M.PHIL. SYLLABUS – 2015

COMPUTER SCIENCE

DEPARTMENT OF COMPUTER SCIENCE
ST. JOSEPH'S COLLEGE (Autonomous)
Accredited at A Grade (3rd cycle) by NAAC
College with Potential for Excellence by UGC
Tiruchirappalli – 620 002

GUIDELINES FOR FULL TIME **M.PHIL.**

1. **Duration :** The programme runs for one year consisting of two semesters. The   Semester- I is from August to February and the Semester- II runs from March to August, of   the   following year.

2. **Course Work:**

Semester - I			Semester - II		
Course	**Title**	**Cr**	**Course**	**Title**	**Cr**
C1	Professional Skills for Teaching – Learning	3	C5	Dissertation (Topic selected should be relevant to the topic of the Guide Paper)	8
C2	Research Methodology	4			
C3	Core Course	5			
C4	Guide Paper	5			
	Total	17		Total	8

2. a) Each Course should contain 5 units, covering the subject requirements of the courses offered.

> **Marks for CIA and SE are in the ratio 40 : 60**.

> The CIA components are **Mid Semester Test (25), End Semester Test (25), Seminar (15), Objective Type Assignment Test (15)**. The total mark 80 will be converted into 40 marks. **The tests and Semester Examination are centrally conducted by COE for 3 hours.**

CIA & SE	Tentatively on
Mid Semester Test	December 2nd Week
End Semester Test	February 2nd Week
Semester Examinations	February 4th Week

> Scholar should acquire **a minimum of 20 marks from CIA to appear for SE.** The Scholar should acquire a minimum of 30 marks in Semester Examination. He / She will be declared to have passed in the various courses in Semester I, provided he/she secures not less than 50 marks on an aggregate (CIA+SE).

2. b) (i) In course C1 on **'Professional Skills for Teaching – Learning'** the first three units are common to all the Departments of the College. The Academic Council has granted permission to incorporate some modifications in the C1 Course by Physics, Computer Science and Mathematics Departments. The first three unit titles are **Soft Skills, E-teaching, E-learning, Elements of Technology of Teaching and Learning.** The remaining two units are department specific to make use of the above mentioned skills & techniques to teach the Core Course.

The C1 Course is (to be) designed to exploit the various Teaching – Learning – Research Skills to be imbibed / cultivated to make the research scholars to be fit   for the profession they are likely to acquire in the Education Industry. Thus   only for the course (C1) the written component is 60% and Practical component   is 40% both in CIA and SE.

b) (ii) **Evaluation for C1:**

Theory Component: For both CIA & SE, there will be a 2 hour test only from the first THREE units. The CIA components are Mid Semester Test (35), End Semester Test (35) and Assignment (30). The total 100 will be converted into 25 marks.

Practical Component: The last TWO units are department specific. There is no Mid and End Semester Tests. But the CIA for the same are assessed continuously by the teacher(s) concerned totaling 15 marks. For SE, the Practical evaluation is done by an external examiner.

c) Question papers for C1, C2 & C3 are set by External Examiners.

d) Question paper for C4 will be set and valued by the Research Advisor only.

e) Departments will be permitted to offer either paper 2 or paper 3 as Open Online Course to the M.Phil. students. The evaluation method will be the same for both C2 and C3 Courses.

3. **Credits:**

	Courses	Title		Contact Hrs.	Library Hrs.	Total Hrs.	Cr	CIA Mk.	SE Mk.	Total Mk.
SEMESTER – I	C1	Professional Skills for Teaching – Learning	T	3	2	5	2	25	35	60
			P	2	2	4	1	15	25	40
	C2	Research Methodology		5	4	9	4	40	60	100
	C3	Core Course		5	5	10	5	40	60	100
	C4	Guide Paper		5	5	10	5	40	60	100
	Total			**20**	**18**	**38**	**17**	**160**	**240**	**400**

