plagiarism checking intellectual property right-patenting case studies .	5	15
	SECOND INTERNAL EXAM		
V	**Research methods – Modelling and Simulation:** Modelling and Simulation – concepts of modelling – mathematical modelling - composite modelling – modelling with – ordinary differential equations – partial differential equations – graphs-heuristics and heuristic optimization - simulation modeling	5	20

VI	**Research Methods – Measurement, sampling and Data acquisition:** Measurement design – errors - validity and reliability in measurement - scaling and scale construction - sample design - sample size determination - sampling errors -data collection procedures - sources of data – data collection methods - data preparation and data analysis	4	20
END SEMESTER EXAM			

COURSE NO: 08CS 6271COURSE TITLE:SEMINAR

CREDITS: 2

Course Objectives:

* Toassessthedebatingcapabilityofthestudenttopresentatechnicaltopic.

* Also toimparttrainingtoastudenttofaceaudienceandpresenthis/herideas.

* Creatingself-esteem andcouragethatareessentialfor anengineer.

Eachstudentis expectedto presentaseminaronatopicof current relevancein Cyber/InformationSecurityorForensicsforabout45minutes. Theyareexpected torefercurrentresearchandreviewpapersfromstandardjournalslikeACM,IEEE, JPDCetc.– atleastthreecrossreferencesmustbeused-theseminarreport mustnotbethereproductionoftheoriginalpaper.Acommitteeconsistingofatleastthreefacultymem bersshallassesstthepresentationoftheseminarand awardmarkstothestudentsbasedonmeritsoftopicofpresentation. Each studentshallsubmittwo copiesofa writeupoftheseminartopic.One copyshall bereturnedtothe studentafterdulycertifying itby thechairmanoftheassessing committeeandtheother willbekeptinthedepartmentallibrary.Internal continuousassessmentmarksareawardedbasedontherelevanceofthetopic, presentation skill,qualityofthe reportandparticipation.

COURSE NO:08CS 6281COURSE TITLE:ADVANCED NETWORKING LAB

CREDITS:1

1. Introduction to NS2 and TCL
2. Simulate a simple network with 2 nodes using NS2
3. Simulate a network with 4 nodes using NS2
4. Simulate any one multicast routing protocol using NS2
5. Implement broadcasting in wired network
6. Implement a simple wireless network
7. Implement link state routing using NS2
8. Implementation of TCP cubic in NS2
9. Familiarization of cyber forensic tool
10. Familiarization of security auditing tools

SEMESTER II

COURSE NO:08CS6212   COURSE TITLE: MOBILE AND WIRELESS NETWORK SECURITY

(L-T-P: 3-0-0) CREDITS: 3

Pre-requisite: Nil

Course Objectives:

- To teach the transmission fundamentals and Wireless System Operations and Standards.

- To discuss the issues concerning various threats to wireless networks, encryption and decryption.

- To provide students with the concepts of security mechanisms for Blue-tooth, WLAN, WIMAX, satellite network etc.

Syllabus

Transmission Fundamentals. SatelliteNetworks,Threats to Wireless networks,Risks.

Course Outcome:

After the completion of the Course, the students,

- Gain detailed idea related to Antenna, wave propagation.

- They are able to gain Ideas related to threats to Wireless networks, ESM, ECM and ECCM.

- Different kinds of Encryption and decryption mechanisms in GSM are discussed in detail.

- How to provide Access point based security using different mechanisms is discussed in detail.

References

1. KavehPahlavan and Preshant Krishnamurthy, Principles Wireless Networks, Prentice Hall, 2006.

2. Cyrus Peikari and Seth Fogie, °Maximum Wireless Security Sams, 2002.

3. Hideki /mai, Mohammad GhulamRahman and KazukuniKoba "Wireless Communications Security, Universal Persor Communications of Adech House, 2006.

4. Stallings William, "Wireless Communications and Network: Second Edition, Pearson Education Ltd, 2009.

5. Jon Edney and William A. Arbaugh, " Real 802.11 Security: Wi Protected Access and 802.11i", Addison-Wesley Professional

COURSE PLAN

COURSE NO: 08CS6212		
COURSE TITLE: MOBILE AND WIRELESS NETWORK SECURITY		
MODULES	**Contact Hours**	**Sem.Exam Marks;%**
MODULE: 1 Transmission Fundamentals, Antennas and Wave Propagation Cellular Wireless networks, Third Generation Systems, 4G, Signal Encoding Techniques, Spread Spectrum, Coding and Error Control, Multiple Access in Wireless Systems.	**7**	**15**
MODULE: 2 Satellite Networks, Wireless System Operations and Standards. Wi-Max and Ultra Wide Band technologies, Mobile IP and Wireless Access: Protocol. Wireless LAN Technology, Wi-Fi and IEEE 802.11 Wireless LAN Standard, Blue-tooth and IEEE 802.15 standard.	**8**	**15**
FIRST INTERNAL TEST		
MODULE: 3 Threats to Wireless networks, ESM, ECM and ECCM, Proliferation of device and technologies, Practical aspects, Wireless availability, Privacy Challenges.	**6**	**15**
MODULE: 4 Risks: Denial of Service, Insertion Attacks, interception and monitoring wireless traffic, Misconfiguration. Wireless Attack: Surveillance, War Driving, Client-to-Client Hacking, Rogue Access Points, Jamming and Denial of Service.	**6**	**15**
SECOND INTERNAL TEST		
MODULE: 5 Authentication, Encryption, Decryption in GSM, Securing the WLAN, WEP Introduction, RC Encryption, Data Analysis, IV Collision, Key Extraction, WEP Cracking WPA/ WPA2, AES.	**6**	**20**
MODULE: 6 Access Point-Based Security Measures Thin Party Security Methods, Funk's Steel-Belted Radius, VVLAN Protection Enhancements, Blue-tooth Security Implementation, Security in WI MAX, UWB security, Satellite network security.	**6**	**20**

COURSE NO:08CS6222 COURSE TITLE: SECURE CODING

(L-T-P: 3-0-0)CREDITS: 3

Course Objectives:

- To provide the students with the concepts of secure programming, threat modelling, attacks, resource management and secure testing methodologies.

