

CS 801 SECURITY IN COMPUTING

Module 1

Introduction- Security problem in computing, Security in Networks. Elementary Cryptography- Introduction- Substitution and Transposition Ciphers.
Review of Number Theory-Modular arithmetic.

Module 2

Encryption Algorithms-Symmetric Key encryption- DES, AES.

Module 3

Public Key encryption. RSA Crypto System. Primality testing- Miller-Rabin Algorithm. Diffie- Hellman Cryptosystem.

Module 4

Authentication protocols, Digital Signature, Secure e-mail, SSL, IP Security. System security –Intruders, Malicious Software , Firewalls.

Text book:

1. Stallings W. ,Cryptography and Network Security Principles and Practice 3/e Pearson Edition Asia 2003.

References:

1. W. Mao Modern cryptography : Theory and Practice , PEA ,2004
2. Handbook of Applied Cryptography, CRC Press 1996.
3. .Calabrese “Information Security Intelligence : Cryptographic Principles &Applications.” Thomson Learning

Type of questions for University Examination

Question 1 - 8 short answer questions of 5 marks each. 2 questions from each module

Question 2-5 – There will be two choices from each module .Answer one question from each module of 15 marks

CS 802 ARTIFICIAL INTELLIGENCE

Module 1

Introduction - Problem spaces and search - Production systems - Characteristics.
Heuristic search techniques - Generate and Test - Hill climbing -Best fit. Graph search - A* algorithm. Problem reduction - constraint satisfaction - Means and End analysis.
Game playing - Minimax - Alpha-beta cut-off.

Module 2

Logic and Deduction. Introduction to symbolic logic - Propositional logic - Well Formed Formula. Predicate Logic - predicates variables and constants - First order logic, Quantifiers. Forward chaining and Unification. Goal trees. Resolution by refutation.

Module 3

Representing Knowledge. Procedural versus Declarative. Reasoning under uncertainty - Nonmonotonic reasoning - Statistical reasoning. Bayesian networks.. Fuzzy Logic . Semantic Nets, Frames, Conceptual Dependency, Scripts, CYC. Natural Language Processing - Transformational grammar, Case grammar - Semantic grammars. Learning: Learning by analysing, by explaining experience, by correcting mistakes, by recording cases

Module 4

Software agents – agent characteristics, agent topology, agent oriented programming, Java implementation of intelligent agents

Text Book:

1. Elaine Rich and Kevin Knight, “Artificial Intelligence”, Tata McGraw-Hill Publishing Company Ltd., New Delhi,1990
2. Jeffrey M Bradshaw, “Software Agents”, AAAI Press/ The MIT Press(97)

References:

1. Natural Language Processing - Transformational grammar, Case grammar - Semantic grammars.
2. Dan W.Patterson, “Introduction to Artificial Intelligence and Expert Systems”, Prentice Hall India Ltd., New Delhi, 1996
3. Winston, P.H., “Artificial Intelligence”, Addison Wesley Pub. House, Reading, MA
4. Nillson N. J., “Artificial Intelligence: A new Synthesis”, Elsevier, New Delhi
5. Eugene Charniak, Drew McDermott, “Introduction to Artificial Intelligence”, Addison Wesley , Reading, Massachusetts, 1985
6. Akshar Bharati, Vineet Chaitanya, Rajeev Sangal, “Natural Language Processing: A Paninian Perspective”, Prentice Hall India Ltd., New Delhi, 1996
7. Nils J.Nillson, ‘Principles of Artificial Intelligence’, Morgan Kauffman Publishers Inc., Palo Alto, California
8. Rober J. Schalkoft, “Artificial Intelligence, An Engineering Approach”, McGraw-Hill Publishing company, New York 1990
9. Gerhard Weiss, “Multi agent System – A modern approach to distributed AI”, MIT Press

Type of questions for University Examination

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Question 2-5 – There will be two choices from each module .Answer one question from each module of 15 marks