		INTERNAL			EXTERNAL		
			Cr	**Mk**		**Cr**	**Mk**
SEMESTER – II	**C5 – DISSERTATION**	Seminar & Review of Related Literature	2	15	Dissertation Evaluation	6	75
		Mid Term Review Presentation	2	15	*Viva-voce*	2	25
		Dissertation Work	3	60			
		Viva-Voce	1	10			
Total			**8**	**100**		**8**	**100**

4. Question Pattern:

	Course	Mid & End Semester Tests and Semester Examinations		
Science	C1	Section A : Short Answers	7/9	7 x 2 = 14
		Section B : Either / Or – Essay Type	3	3 x 7 = 21
	C2	Section A : Short Answers	10	10 x 2 = 20
		Section B : Either / Or – Essay Type	5	5 x 8 = 40
	C3	Section A : Short Answers	10	10 x 2 = 20
		Section B : Either / Or – Essay Type	5	5 x 8 = 40
	C4	Open Choice : Comprehensive Type	5/8	5 x 12 = 60
	Course	**Mid & End Semester Tests and Semester Examinations**		
Arts	C1	Section A : Short Answers	7/9	7 x 2 = 14
		Section B : Either / Or – Essay Type	3	3 x 7 = 21
	C2	Open Choice : Comprehensive Type	5/8	5 x 12 = 60
	C3	Open Choice : Comprehensive Type	5/8	5 x 12 = 60
	C4	Open Choice : Comprehensive Type	5/8	5 x 12 = 60

5. Dissertation

For carrying out the dissertation, it is mandatory to strictly adhering to the rules of the college as given below:

5.1. Requirement

Every student is expected to give two seminars one concerning Review of Related Literature within the four weeks from the beginning of the second semester and the other on Data Analysis/Result/Mid Term Review just before the submission of the final draft of the dissertation

5.2. Submission

Candidates shall submit the Dissertations to the Controller of Examinations **not earlier than five months but within six months** from the date of the start of the Semester –II. The above said time limit shall start from the 1st of the month which follows the month in which Semester - I examinations are conducted. If a candidate is not able to submit his/her Dissertation within the period stated above, he/she shall be given an extension time of **four** months in the first instance and another **four** months in the second instance with penalty fees. If a candidate does not submit his/her Dissertation even after the two extensions, his/her registration shall be treated as cancelled and he/she has to re-register for the course subject to the discretion of the Principal. However the candidate need not write once again the theory papers if he/she has already passed these papers.

At the time of Submission of Dissertation, the guide concerned should forward the marks for 90% as stated above to the COE in a sealed cover

5.3. All the M.Phil. Scholars (along with their Guides) have to submit at least one Research articles for publication, at the time of submitting the dissertation.

Departments (with the constituted Expert Committee) will scrutinize; select and recommend the best articles for a publication either in RETELL or in School-based Journals.

5.4. Requirement

For the valuation of dissertation it is mandatory to have passed in all the four courses. One external examiner and the Research Adviser shall value the Dissertation. The external examiner should be selected only from outside the college and shall be within the colleges affiliated to Bharathidasan University. In case of non-availability, the panel can include examiners from the other university/colleges in Tamil Nadu. The external examiner shall be selected from a panel of 3 experts suggested by the Research Adviser. However, the Controller of Examination may ask for another panel if he deems it necessary. Both the internal and external examiner will evaluate the Dissertation and allot the marks separately. However the *viva-voce* will be done by both of them. The average marks will be considered.

5.5. *Viva-Voce*

The external examiner who valued the Dissertation and the Research Adviser shall conduct the *Viva-Voce* for the candidate for a maximum of 100 marks. A Candidate shall be declared to have passed in *viva-voce* if he/she secures not less than 50% of the marks prescribed for Dissertation and 50% of the marks in the aggregate of the marks secured in *viva-voce* and Dissertation valuation. A student can undertake dissertation in the second semester whether or not he/she has passed the first semester.