Syllabus

A brief overview of Application Security and Secure Programming concepts. Secure Coding in Java and Web Applications,Resource leaks and resource lifetime management.

Course Outcome:

After the completion of the Course, the students,

- Would have provided a detailed description of different threats that could affect a piece of code.
- Ability to understand the various injection attacks mechanisms.
- Would have a clear knowledge about the various secured software testing techniques.

References

1. Robert C. Seaford, 'Secure Coding in C and C++', Addison-Wesley Professional, 2005.
2. James A. Whittaker and Herbert H. Thompson, "How to Break Software Security", Addison Wesley, 2003
3. John C. Mitchell and Krzysztof Apt, "Concepts in Programming Languages", Cambridge University Press, 2001.

COURSE PLAN

<table>
<tr><td colspan="3" align="center">COURSE NO: 08CS6222

COURSE TITLE:SECURE CODING</td></tr>
<tr><td align="center">MODULES</td><td>Contact Hours</td><td>Sem.Exam Marks;%</td></tr>
<tr><td>MODULE: 1
A brief overview of Application Security and Secure Programming concepts. Secure Coding in C and C++, Stack overflow, Strings, Integers, Arrays, File I/O, Race conditions, Signal handling, Recommended Practice.</td><td align="center">10</td><td align="center">15</td></tr>
<tr><td>MODULE: 2
Secure Coding in Java and Web Applications-Web as a primary vector for Cyber-attacks, Anatomy of attacks, data breach case studies,Threatmodelling, Cross Site Scripting (XSS) vulnerabilities, Injection flaws (SQL, process, path etc.), Buffer overflows.</td><td align="center">9</td><td align="center">15</td></tr>
<tr><td align="center">FIRST INTERNAL TEST</td><td></td><td></td></tr>
<tr><td>MODULE: 3
Resource leaks and resource lifetime management, Threat modeling and Security design review.</td><td align="center">4</td><td align="center">15</td></tr>
<tr><td>MODULE: 4
Software Assurance and Testing-Software Assurance overview, Testing threat categories, Assessing Risk.</td><td align="center">5</td><td align="center">15</td></tr>
<tr><td align="center">SECOND INTERNAL TEST</td><td></td><td></td></tr>
<tr><td>Secure Testing Methodologies - Attacking Dependencies, Attacking through the User Interface, Attacking Design, Attacking Implementation.</td><td align="center">5</td><td align="center">20</td></tr>
<tr><td>Software engineering practices for development of high assurance code, Model Checking, Static Analysis techniques for analysing software.</td><td align="center">6</td><td align="center">20</td></tr>
</table>

COURSE NO:08CS6232 COURSE TITLE: DIGITAL FORENSICS

(L-T-P: 3-0-0) CREDITS: 3

Prerequisite: Computer Organization

Course Objectives:

- To provide the students with the concepts security audit mechanisms for various file systems, database and networks.

- An introduction to applications of digital forensic analysis in mobile and smart phones and vehicular systems are also given.

Syllabus

Framework for digital forensic evidence collection and processingAuditing and security architecture,Forensic Analysis of Database.

Course Outcome:

After the completion of the Course, the students,

- Able to get the fundamental concepts of security audit mechanisms for various file systems.

- Understand the fundamentals of forensic analysis of database systems.

- Would have clear knowledge about the fundamentals of host forensics for Microsoft and Linux OS.

References

1. K. J. Jones, R. Beftlich and C. W. Rose, Real Digital Forensics', Addison- Wesley, 2006.
2. D. P Bovet and M. Cesati, "Understanding the Linux Kernel", Third Edition, O'Reiry, 2006.
3. B. Carrier, "File System Forensic Analysis", Addison- Wesley, 2005.
4. M. Russinovich, D. A. Soiomon and A. lonescu, "Windows InternalsTM, Fifth Edition, Microsoft Press, 2008.
5. Chang-Tsun Li, "Multimedia Forensics and Security", Information Science Reference, Hershey, New York, 2008.
6. Online Documentation of MySQL,MariaDB and PostgreSQL.

COURSE PLAN

MODULES	Contact Hours	Sem.Exam Marks;%
COURSE NO: 08CS6232 **COURSE TITLE:DIGITAL FORENSICS**		
MODULE: 1 Framework for digital forensic evidence collection and processing. Fundamentals of host forensics for Microsoft windows, including kernel architecture, device driver architecture, registry.	5	15
MODULE: 2 Auditing and security architecture, file system handling, reconstruction of files and directory structures on the FAT and NTFS file system families.	5	15
FIRST INTERNAL TEST		
MODULE: 3 Fundamentals of host forensics for UNIX derivatives use the Linux operating system, including kernel and device drives architecture, security and audit mechanisms, file system and pseudo file systems, and the reconstruction of file and directory structures using UFS and Ext2/3fs as exemplars.	9	15
MODULE: 4 Forensic Analysis of Database Systems [MySQL/MariaDB/PostgreSQL], Database Tampering, Forensic analysis of Database Components, table storage, transaction log, indexes, Forensic recovery for table storage.	5	15
SECOND INTERNAL TEST		
Fundamentals of network forensics from data capturing and collection to network file systems and supplementary protocols and selection application layer protocols and techniques used for identifying and reverse- engineering protocols used on networks	6	20
Application to malware detection, anti-forensic and propagation techniques, Application to stenographic and steganalysis, Application to non-standard storage mechanisms like mobile and smart phones and vehicular systems and network based search and storage mechanism.	9	20

COURSE NO: 08CS6242(A) COURSE TITLE:DATA COMPRESSION

(L-T-P:3-0-0)CREDITS: 3

Prerequisite: Nil

Course Objective:

- To familiarize the students with the different data compression techniques for image Compression, audio compression, video compression etc.