CS 803 OBJECT ORIENTED MODELLING AND DESIGN

Module 1

Object Oriented Programming and Design Principles: Object Oriented Concepts – Nature and purpose of models – Object Modeling – Dynamic Modeling – Functional Modeling System Design- Object Design

Module 2

UML Structural Modeling: Basics of UML based object oriented analysis and design Classes – Relationships – Interfaces – Roles – Class diagrams – Advanced classes and relationship – Packages – Instances – Object diagrams

Module 3

UML Behavioral Modeling: Interactions – Use cases – Interaction diagrams – Use case diagrams – Activity diagrams – Events – Signals – State Machines – Processes – Threads – State chart diagrams

Module 4

UML Architectural Modeling: Component diagrams – Deployment diagrams – Collaborations – Unified Processes Introduction to Software Architecture: Design frameworks – Design pattern – Describing the architecture in Architecture description language (ADL)

Text Book:

1. James Rumbaugh et. al., Object Modelling and Design –PHI
2. Grady Booch, James Rumbaugh,Ivar Jacobson .A.WThe Unified Modeling Language User Guide –

References:

1. Ivan Jacobson, Grady Booch, James Rumbaugh A.W The Unified Software Development Process –
2. Bruegge. Object Oriented Software Engineering using UML patterns and Java,Pearson Education ,2003 –
3. Rational Unified Process, Third Edition – Kruchten.

Type of questions for University Examination

Question 1 - 8 short answer questions of 5 marks each. 2 questions from each module

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CS/EC/EE/EI 804 A DIGITAL IMAGE PROCESSING

Module 1

Digital image fundamentals: representation - elements of visual perception - simple image formation model - Image sampling and quantization - basic relationships between pixels – imaging geometry. Review of matrix theory results: Row and column ordering - Toeplitz, Circulant and Block matrices. Review of Image transforms: 2D-DFT, FFT, Walsh, Hadamard, Haar, DCT and Wavelet transforms.

Module 2

Image enhancement: Spatial domain methods: point processing - intensity transformations, histogram processing, image subtraction, image averaging; Spatial filtering- smoothing filters, sharpening filters. Frequency domain methods: low pass filtering, high pass filtering, homomorphic filtering. Generation of spatial masks from frequency domain specifications.

Image segmentation: Detection of discontinuities - point, line and edge and combined detection, Edge linking and boundary description - local and global processing using Hough transform – Thresholding - Region oriented segmentation - basic formulation, region growing by pixel aggregation, region splitting and merging - Use of motion in segmentation. Fundamentals of Representation and Description.

Module 3

Image restoration: Degradation model - Diagonalization of circulant and Block circulant matrices - Algebraic approaches - Inverse filtering - Wiener filter - Constrained Least squares restoration - Interactive restoration - Geometric transformations. Fundamentals of Colour image processing: colour models - RGB, CMY, YIQ, HIS - Pseudo color image processing - intensity slicing, gray level to color transformation.

Module 4

Image compression: fundamentals- redundancy: coding, inter pixel, psychovisual, fidelity criteria, Models, Elements of information theory, Error free compression- variable length, bit plane, lossless predictive, Lossy compression- lossy predictive, transform coding. Fundamentals of JPEG, MPEG, Fractals.

Text Book:

1. Gonzalez and Woods, “Digital Image Processing”, 2 Ed, Pearson Education, 2002.

References:

1. Anil K. Jain, “Fundamentals of Digital Image Processing”, Pearson Education, 2003.
2. Mark Nelson, Jean-Loup Gailly “The Data compression Book” 2 Ed, bpb Publications.
3. Pratt William K.,”Digital Image Processing”, John Wiley & sons
4. Chanda & Majumdar, “Digital Image Processing and Analysis”, PHI.
5. M.Sonka,V. Hlavac, R. Boyle, “Image Processing, Analysis and Machine Vision”, Vikas Publishing House

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Question 1 - 8 short answer questions of 5 marks each. 2 questions from each module

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CS/EB/EC/IT 804 B BIOINFORMATICS