6. Classification of Successful Candidates

6.1. The candidates who pass the Semester– I and Semester – II examinations in their first attempt shall be classified as follows:

S. No.	Total Marks secured in Semester – I and Semester–II Examinations	Classification
1.	80% and above in the case of Science Subjects & 75% and above in the case of Arts and Social Science Subjects	I Class with Distinction
2.	60% to 79% in the case of Science Subjects & 60 % to 74% in the case of Arts and Social Science Subjects	I Class
3.	50% to 59% in all the subjects	II Class

Note: Mathematics, Statistics and Computer Science/Application shall be treated as Science Subjects

6.2. Candidates who have failed in the courses may take the supplementary exams conducted by the COE immediately. Even then if they could not complete the course(s), they will be given two more chances only to appear for those courses along with the next batch scholars. The maximum duration for the completion of the M.Phil. Programme is 2 Years.

7. Attendance:

Daily attendance for 90 working days should be enforced for the students. Periodical report of a student to he guide concerned should be recorded in he register kept by the guide.

8. The Scholar must obtain 80% of attendance per semester in order to appear for the Semester Examinations/*Viva-Voce*.

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M.PHIL. COMPUTER SCIENCE COURSE PATTERN – 2015

Sem	Code	Title of the paper
	15MCS 101	Course – C1 : Professional Skills For Teaching – Learning
	15MCS 102	Course – C2 : Research Methodology
	15MCS 103	Course – C3 : Advanced Concepts in Computer Science
	15MCS 104A	Course – C4 : Artificial Intelligence & Expert Systems
	15MCS 104B	Course – C4 : Simulation and Modeling
	15MCS 104C	Course – C4 : Data Mining
	15MCS 104D	Course – C4 : Digital Image Processing
	15MCS 104E	Course – C4 : Neural Computing
	15MCS 104F	Course – C4 : Soft Computing
	15MCS 104G	Course – C4: Network Security
	15MCS 104H	Course – C4 : Cloud Computing
I	15MCS 104I	Course – C4 : Big Data Analytics and Management
	15MCS 104J	Course – C4 : Data Structures and Algorithms
	15MCS 104L	Course – C4 : Virtualisation & Cloud Computing
	15MCS 104M	Course – C4 : Artificial Neural Networks
	15MCS 104O	Course – C4 : Web Services
	15MCS 104P	Course – C4 : Security in Computing
	15MCS 104Q	Course – C4 : Psychology of Computer Programming
	15MCS 104R	Course – C4 : Parallel Processing
	15MCS 104S	Course – C4 : Data Mining Concepts and Techniques
	15MCS 104T	Course - C4 : Object Oriented Technology
	15MCS 104U	Course – C4 : Software Metrics
	15MCS 104V	Course – C4 : Grid Computing
II	15 MCS 205	Course – C5 : Dissertation

C1: PROFESSIONAL SKILLS FOR TEACHING – LEARNING

Objective: *To provide the basic skills required for carrying out the research in the field of computer science and information technology*

Unit – I: SOFT SKILLS

a) Communication skills: reading – writing – speaking – listening - Aids and blocks – interpersonal communication – effective communication
b) Behavioral skills – attitude – time management – leadership – team building
c) Lateral thinking – conventional teacher and lateral teacher – creativity and innovation
d) Facing interviews – different types of interviews – dress code – Do's and Don'ts – frequently asked questions – preparing a resume – mock interviews
e) Group dynamics – knowledge – leadership – thinking   – listening mock GDs

Unit – II : LATEX

The Basics -The Document – Bibliography - Bibliographic Databases - Table of contents, Index and Glossary - Displayed Text - Rows and Columns - Typesetting Mathematics - Typesetting - Theorems - Several Kinds of Boxes – Floats - Cross References in LATEX - Footnotes, Margin pars, and Endnotes

Unit – III: SPSS and MATLAB

SPSS: A first look at SPSS 160 - Tables and Graphs for One Variable - Tables and Graphs for Two Variables - One Variable Descriptive Statistics- Two Variable Descriptive Statistics- Analysis of Variance II - Linear Regression I - Linear Regression II - Multiple Regression – One Sample Hypothesis Tests – Two Sample Hypothesis Tests.