- Also gives a comparison of different compression algorithms and their implementation.

Syllabus

Dictionary Methods ,Image Compression,Wavelet Methods,Video compression.

Course Outcome:

- Able to gain knowledge about the different data compression techniques like image compression, audio compression, video compression.

- A comparative study on different compression algorithms used.

References

1. David Solomon, *Data compression: the complete reference*, 2nd edition, Springerverlag,New York. 2000.
2. Stephen Welstead, *Fractal and wavelet Image Compression techniques*, PHI, NewDelhi-1, 1999.
3. Khalid Sayood, *Introduction to data compression*, Morgan Kaufmann Publishers, 2003 reprint

COURSE PLAN

COURSE NO: 08CS6242(A) COURSE TITLE:DATA COMPRESSION		
MODULES	**Contact Hours**	**Sem.Exam Marks;%**
MODULE: 1 Introduction, Basic Techniques, Dictionary Methods.	**8**	**15**
MODULE: 2 Image Compression, Transform based techniques.	**5**	**15**
FIRST INTERNAL TEST		
MODULE: 3 Wavelet Methods, adaptive techniques	**5**	**15**
MODULE: 4 Video compression, Audio Compression, Fractal techniques.	**6**	**15**
SECOND INTERNAL TEST		
MODULE: 5 Comparison of compression algorithms.	**7**	**20**
MODULE: 6 Implementation of compression algorithms.	**8**	**20**

COURSE NO:08CS6242(B) COURSE TITLE:INTERACTIVE PROGRAMMING WITH PYTHON

(L-T-P:3-0-0)   CREDITS: 3

Prerequisite: Web Systems and Network Security

Course Objectives:

- To familiarize the students with the concept of Interactive programming with python.

Syllabus

Introduction to Interpreted Languages and Python - Multithreading and Concurrency,Web Servers and Client scripting.

Course Outcome:

After the completion of the Course, the students,

- Detailed Study on different Programming Constructs in Python.

- How to perform the Web Browser Emulation is discussed with proper effective examples.

- Implementation of Immunity Debuggers and Libs are discussed along with Scraping Web Application.

References

1. Mike Dawson,‖More Python programming for Absolute Beginner‖, Cengage Learning PTR; 3rd edition,2010, ISBN-10: 1435455002, ISBN-13: 978-14354550092.
2. Mark Lutz,‖ Python Pocket reference‖, O'Reilly Media; 4th edition ,2009,ISBN-10: 0596158084, ISBN-13: 978-0596158088

COURSE PLAN

MODULES	Contact Hours	Sem.Exam Marks;%
COURSE NO: 08CS6242(B) **COURSE TITLE: INTERACTIVE PROGRAMMING WITH PYTHON**		
MODULE: 1 Introduction to Interpreted Languages and Python - Data Types and variables - Operators and Expressions - Program Structure and Control - Functions and Functional Programming - Classes, Objects and other OOPS concepts . I/O in Python - File and Directory Access.	7	15
MODULE: 2 Multithreading and Concurrency - Inter Process Communication (IPC) - Permissions and Controls , Raw Socket basics -Socket Libraries and Functionality.	6	15
FIRST INTERNAL TEST		
MODULE: 3 Programming Servers and Clients - Programming Wired and Wireless Sniffers - Programming arbitrary packet injectors - PCAP file parsing and analysis.	7	15
MODULE: 4 Web Servers and Client scripting - Web Application Fuzzers - Scraping Web Applications – HTML and XML file analysis.	7	15
SECOND INTERNAL TEST		
MODULE: 5 Web Browser Emulation - Attacking Web Services - Application Proxies and Data Mangling - Automation of attacks such as SQL Injection, XSS etc.	6	20
MODULE: 6 Exploit Development techniques - Immunity Debuggers and Libs - Writing plugins in Python - Binary data analysis - Exploit analysis Automation.	6	20

COURSE NO: 08CS6242(C) COURSE TITLE: COMPUTER AND INFORMATION SECURITY MANAGEMENT

(L-T-P:3-0-0) CREDITS: 3

Prerequisite: Knowledge of TCP/IP, Cryptography and Network Security is preferred

Course Objectives:

- To learn how to manage computer and information security aspects.

- Provides methods to develop new framework for information security, overview of security risk assessment and management and security planning in an organization.

Syllabus

The big picture-Learning from experience-Risk assessment-Measuring ROI on security-Overview of SSE CMM

Course Outcome:

After the completion of the Course, the students,

- Gain knowledge on Effective on Risk Assessment Techniques.

- How to create a path for the security of the software.

- Different mechanisms to establish configuration management.

- Implementation of Information security management in Health care industry is discussed in detail.

References:

1. Donn Parkers, ― Fighting Computer Crime: A New Framework for Protecting Information‖, John Wiley&Sons, 2003
2. Micki Krause, Harold F.Tripton, ― Information Security Management Handbook‖, Auerbach Publications, 2012.