Module 1

Basic Concepts of Molecular Biology: Cells - Chromosomes, DNA, RNA, Proteins, Central dogma of molecular biology, Genomes and Genes - Genetic code, Transcription, Translation and Protein synthesis. Web based genomic and proteomic data bases: NCBI, GenBank

Module 2

Sequence alignments – Dot plot-Pair-wise sequence alignments - local and global - Sequence similarity and distance measures - Smith-Waterman algorithm, Needleman-Wunch algorithm, Multiple sequence alignment –Sum-of-Pairs measure - Star and tree alignments – PAM and BLOSUM, Phylogenetic analysis

Module 3

Informational view of Genomic data, Genomic Signal Processing, DNA Spectrograms, Identification of protein coding regions, Gene expression, Microarrays, Microarray image analysis

Module 4

Gene structure in Prokaryotes and Eukaryotes: Molecular Structure Prediction: Basic concepts and terminologies related to molecular structures, Basic molecular Visualization, RNA secondary structure prediction, Protein folding problem, Protein Threading, Protein Visualization, Introduction to Drug Discovery.

Case Study

Software Tools: Use of Tools for basic and specialized sequence processing such as: BLAST, FASTA, RasMol, Phylip, ClustalW

Text Books:

1. Setubal & Meidanis, *Introduction to Computational Molecular Biology*, Thomson:Brooks/Cole, International Student Edition, 2003
2. Claverie & Notredame, *Bioinformatics - A Beginners Guide*, Wiley-Dreamtech India Pvt Ltd, 2003.

References:

1. Lesk, *Introduction to Bioinformatics*, Oxford University Press, Indian Edition, 2003
2. Higgins and Taylor, *Bioinformatics: Sequence, structure and databanks*, Oxford University Press, Indian Edition, 2003
3. Bergeron, *Bioinformatics Computing*, Prentice hall of India, 2003
4. Jiang, Xu and Zhang, *Current topics in Computational Molecular Biology*, Ane Books, New Delhi, 2004
5. S.C Rastogi & Namitha Mendiratta, *Bioinformatics method and application Genomics,Proteinomics & drug discovery*
6. Dov Stekel, *Microarray Bioinformatics*, Cambridge University Press

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Question 1 - 8 short answer questions of 5 marks each. 2 questions from each module

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CS 804 C SOFTWARE ARCHITECTURE

Module 1

Software Architecture –Introduction-Architectural Styles-Pipes and Filters-Data Abstraction and Object Oriented Organization-Event based, Implicit Invocation-Layered Systems-Repositories-Interpreters-Process Control-Process control Paradigms-Software Paradigm for Process Control-Distributed processes-Main program / subroutine organizations – Domain – specific software architecture – heterogeneous architectures .

Module 2

Shared Information Systems – Data base integration –Batch sequential – Simple Repository –Virtual Repository – Hierarchical Layers – Evolution of Shared Information Systems in BusinessData Processing – Integration in Software Development Environments – Integration in Design of Buildings- Architectural Structures for Shared Information Systems.

Module 3

Architectural Design Guidance- Guidance for User-Interface Architectures -Design Space and rules-Design Space for User Interface Architectures-Design. Rules for User Interface Architecture applying the Design Space – Example – A Validation Experiment – How the Design Space Was Prepared .

Module 4

Value of Architectural Formalism – Formalizing the Architecture of a Specific System – Formalizing an Architectural Style – Formalizing an Architectural Design.Linguistic Issues – Requirements for Architecture - Description Languages - First Class Connectors – Adding Implicit Invocation to Traditional Programming Languages .
Tool for Architectural Design – UniCon .

Text Book:

1. Mary Shaw, David Garlan, "Software Architecture", Prentice Hall ,India, 2000

Type of questions for University Examination

Question 1 - 8 short answer questions of 5 marks each. 2 questions from each module

Question 2-5 – There will be two choices from each module .Answer one question from each module of 15 marks

CS/IT 804(D) MOBILE COMPUTING

Module 1

Review of wireless and mobile communication (covered in Advanced Computer Networks)-Mobile computing architecture-Pervasive Computing-Voice oriented data Communication, Operating System for Mobile Computing, Mobile Devices, cards and sensors, Mobile computing applications: messaging-SMS-MMS-GPRS applications-Mobile agents.