MATLAB: Introduction to MATLAB programming – Selection statements – loop statements – vectorized code String Manipulation – File Input and output – Advance functions – Advance plotting functions – Matrix representations – Basis statistics ,sets, sorting and indexing,-Advance mathematics

Unit – IV:

(Computer practical session and Lesson preparation for teaching) Problem solving – Data structures and Algorithms

Unit – V: TEACHING PRACTICE

Programming languages – Database Management Systems – Computer Networks – Software Engineering – Computer Organization and Architecture – Internet concepts – Operating Systems etc.,

Book(s) for Study:

Unit I

1. Prof. G. Ravindran, Dr. S.P.B. Elango and Dr. L. Arockiam, "Success through soft skills", IFCOT Publications, Tiruchirapalli.
2. Dr. K. Alex, "Soft Skills", S.Chand Company Ltd, Ne w Delhi, 2012.
3. Edward De Bono, "Lateral thinking", Penguin, 2009.
4. Francis Thamburaj, "Communication Soft skills for Professional Excellence", Grace Publication, 2007

Unit II

1. Krishnan. E, "Latex Tutorials: A Primer", Indian TEX Users Group, 2003.

Unit III

1. Stormy Attaway, "Matlab : A Practical Introduction to Programming and Problem Solving", Butterworth-Heinemann; 2nd Edition, 2011.

2. Robert H. Carver, Jane Gradwohl Nash, "Doing Data Analysis with SPSS Version 16", Cengage Learning, 4th Edition, 2009.

Book(s) for Reference:

1. "Leslie Lamport", "Latex: A Document Preparation System", 2nd Edition, Pearson education, 2007.
2. Rudra Pratap, "Getting Started with MATLAB: A Quick Introduction for Scientists and Engineers", Oxford University Press, USA, 2009.
3. SPSS Student Version 15.0: For Microsoft Windows XP or 2000, Inc. SPSS, Prentice Hall, 2007.

Web Reference:

1. http://en.wikibooks.org/wiki/LaTeX

C2 - RESEARCH METHODOLOGY

Objective: *To give knowledge on research types and thesis writing and to impart the basic concepts on formal languages and Automata, Logics and statistical analysis which are required for research.*

Unit – I
Thesis Writing

Research types – objectives and approaches – Literature Collection: Web browsing – Software tools -Writing review and journal articles - manuscript publication.

Planning a thesis - general format – page and chapter format – footnotes –tables and figures – references and appendices.

Unit – II: Analysis of algorithms:

The role of algorithm in computing - Insertion sort – Analyzing and designing algorithms - growth of functions – Introduction to NP –Completeness.

Unit – III: Formal Languages and Finite Automata:

Contextfree grammars – Derivation trees – Simplification of Context Free Grammars – Chomsky normal form – Greiback normal form – The pumping lemma for Context Free Languages.

Finite state systems - Basic definitions – Non deterministic finite automata – Finite automata with epsilon moves – Regular expressions – Applications of finite Automata. (Stress on theorem statement and problems only, no proof for theorems)

Unit – IV: Probability and Statistical Analysis:

Probability – Fail time data analysis – Hazard models – Conditional probability – Bayes rule – System reliability

Unit – V: Logics - Relations and Functions:

Propositions – Precedence rules for operators – Law s of equivalence – Natural deduction system: – Developing natural deduction system proof s

Relation properties –Matrix and Graph – Graph Notations for relations – Partition and covering - Equivalence relation – Compatibility relations—Partial ordering – Functions – components – Composition of function – Inverse functions –Binary and n – ary operations

Book(s) for Study:

1. Kothari C R, "Research Methodology – methods and techniques", Wishwa Prakashjan, New Delhi, 2nd Edition, 1999.
2. Berny H. Durston, M. Poole, "Thesis and Assignment writing", Wiley Eastern Ltd, ND, 1970.
3. Misra R P, "Research Methodology - A Hand Book", Concept publishing Company, New Delhi, 1988.
4. Ellis Horowitz and Sartaj Sahni, "Fundamentals o f Computer algorithms", Galgotia Publications, New Delhi, 2000.
5. Thomas. H. Cormen, Charles E. Leiserson, Ronald L. Rivest "Introduction to Algorithms", Prentice Hall of India, 1998.
6. John E. Hopcroft, Jeffery D. Ullman, "Introduction to Automata Theory Language and Computation", Narosa Publishing House, 1979.
7. L.S. Srinath, "Reliability engineering", Affliated East. West Press Pvt. Ltd., New Delhi, Third Edition, 2005.
8. E. BalaGurusamy, "Reliability Engineering", Tata McGraw Hill Publishing Ltd, New Delhi, 2003.
9. David Gries, "The Science of Programming", Narosa Publishing House, 1981.
10. Leon S. Levy, "Discrete Structures of Computer Science", Wiley Eastern Ltd., 1980.