COURSE PLAN

<table>
<tr><td colspan="3">COURSE NO: 08CS6242(C)

COURSE TITLE: COMPUTER AND INFORMATION SECURITY
MANAGEMENT</td></tr>
<tr><td>MODULES</td><td>Contact Hours</td><td>Sem.Exam Marks;%</td></tr>
<tr><td>MODULE: 1

The big picture-Learning from experience-Weaknesses in Information Security-The extent of crime in cyberspace- The cyberspace crimoid syndrome-Policies and technologies- A new framework for information security.</td><td>6</td><td>15</td></tr>
<tr><td>MODULE: 2

Risk assessment-Richard Baskerville's risk assessment methodology- Generations of risk assessment techniques-Quantitative approach to risk assessment-Problems with Quantitative approach – NIST ALE- Baseline approach.</td><td>5</td><td>15</td></tr>
<tr><td colspan="3">FIRST INTERNAL TEST</td></tr>
<tr><td>MODULE: 3

Measuring ROI on security- Security patch management- Purposes of Information Security management- The building blocks of information security- Human side of information security-Security management- Securing new information technology.</td><td>9</td><td>15</td></tr>
<tr><td>MODULE: 4
Overview of SSE CMM- SSE CMM relationship to other initiatives- Capability levels.</td><td>5</td><td>15</td></tr>
<tr><td colspan="3">SECOND INTERNAL TEST</td></tr>
<tr><td>MODULE: 5

Security Engineering- Security Engineering process overview-Basic process areas- Configuration management- Base practices-Establish configuration management .Security Engineering-Security Engineering process overview- Basic process areas-Configuration management- Base practices- Establish configuration management .</td><td>6</td><td>20</td></tr>
<tr><td>MODULE: 6

Maintaining information security during downsizing- Business case for Information Security- Information Security Management in healthcare industry- Protecting high tech trade secrets-Outsourcing Security.</td><td>8</td><td>20</td></tr>
</table>

COURSE NO: 08CS6252(A) COURSE TITLE:COMPUTER LAW AND ETHICS

(L-T-P:3-0-0)   CREDITS: 3

CourseObjectives:

- To provide the students with the concepts of Intellectual property rights, issues in equipment contracts.

- Discusses the ethical issues in computer security, cyber laws in India and IT Act 2000.

Syllabus

Intellectual property rights, Computer contracts,Computer crime, computer fraud, hacking

Course Outcome:

After the completion of the Course, the students,

- can able to identify the ethical issues surrounding computers and it causes.

- can able enhance their analytical skills to solve the problems.

References

1.   D. Bainbridge, *Introduction to Computer Law*, 5/e, Pearson Education, 2004.
2.   P. Duggal, *Cyber law: the Indian Perspective*, 2005.
3.   C. P. Fleeger and S. L. Fleeger, *Security in Computing*, 3/e, Pearson Education, 2003

COURSE PLAN

MODULES	Contact Hours	Sem.Exam Marks;%
COURSE NO: 08CS6252(A) **COURSE TITLE:** COMPUTER LAW AND ETHICS		
MODULE: 1 Intellectual property rights, computer software copyrights, copyright in databases and electronic publishing.	6	15
MODULE: 2 Law of confidence, patent laws, trademarks, product designs, international law.	5	15
FIRST INTERNAL TEST		
MODULE: 3 Computer contracts, liability for defective hardware and software, software contracts, web and hardware contracts, electronic contracts and torts, liabilities.	8	15
MODULE: 4 Computer crime, computer fraud, hacking, unauthorized modification of information, piracy, computer pornography and harassment.	7	15
SECOND INTERNAL TEST		
MODULE: 5 Cyber laws in India, IT Act 2000, data subjects' rights.	7	20
MODULE: 6 Ethical issues in computer security, case studies.	6	20

COURSE NO: 08CS6252(B) **COURSE TITLE:** BIO-INFORMATICS
(L-T-P:3-0-0) **CREDITS: 3**

Course Objectives:

- Gives students an introduction to the area of Bio-informatics and various concepts related to bio- informatics such as search engines, data mining, pattern matching etc.

Syllabus

The Central Dogma – The search process-Statistical concepts-Data Mining.

Course Outcome:

- The students can able to understand the basic terminology of bioinformatics, types of biological databases, data storage and retrieval and sequence alignments.

References

1. Bryan Bergeron, ―Bio Informatics Computing‖, Second Edition, Pearson Education,2003.
2. D. E. Krane and M. L. Raymer, Fundamental Concepts of Bioinformatics, Pearson Education, 2003.
3. T. K. Attwood and D. J. Parry-Smith, Introduction to Bioinformatics, Pearson Education, 2003.
4. J. H. Zar, Biostatistical Analysis, 4/e, Pearson Education, 1999.

COURSE PLAN

MODULES	Contact Hours	Sem.Exam Marks;%
COURSE NO: 08CS6252(B) **COURSE TITLE:BIO-INFORMATICS**		
MODULE: 1 The Central Dogma – The Killer Application – Parallel Universes – Watson's Definition– Top Down Versus Bottom up – Information Flow – Convergence – Databases – Data Management – Data Life Cycle – Database Technology – Interfaces – Implementation – Networks – Geographical Scope – Communication Models – Transmissions Technology– Protocols – Bandwidth – Topology – Hardware – Contents – Security – Ownership –Implementation – Management.	7	15
MODULE: 2 Statistical concepts – Microarrays – Imperfect Data – Randomness – Variability –Approximation – Interface Noise – Assumptions – Sampling and Distributions –Hypothesis Testing – Quantifying Randomness – Data Analysis – Tool selection-statistics of Alignment – Clustering and Classification.	7	15
FIRST INTERNAL TEST		
MODULE: 3 Statistical concepts – Microarrays – Imperfect Data – Randomness – Variability –Approximation – Interface Noise – Assumptions – Sampling and Distributions –Hypothesis Testing – Quantifying Randomness – Data Analysis – Tool selection-statistics of Alignment – Clustering and Classification .	6	15
MODULE: 4 Data Mining – Methods – Selection and Sampling – Preprocessing and Cleaning – Transformation and Reduction – Data Mining Methods – Evaluation – Visualization – Designing new queries – Pattern Recognition and Discovery – Machine Learning – Text Mining – Tools.	6	15