Module 2

Wireless Internet-Mobile IP-wireless web-Web services and mobile web services-Wireless middleware-wireless gateway and mobile application servers-Wireless Access Protocol(WAP)-WAP protocol layers. Mobile database management:-data caching, transaction models, processing queries, Data recovery, QoS .Mobile Transport Layer

Module 3

Cellular network- First Generation Networks-Second generation (2G): GSM-CDMA network .data over cellular network-2.5G network-GPRS-GPRS System Architecture and Protocol layers. EDGE. Third generation network(3G) network-MMS-introduction to 4G and 5G systems-Emerging wireless networks: Ultra wide band(UWB)-Free space optics(FSO)-Mobile ad-hoc network(MANET)-Wireless sensor networks-OFDM and Flash OFDM

Module 4

Wireless security-WLAN security-cellular wireless network security-Mobile ad-hoc network security-Internet security protocols: VPNs and IPSec-Wireless middleware security-SSL for wireless web security-WAP security and WTLS. Client programming tools-using XML and UML for mobile computing –J2ME.

Text Book:

1. Raj Kamal, *Mobile Computing*, Oxford University Press, 2007

References:

1. Amjad Umar, *Mobile Computing and Wireless Communications*, NGE Solutions, 2004
2. Asoke Talukder, Roopa Yavagal, *Mobile Computing*, McGrawhill, 2006
3. Reza Behravanfar, Phillip Lindsay, Reza B'Far, *Mobile Computing Principles: designing and developing mobile applications with UML and XML*, Cambridge University Press, 2006.
4. U. HansMann, L Merk, M.S. Nicklous and T. Stober, *Principles of Mobile Computing*, 2/e, Spniyer, 2003
5. Schiller J, *Mobile Communications*, 2/e-Addison Wesley, 2003.

Type of questions for University Examination

Question 1 - 8 short answer questions of 5 marks each. 2 questions from each module

Question 2-5 – There will be two choices from each module .Answer one question from each module of 15 marks

CS 805 PROJECT WORK

The project work commencing from the seventh semester shall be completed and the project report shall be submitted by each student by the end of eighth semester. There shall be an internal examination of the project that includes a presentation, demonstration and oral examination of the project work. The evaluation panel shall consist of at least two faculty members including project guide as appointed by the Head of the department.

Each batch of students shall develop the project designed during the VII semester. The implementation phase shall proceed as follows:

A detailed algorithm level implementation, test data selection, validation, analysis of outputs and necessary trial run shall be done.

Integration of hardware and software, if applicable, shall be carried out.

A detailed project report in the prescribed format shall be submitted at the end of the semester. All test results and relevant design and engineering documentation shall be included in the report.

The work shall be reviewed and evaluated periodically

The final evaluation of the project shall be done by a team of minimum 3 internal examiners including the project guide and shall include the following.

- Presentation of the work
- Oral examination
- Demonstration of the project against design specifications
- Quality and content of the project report

Guidelines for evaluation:

Regularity and progress of work	30
Work knowledge and Involvement	100
End semester presentation and oral examination	50
Level of completion and demonstration of functionality/specifications	70
Project Report – Presentation style and content	50
<i>Total</i>	<i>300 marks</i>

Note: Points (i) and (ii) to be evaluated by the respective project guide and the project coordinator based on continuous evaluation. (iii)-(v) to be evaluated by the final evaluation team comprising of 3 internal examiners including the project guide.

CS 806 VIVA-VOCE

Each student is required to appear for a viva-voce examination, and he/she has to bring his seminar report and project report for the same. The evaluation panel should contain at least one external and two internal examiners appointed by the University. There can be more than one panel in case the number of students is large.