C3 - ADVANCED CONCEPTS IN COMPUTER SCIENCE

Objective: *To impart the knowledge on some of the advanced topics in Computer Science such as distributed databases, web technology, Network protocols for communication and security methodologies.*

Unit – I

Distributed Databases: Introduction - Distributed Database Architecture – Distributed Database Design - Distributed Transaction Management - Concurrency control – Distributed database management systems.

Unit – II

Web Technology - Introduction – Dynamic web pages – Active web page s – User sessions – On line security and payment processing mechanism – Middle ware and component based architectures – EDI – XML

Unit – III

Open System: File System Structure: History-system Structure- user perspective. Internal representation of files: inodes- structure of a regular file – directories-conversion of a path to an inode- super block-inode assignment to a new file-allocation of disk blocks. System calls for the file system: open-read-write-close-file creation-creation of special files-change directory, root, owner and mode-stat and fstat- pipes-dup-mounting and unmounting file systems-link and unlink.

Unit – IV

Communication Protocols: Overview – Protocols and architecture – Internet protocols – Inter-network operations – Transport protocols.

Unit – V

Network Security: Cryptography **-** Introduction -Submission Ciphers – Transposition Ciphers - One time pads – Cryptographic Principles – Symmetric Key Algorithms: DES - AES – Cipher Modes -Cryptanalysis –Public Key Algorithms – Digital Signatures: Symmetric Key Signatures – Public Key Signatures - Message Digests - The Birth Day Attack – Management of public keys: Certificates – X 509 - Public Key Infrastructure.

Book(s) for Study:

1. M. Tamer OZ Su and Patrick Valduriez, "Principl es of Distributed Database Systems", 2nd Edition, Prentice Hall International Inc. 1999.
2. Achyut S. Godbole, Atul Kahate, "Web Technologie s" , Tata McGraw Hill publishing Company, New Delhi, 2003.
3. Maurice J. Bach, "The Design of the UNIX Operating System", Prentice Hall of India Pvt. Ltd., New Delhi, 1998.
4. Andrew S Tanenbaum, "Computer Networks", Pearson Education, 4th Edition,   New Delhi, 2003.
5. William Stallings, "Cryptography and Network Security", Pearson Education,   New Delhi, 2006.

Web References:

1. http://plg.uwaterloo.ca/~itbowman/CS746G/a1/ - Conceptual Architecture of the Linux Kernel.

2. http://se.uwaterloo.ca/~mctanuan/cs746g/LinuxCA.html -An Introduction to the Linux Operating System Architecture

3. http://www.oopweb.com/OS/Documents/tlk/VolumeFrames.html - The Linux Kernel.

Online learning links

Paper-III: ADVANCED CONCEPTS IN COMPUTER SCIENCE

Unit I - Distributed Database Systems study materials and its links

http://kuponssystem.googlecode.com/files/Principles%20of%20Distributed%20Database%20Systems.pdf

https://www.cs.purdue.edu/homes/bb/cs542-06Spr/Introduction-ho.pdf

https://www.cs.purdue.edu/homes/bb/cs542-06Spr/Design-ho.pdf

https://www.cs.purdue.edu/homes/bb/cs542-06Spr/Query-ho.pdf

https://www.cs.purdue.edu/homes/bb/cs542-06Spr/Transaction-ho.pdf

https://www.cs.purdue.edu/homes/bb/cs542-06Spr/Parallel-ho.pdf

http://www.uio.no/studier/emner/matnat/ifi/INF5100/h11/undervisningsmateriale/distributed_dbs.pdf