SECOND INTERNAL TEST		
MODULE: 5 Pair wise sequence alignment – Local versus global alignment – Multiple sequence alignment – Computational methods – Dot Matrix analysis – Substitution matrices –Dynamic Programming – Word methods – Bayesian methods – Multiple sequence alignment – Dynamic Programming – Progressive strategies – Iterative strategies – Tools– Nucleotide Pattern Matching – Polypeptide pattern matching – Utilities – Sequence Databases.	**6**	**20**
MODULE: 6 Drug Discovery – components – process – Perspectives – Numeric considerations – Algorithms – Hardware – Issues – Protein structure – Ab Initio Methods– Heuristic methods – Systems Biology – Tools – Collaboration and Communications –standards - Issues – Security – Intellectual property.	**7**	**20**

COURSE NO: 08CS6252(C)COURSE TITLE :SOFT COMPUTING

(L-T-P:3-0-0)   CREDITS: 3

Course Objectives:

- To provide the students with the concepts of soft computing techniques such as neural networks, fuzzy systems, genetic algorithms etc.

Syllabus

Evolution of Computing -.Supervised Learning Neural Networks-Fuzzy Sets.

Course Outcome:

- Able to understand the basic concepts of fuzzy neural network and genetic algorithm.
- Students can the improve the performance of any system integrated with soft computing.
- Ability to hybrid soft computing mechanisms.

References:

1. Jyh-Shing Roger Jang, Chuen-Tsai Sun, EijiMizutani, ―Neuro-Fuzzy and Soft Computing‖, Prentice-Hall of India, 2003.
2. James A. Freeman and David M. Skapura, ―Neural Networks Algorithms, Applications, and Programming Techniques‖, Pearson Edn., 2003.
3. George J. Klir and Bo Yuan, ―Fuzzy Sets and Fuzzy Logic-Theory and Applications‖, Prentice Hall, 1995.
4. AmitKonar, ―Artificial Intelligence and Soft Computing‖, First Edition, CRC Press, 2000.
5. Simon Haykin, ―Neural Networks: A Comprehensive Foundation‖, Second Edition Prentice Hall, 1999.
6. Mitchell Melanie, ―An Introduction to Genetic Algorithm‖, Prentice Hall,1998.
7. David E. Goldberg, ―Genetic Algorithms in Search, Optimization and Machine Learning‖, Addison Wesley, 1997.

COURSE PLAN

MODULES	Contact Hours	Sem.Exam Marks;%
COURSE NO: 08CS6252(C) **COURSE TITLE:SOFT COMPUTING**		
MODULE: 1 Evolution of Computing - Soft Computing Constituents – From Conventional AI to Computational Intelligence - Adaptive Networks – Feed forward Networks.	9	15
MODULE: 2 Supervised Learning Neural Networks – Radia Basis Function Networks - Reinforcement Learning –Unsupervised Learning Neural Networks – Adaptive Resonance architectures	5	15
FIRST INTERNAL TEST		
MODULE: 3 Fuzzy Sets – Operations on Fuzzy Sets – Fuzzy Relations - Fuzzy Rules and Fuzzy Reasoning – Fuzzy Inference Systems – Fuzzy Logic – Fuzzy Expert Systems – Fuzzy Decision Making.	5	15
MODULE: 4 Adaptive Neuro-Fuzzy Inference Systems – Coactive Neuro-Fuzzy Modeling – Classification and Regression Trees.	5	15
SECOND INTERNAL TEST		
MODULE: 5 Data Clustering Algorithms – Rule base Structure Identification – Neuro-Fuzzy Control.	5	20
MODULE: 6 Machine Learning Techniques – Machine Learning Using Neural Nets – Genetic Algorithms (GA) – Applications of GA in Machine Learning - Machine Learning Approach to Knowledge Acquisition. Support Vector Machines for Learning – Linear Learning Machines – Support Vector Classification – Support Vector Regression -Applications.	10	20

COURSE NO:08CS6262COURSE TITLE: MINI PROJECT

CREDITS: 2

Course Objectives:

- To estimate the ability of the student in transforming the theoretical knowledge studied so far into a working model of a computer / information system.
- Enabling the students to gain experience in organisation and implementation of a small project and thus acquire the necessary confidence to carry out main project in the final year.

COURSE NO: 08CS6272COURSE TITLE:CYBER SECURITY LABORATORY

CREDITS: 1

1. Implementation of Substitution and Transposition ciphers
2. Implementation of Data Encryption Standard
3. Implementation of International Data Encryption Algorithm
4. Implementation of Advanced Encryption Standard
5. Implementation of RSA Algorithm
6. Implementation of Diffie-Hellman Key Exchange
7. Implementation of Message Authentication Codes
8. Implementation of Hash functions
9. Implementation of Digital Signature Standard
10. Hiding of confidential information within Image
11. Implementation in FOSS based security mechanisms'

SEMESTER 3

COURSE NO: 08CS 7213(A)COURSE TITLE:DIGITAL WATERMARKING

(L-T-P : 3-0-0) CREDITS: 3

Pre-requisites: Nil

Course Objectives:

- To provide the students with the concepts of modelling of watermarking, message coding.

- Also to gain knowledge in Watermark security and cryptography.

Syllabus

Watermarking host signals: Image, Video, Audio. Multimedia compression and decompression, Lossless compression, Modeling watermark detection by correlation.

Course Outcome:

- The students can able to understand the different authentication methodology.

- They can also understand about the copyright protection of their materials.