http://codex.cs.yale.edu/avi/db-book/db4/slide-dir/ch19.ppt

https://www.youtube.com/watch?v=ZsqVp6qSmxI

https://www.youtube.com/watch?v=qMjCliHkdZk

https://www.youtube.com/watch?v=V7m2AKdASy8&list=PL723DDDD9219A5AF5

https://www.youtube.com/watch?v=e_pGyzJrmqU

Unit II – Web Technology

S. No	Topics	Type of Contents	Location
1	Web Technology	Video tutorial	https://www.youtube.com/watch?v=XHnrw-ANx40
2	Distributed Architecture	PPT	http://www.sjctni.edu/ Department/CS/ooc/architecture.ppt
3	Dynamic web pages – Active web pages	PPT	http://www.sjctni.edu/Department/CS/ooc/presentation.ppt
4	AJAX	Video tutorial	http://www.sjctni.edu/Department/CS/ooc/ajax.webm
5	On line payment processing mechanism –	Web Content	https://www.youtube.com/watch?v=bPpmhauual8
6	Middle ware and component based architectures	PPT & Sample codes	http://www.sjctni.edu/Department/CS/ooc/middleware.ppt http://www.sjctni.edu/Department/CS/ooc/ejb_examples
7	EDI	Web Content	https://www.youtube.com/watch?v=6UlXLpwAWHM
8	XML	PPT Code samples	http://www.sjctni.edu/Department/CS/ooc/xml.ppt http://www.sjctni.edu/Department/CS/ooc/xml_examples

Unit III – Open Systems

https://www.cs.drexel.edu/~spiros/teaching/SE101/slides/unix.pdf
http://avellano.fis.usal.es/~lalonso/amp_inf/unix.pdf
https://samlin.hackpad.com/My-Study-Notes-The-design-of-the-UNIX-operating-system-XZKzcRux3JA
http://www.tutorialspoint.com//unix_system_calls
http://www.scribd.com/doc/8013270/The-Design-of-the-Unix-Operating-System-by-Maurice-J-Bach#scribd
http://www.pallavan.edu.in/pdf/Question-bank-CSE/CS2028%20%20UNIX%20Internals.pdf
https://www.classle.net/content-page/unix-internals-question-bank
https://www.vidyarthiplus.com/vp/attachment.php?aid=27370
http://www.sanfoundry.com/technical-interview-questions
https://www.youtube.com/watch?v=3DA1grSp4mU
http://www.doc.ic.ac.uk/~wjk/UnixIntro/index.html

Unit IV

Communication Protocols-Overview:

1. **PPT:** www.etidweb.tamu.edu/classes/entc435/01-Overview.ppt
2. **Video:** www.youtube.com/watch?v=QOIaBlbnPf8

Protocol and Architecture:
    PPT: www.etidweb.tamu.edu/classes/entc435/02-ProtocolArchitecture.ppt
Internet Protocols:
    PPT: www.etidweb.tamu.edu/classes/entc435/InternetProtocols.ppt
Internetworking operations:
    PPT: www.noppa.lut.fi/noppa/opintojakso/ct30a2002/luennot/luento5_extra2_draft.pptx
Transport Protocols:
    PPT: www.csie.ncnu.edu.tw/~ccyang/CSNetwork/Slides8e/20-TransportProtocols.ppt

Other related videos:

1. www.youtube.com/watch?v=Vdc8TCESIg8
2. www.youtube.com/watch?v=n_BPJnD1fl8
3. www.youtube.com/watch?v=77VVjODrJiQ
4. www.youtube.com/watch?v=M78kvjyMrA0
5. www.youtube.com/watch?v=vtEYQnv9HYw
6. www.youtube.com/watch?v=1owwzYqTX0Y
7. www.youtube.com/watch?v=lzEwQK_EgtA
8. www.youtube.com/watch?v=wAIT9q6-OT

Unit-V: Network Security – Introduction and Fundamentals
        William Stallings, Cryptography and Network Security 4/e
        *https://www.rivier.edu/faculty/.../CS553_ST7_Ch21-**NetworkSecurity**.pp.*.
        www.cise.ufl.edu/~nemo/crypto/**stallings**/ch01_overview_nemo.**ppt**