References

1. Cox I., M. Miller, J. Bloom, J. Fridrich and T Kalker, "Digital Watermarking and Steganography", Second Edition, Morgan Kaufmann Publishers, 2008.

COURSE PLAN

MODULES	Contact Hours	Sem.Exam Marks%
COURSE NO: 08CS 7213(A)COURSE TITLE: DIGITAL WATERMARKING **(L-T-P: 3-0-0) CREDITS: 3**		
MODULE: 1 Watermarking host signals: Image, Video, Audio. Multimedia compression and decompression, Lossless compression.	6	15
MODULE: 2 Models of watermarking, Communication-based models of watermarking. Geometric models of watermarking, Modeling watermark detection by correlation.	7	15
FIRST INTERNAL TEST		
MODULE: 3 Basic message coding, Mapping message into message vectors, Error correction coding, detecting multi-symbol watermarks, Watermarking with side information.	7	15
MODULE: 4 Informed embedding, Informed coding, structured dirty-paper codes, Analyzing errors, Message errors, ROC curves, The effect of whitening on error rates, Analysis of normalized correlation, Using perceptual models.	8	15
SECOND INTERNAL TEST		
MODULE: 5 Evaluating perceptual impact of watermarks, General forms of a perceptual model, Perceptual adaptive watermarking, Robust watermarking.	6	20
MODULE: 6 Watermark security, Watermark security and cryptography, Content authentication, Exact authentication, Selective authentication, Localization, Restoration.	5	20

COURSE NO:08CS 7213(B):COURSE TITLE:MATHEMATICAL MODELS OF INTERNET

(L-T-P: 3-0-0) CREDITS: 3

Pre-requisites: Nil

Course Objectives:

- To provide the students with the conceptsof modeling the queuing systems and moving networks.

- Also to know the applications of various models used in internet based applications.

Syllabus

Definition and characteristics of mathematical models, Modeling the network - queuing systems, modeling the QoS for improvement.

Course Outcome:

- Able to gaincomplete knowledge about queuingsystems.

- Understand the various internet based applications models.

References

1. Harold Tipton, Micki Krause, *Information Security Management Handbook*, 5thEdition, Auerbach / CRC Press 2004

2. Seymour Bosworth, M E Kabay .*Computer Security Handbook*, 4th Edition. John Wiley, 2002.

3. Theo Dimitrakos, Fabio Martinelli, (Editors). *Formal Aspects in Security and Trust:* Proceedings of IFIP Workshop on Formal Aspects in Security and Trust (FAST) 2004

4. Ali E Abdallah, Peter Ryan, Steve Schneider (Editors). *Formal Aspects of Security:* Proceedings of First International Conference, FASec 2002. LNCS 2629, Springer2003

5. Markus Schumacher. *Security Engineering with patterns: origins, theoretical model, Andnew applications.* LNCS 2754, Springer

COURSE PLAN

MODULES	Contact Hours	Sem.Exam Marks;%
COURSE NO: 08CS 7213(B)COURSE TITLE: MATHEMATICAL MODELS OF INTERNET (L-T-P: 3-0-0) CREDITS:3		
MODULE : 1 Definition and characteristics of mathematical models.	10	15
MODULE : 2 Modeling the network - queuing systems, modeling the QoS for improvement.	5	15
FIRST INTERNAL TEST		
MODULE : 3 Mathematical models of fairness and stability**.**	5	15
MODULE : 4 Modeling a self-managed internet. Moving away from the end to end concept.	9	15
SECOND INTERNAL TEST		
MODULE : 5 Modeling required in an untrustworthy world.	5	20
MODULE : 6 Modeling of an internet based application.	5	20

COURSE NO: 08CS 7213(C)COURSE TITLE: DATABASE SECURITY

(L-T-P: 3-0-0) CREDITS: 3

Pre-requisites: Nil

Course Objectives:

- To provide the students with the conceptsof modeling database, authentication and access control mechanisms.

- Also to know the various issues concerning private database management.

Syllabus

Introduction to databases: database modeling, conceptual database design, overview of SQL and relational algebra, Access control mechanisms in general computing systems: Lampson's access controi matrix. Mandatory access control

Course Outcome:

- Students can able to understand the risk analysis of large database.

- They also understand how to setup privilege, Audit, Back-up and Restore the databases.

References

1. Ron Ben Natan, "Implementing Database Security and Auditing", Elsevier, 2005.

2. Hassan A. Afyouni, "Database Security and Auditing: Protecting Data Integrity and Accessibility", Course Technology, 2005.

3. Michael Gertz and Sushi! Jajodia, "Handbook of Database Security—Applications and Trends", Springer, 2008.

COURSE PLAN

MODULES	Contact Hours	Sem.Exam Marks;%
COURSE NO: 08CS 7213(C)COURSE TITLE: DATABASE SECURITY **(L-T-P: 3-0-0) CREDITS: 3**		
MODULE: 1 Introduction to databases: database modeling, conceptual database design, overview of SQL and relational algebra	**10**	**15**
MODULE: 2 Access control mechanisms in general computing systems: Lampson's access controi matrix. Mandatory access control	**9**	**15**
FIRST INTERNAL TEST		
MODULE: 3 Authentication mechanisms in databases, DAC in databases: Griffiths and Wade.	**5**	**15**
MODULE: 4 MAC mechanisms in databases: SeaView. RBAC in databases, SQL Injection, Auditing in databases, Statistical inferencing in databases,	**5**	**15**
SECOND INTERNAL TEST		
MODULE: 5 Private information retrieval viewed as a database access problem.	**5**	**20**
MODULE:6 Privacy in data publishing, Virtual Private Databases, Security of outsourced databases.	**5**	**20**

COURSE NO: 08CS 7223(A)COURSE TITLE:CLOUD AND UTILITY COMPUTING

(L-T-P: 3-0-0) CREDITS: 3

Pre-requisites: Nil

Course Objectives:

- To provide the students with concept of on-demand network access to a shared pool of configurable computing.

Syllabus

Introduction to Cloud Computing- The Evolution of Cloud Computing – Hardware

Evolution – Internet Software ,Interoperability Standards for Data Center Management, Software Utility Application Architecture

Course Outcome:

- Students can able to compare the operation, implementation and performance of cloud computing systems, and the relative merits and suitability of each for complex data-intensive applications.

- They can able to nexplain and characterise different cloud computing models, namely, infrastructure as a service (IaaS), platform as a service (PaaS), and software as a service (SaaS)

- They will identify security implications in cloud computing

References

1. John W. Rittinghouse and ames F. Ransome, ―Cloud Computing Implementation, Management and Security‖, CRC Press, Taylor & Francis Group, Boca Raton London New York. 2010 [Unit -11 and Unit II]

2. Alfredo Mendoza, ―Utility Computing Technologies, Standards, and Strategies‖, Artech House INC, 2007. [Unit -11I to Unit V]

3. Guy Bunker and Darren Thomson, ―Delivering Utility Computing‖, John Wiley & Sons Ltd, 2006.

COURSE PLAN

MODULES	Contact Hours	Sem.Exam Marks;%
COURSE NO: 08CS 7223(A)COURSE TITLE: CLOUD AND UTILITY COMPUTING (L-T-P: 3-0-0) CREDITS: 3		
MODULE: 1 Introduction to Cloud Computing- The Evolution of Cloud Computing – Hardware Evolution – Internet Software Evolution – Server Virtualization - Web Services Deliver from the Cloud – Communication-as-a-Service – Infrastructure-as-a-Service – Monitoring-as-a-Service – Platform-as-a-Service – Software-as-a-Service – Building Cloud Network.	5	15
MODULE: 2 Federation in the Cloud - Presence in the Cloud - Privacy and its Relation to Cloud-Based Information Systems – Security in the Cloud - Common Standards in the Cloud – End-User Access to the Cloud Computing	5	15
FIRST INTERNAL TEST		
MODULE: 3 Introduction - Advancing towards a Utility Model – Evolving IT infrastructure – Evolving Software Applications – Continuum of Utilities- Standards and Working Groups – Standards Bodies and Working Groups – Service Oriented Architecture – Business Process Execution Language.	5	15
MODULE: 4 Interoperability Standards for Data Center Management - Utility Computing Technology – Virtualization – Hyper Threading – Blade Servers - Automated Provisioning - Policy Based Automation – Application Management – Evaluating Utility Management Technology - Virtual Test and development Environment - Data Center Challenges and Solutions - Automating the Data Center .	5	15

SECOND INTERNAL TEST		
MODULE: 5 Software Utility Application Architecture - Characteristics of anSaaS - Software Utility Applications - Cost Versus Value - Software Application Services Framework – Common Enablers – Conceptual view to Reality – Business Profits - Implementing Database Systems for Multitenant Architecture.	**10**	**20**
MODULE: 6 Other Design Considerations - Design of a Web Services Metering Interface – Application Monitoring Implementation - A Design for an Update and Notification Policy - Transforming to Software as a Service - Application Transformation Program – Business Model Scenarios - Virtual Services for Organizations - The Future.	**9**	**20**

COURSE NO: 08CS 7223(B)COURSE TITLE:CRYPTO COMPLEXITY

(L-T-P: 3-0-0) CREDITS: 3

Pre-requisites: Nil

Course Objective:

- To provide the studentswith the concepts of cryptology and complexity theory.

- Also to know the different protocols like diffiehellman, elgamaletc and randomized algorithms and complexity classes.

Syllabus

Review of Relevant Mathematics, Complexity Theory, Foundations of Cryptology,

Hierarchies based on NP.,Randomized algorithms and Complexity classes.

Course Outcome:

- Student gain knowledge on various factoring methods.

- RSA Cryptosystem is discussed in detail.

- Various advantages of performing Primality Tests in the field of advanced cryptology is given.

References:

1. Jorg Roth, *Complexity Theory and Cryptology – An introduction to cryptocomplexity*, Springer, 2005.

2. 2.H. Anton, *Elementary Linear algebra*, John Wiley and Sons, New York, eighth edition,2000.

3. G. Brassard. *A note on the complexity of cryptography*, IEEE Transactions on Information Theory, 25(2):232-233, 1979

COURSE PLAN

MODULES	Contact Hours	Sem.Exam Marks;%
COURSE NO: 08CS 7223(B)**COURSE TITLE:** CRYPTO COMPLEXITY (L-T-P: 3-0-0) CREDITS: 3		
MODULE: 1 Review of Relevant Mathematics, Complexity Theory, Foundations of Cryptology, Hierarchies based on NP.	9	15
MODULE: 2 Randomized algorithms and Complexity classes.	5	15
FIRST INTERNAL TEST		
MODULE:3 Probabilistic Polynomial time classes,Quantifiers, Graph Isomorphism and lowness.	5	15
MODULE: 4 RSA Cryptosystem, Primality and factoring, Primality Tests.	5	15
SECOND INTERNAL TEST		
MODULE: 5 Factoring Methods, Security of RSA.	5	20
MODULE: 6 Diffie Hellman's, ElGamal's and other protocols, Arthur Merlin Games and Zero Knowledge.	10	20

COURSE NO:08CS 7223(C)COURSE TITLE:SECURITY POLICIES AND ASSURANCE

(L-T-P: 3-0-0) CREDITS: 3

Course Objectives:

- To impart knowledge to students to know the standards of security policies, guidelines and procedures.