Public Key Cryptography and the. RSA Algorithm.
        *www.cs.binghamton.edu/~steflik/cs455/RSA.**ppt***
        Public Key Cryptography and the. RSA Algorithm. Cryptography and *Network Security*.
        by *William Stallings*. Lecture slides by Lawrie Brown.
        *www.cs.binghamton.edu/~steflik/cs455/**RSA**.**ppt***

Public Key *Cryptography* and the. *RSA Algorithm. Cryptography* and Network Security.
by William Stallings. Lecture slides by Lawrie Brown.
*mercury.webster.edu/aleshunas/COSC%205130/ch09.**ppt***
Public Key *Cryptography* and *RSA*. Every Egyptian received two ... some *algorithms* are
suitable for all uses, others are specific to one.
*https://engineering.purdue.edu/kak/compsec/NewLectures/Lecture12.**pdf***
To review the *RSA algorithm* for public-key *cryptography*. • To present the ... The *RSA
Algorithm*

Symmetric Key Cryptography
    Symmetric Encryption
    *www.cs.binghamton.edu/~steflik/cs455/**SymmetricEncryption**.ppt*
    Plaintext; *Encryption Algorithm*; Secret Key (known to sender and receiver); Ciphertext
    ... of *cryptographic algorithms*; provide secrecy and/or authentication services ....
    subsequently for *DES* and *AES*; have block and stream modes.
    Symmetric Key Cryptography
    *www.doc.ic.ac.uk/~mrh/430/03.**SymmetricKey**.ppt.pdf*
    Symmetric key *algorithms* also popular for file ... Triple-*DES*. ➢ *AES* (Rijndael).
    A Study of Encryption Algorithms AES, DES and RSA for ...
    *https://globaljournals.org/.../4-A-Study-of-**Encryption**-Algorithms.pdf*
    Encrypt techniques like *AES*, *DES* and RSA *algorithms* and compared their performance

Evaluation of performance of the Symmetric Key Algorithms ...
    *www.rroij.com/.../evaluation-of-performance-of-the-**symmetric**-key-**algo**...*

    Four most common and used symmetric key *algorithms*: *DES*, 3DES,*AES* and ...
    Keyword: *Cryptography*, *Symmetric*, *Encryption*, Decryption, *DES*, 3DES, *AES*, ...

Electronic Mail Security
    Cryptography and *Network Security* Chapter 15. Fourth Edition. by *William Stallings*.
    Lecture slides by Lawrie Brown. Chapter 15.ppt
    ece.uprm.edu/~noack/crypto/textslides/ch15.ppt

Web Security
    Cryptography and *Network Security* Chapter 17. Fourth Edition. by *William Stallings*.
    Lecture slides by Lawrie Brown. Chapter 17
    www.cisa.umbc.edu/courses/cmsc/487/spring07/slides/ch17.**ppt**

Introduction to Network Security PPT Presentation - YouTube
    www.youtube.com/watch?v=t3uzE8kDgo8
    Intentional attacks on computing resources and *networks* persist for a number of reasons
    Complexity
    *www.powershow.com/.../Introduction_to_**Network**_...*
    What is *Network Security*? ... **Network Security Powerpoint (PPT) Presentation ... -**
    www.youtube.com/watch?v=XFjw6vanxpM
    www.youtube.com/watch?v=16_IgpSfjuA

C4 - ARTIFICIAL INTELLIGENCE & EXPERT SYSTEMS

Prof. D. S. RAVI

Objective: *To gain basic knowledge about AI, knowledge representation techniques and Expert system development to enable students to pursue research.*

Unit – I
Artificial Intelligence:
AI problem – AI technique – level of the model – defining the problem – production systems – production system characteristics – Heuristic search techniques.

Unit – II
Knowledge Representation:
Representations and Mappings – issues in knowledge representation – predicate logic – representing knowledge using rules – symbolic reasoning under uncertainity.

Unit – III
Natural language processing:
Syntactic processing – semantic analysis – parallel and distributed AI – learning – learning in problem solving – explanation – based learning – discovery – analogy – formal learning theory.