Syllabus

Security policies, Integrity policies,Assurance and trust,Waterfall model.

Course Outcome:

- The students can be understand the policy related to Information assurance which includes protection of the integrity, availability, authenticity and security.

References:

1. M. Bishop, *Computer Security: Art and Science*, Pearson Education, 2003.
2. W. Mao, *Modern Cryptography: Theory & Practice*, Pearson Education, 2004.
3. C. P. Fleeger and S. L. Fleeger, *Security in Computing*, 3/e, Pearson Education, 2003.

COURSE PLAN

MODULES	Contact Hours	Sem.Exam Marks;%
COURSE NO: 08CS 7223(C)COURSE TITLE: SECURITY POLICIES AND ASSURANCE (L-T-P: 3-0-0) CREDITS: 3		
MODULE:1 Security policies, policy languages, confidentiality policies, Bell-Lapadula model, controversies over the model.	9	15
MODULE:2 Integrity policies, Biba model, Lipner's model, Clark-Wilson models, Chinese wall model.	5	15
FIRST INTERNAL TEST		
MODULE: 3 Clinical information systems security policy, non-interference and policy composition.	5	15
MODULE: 4 Assurance and trust, building secure and trusted systems.	5	15
SECOND INTERNAL TEST		
MODULE: 5 Waterfall model, other models of development.	5	20
MODULE: 6 Assurance in requirements definition and analysis, assurance during system and software design, assurance during implementation and integration.	10	20

COURSE NO:08CS 7233COURSE TITLE:SEMINAR II

(L-T-P: 2)   CREDITS: 2

Course Objectives:

- Toassess thedebatingcapabilityofthestudenttopresentatechnical topic.

- Also to imparttrainingtoastudenttofaceaudienceandpresenthis/herideasand thuscreating self-esteemand couragethatareessentialfor anengineer.

Eachstudentis expectedto presentaseminaronatopicof current relevancein Cyber/InformationSecurityorForensicsforabout45minutes. Theyareexpected torefercurrentresearchandreview papersfromstandardjournalslikeACM,IEEE, JPDC,IEEetc.–atleastthreecrossreferencesmustbeused-theseminarreport mustnotbethereproductionoftheoriginalpaper.Acommitteeconsistingofatleastthreefacultyme mbersshallassessthepresentationoftheseminarand awardmarkstothestudentsbasedonmeritsoftopicofpresentation. Each studentshallsubmittwo copiesofawrite-upoftheseminartopic.Onecopyshall bereturnedtothe studentafterdulycertifyingitby thechairmanoftheassessing committeeandtheother willbekeptinthedepartmentallibrary.Internal continuousassessmentmarksareawardedbasedontherelevanceofthetopic, presentation skill,qualityofthe reportandparticipation.

COURSE NO:08CS 7243COURSE TITLE: PROJECT (PHASE 1)
(L-T-P: 0-0-12) CREDIT:6

Course Objectives:

- Toimprove   theprofessionalcompetencyandresearchaptitudebytouchingthe areaswhichotherwisenotcoveredbytheoryorlaboratoryclasses.

- Theprojectworkaims   todeveloptheworkpracticeinstudentstoapplytheoreticaland practicaltools/techniquestosolvereallifeproblems relatedtoindustry and currentresearch.

The projectwork shouldbea projectrelatedto cybersecurityoralliedtopics.

Theprojectworkisallottedindividuallyondifferenttopics.Thestudents shallbe encouraged todo their   project   work   in   the   parent   institute   itself.   If   found   essential, theymaybepermittedtodotheirprojectoutsidetheparentinstitute

subjecttotheconditionsinclause10ofM.Techregulations.   Department   will constituteanEvaluationCommittee   toreviewtheprojectwork.TheEvaluation   committee consistsofatleastthreefacultymembersof whichinternalguideand   another   expertin   the specified   area   of   the   project   shall   be   two   essential   members. Thestudentisrequiredtoundertakethemastersresearchproject   phase-Iduringthethirdsemesterandthe   sameiscontinued   inthe4th   semester.(Phase-II).Phase-Iconsistsofpreliminary   thesiswork,two   reviewsofthe workandthesubmissionofpreliminaryreport.Firstreviewwouldhighlight   the topic,objectives,methodology   and   expectedresults.   Secondreviewevaluatesthe progressofthework,preliminaryreportandscopeoftheworkwhichistobe completedinthe4thsemester.

COURSE NO:08CS 7214COURSE TITLE:PROJECT (PHASE 2)

(L-T-P:0-0-21) CREDITS: 12

Course Objectives:

- Toimprovetheprofessionalcompetencyandresearchaptitudebytouchingthe areaswhichotherwisenotcoveredbytheoryorlaboratoryclasses.

- Theproject workaims todeveloptheworkpracticeinstudentstoapplytheoreticaland practicaltools/techniquestosolvereallifeproblems relatedtoindustry and currentresearch.

MastersResearchprojectphase-IIisacontinuationofprojectphase-Istartedinthethirdsemester.Beforetheendofthefourthsemester, therewillbetwo reviews,oneatmiddleof thefourth semesterandothertowardstheend.Inthe firstreview,progressof theprojectworkdoneistobeassessed. Inthesecond review,thecompleteassessment(quality,quantumandauthenticity)oftheThesis istobeevaluated. BoththereviewsshouldbeconductedbyguideandEvaluation committee.Thiswouldbeapre-qualifyingexerciseforthestudentsforgetting approvalforthesubmissionofthethesis.Atleastonetechnicalpaperistobe preparedforpossiblepublicationinjournalorconferences. Thetechnicalpaperis tobesubmittedalongwiththethesis.Thefinal evaluationoftheprojectwillbe externalevaluation.