Unit – IV Expert
Systems:
Introduction – architecture of expert systems – knowledge representation – decomposition / Hierarchy of knowledge – augmented transition networks – semantic analysis of knowledge.

Unit – V
Knowledge Base and chaining functions: Modeling of uncertain reasoning – coherence of knowledge base – reductions of sets of rules – syntactic semantic analysis discursive grammar – the semiotic square – analyse achantieue narrative grammar – applications of semiotic theory of artificial intelligence.

Book(s) for Study:
1. Elaine Rich and Kevin Knight, "Artificial Intelligence", Tata Mc-Graw Hill Edition, 2nd Edition,1995

2. Eugene charniat and Drew McDermot, "Introduction to Artificial Intelligence", Addison Wesley, 1985.

3. Jean-Louis Ermine, "Expert Systems Theory and Practice", Prentice-Hall of India Pvt. Ltd., 2001.

C4 - SIMULATION AND MODELING

Prof. D. S. RAVI

Objective: *To provide knowledge about modeling random number generation and discrete system design which will enable the student to do research.*

Unit – I
Introduction to Simulation:
Advantages and Disadvantages of Simulation – Types of Models – Simulation of Queuing Systems – Other Examples of Simulation – Concepts in Discrete – Event Simulation – List Processing – History of Simulation Software – Simulation Packages – Trends in Simulation Software.

Unit – II
Statistical Models in Simulation:
Continuous Distributions – Empirical Distributions – Characteristics of Queueing Systems – Long-Run Measures of Performance of Queueing Systems – Steady-State Behaviour of finite – Population Models – Networks of Queues.

Unit – III
Random - Number Generation:
Properties of Random Numbers – Techniques for Generating Random Numbers – Tests for Random Numbers – Inverse Transform Technique – Dire ct Transformation for the Normal and Lognormal Distributions – Convolution Method – Acceptance – Rejection Technique.

Unit – IV
Input Modeling:
Data Collection: Parameter Estimation – Goodness-of-Fit Tests – Selecting Input Models without Data – Multivariate and Time-Series Input Models – Model Building, Verification and Validation – Calibration and Validation of Models – Types of Simulations with Respect to Output Analysis – Output Analysis for Terminating Simulations – Output Analysis for Steady – State Simulations.

Unit – V
Comparison of Two System Designs:
Metamodeling – Optimization via Simulation – Manufacturing and Material Handling Simulations – Issues in Manufacturing and Material Handling Simulations – Simulation Tools – Model Input – High-Level Computer-System Simulation – CPU Simulation – Memory Simulation.

Book(s) for Study:
1. Jerry Banks, John S. Carson, II, Barry L. Nelson, David M. Nicol, "Discrete – Event System Simulation", Pearson Education International Series in Industrial and Systems Engineering, Third Edition, 2001.
2. Robert E. Shannon, "Systems Simulation, the Art and Science", Prentice Hall Inc., 1975.
3. Narsing Deo, "System Simulation with Digital Computer", Prentice Hall of India Inc., New Delhi, 1996.
4. Geoffery Gordon, "System Simulations", Prentice Hal l of India Inc., New Delhi, Second Edition, 1992.
5. Avriell M. Law, W.David Kelton, "Simulation Mode ling Analysis", McGraw-Hill International Editions, Second Edition, 1991.

C4 - DATA MINING

Prof. D. P. JEYAPALAN

Objective: *To understand the basic techniques of data Mining and to introduce certain areas of applications of the same and to introduce research issues.*

Unit – I
Introduction to Data Mining:
Functionalities – Classification of Data Mining Systems – Data Warehouse and OLAP Technology for Data Mining – Data models – Warehousing Architecture, Implementation – Data Cube Technology

Unit – II
Data Processing:
Cleaning: Integration and Transformation – Reduction – Descre tization and Concept Hierarchy Generation – Data Mining Primitives, Lang uages and System Architectures – Query Language.

Unit – III
Concept description:
Characterization And Comparison – Analytical Characterization – Mining Class Comparison – Descriptive Statistical Measures In Large Databases – Association Rule Mining – Mining Single Level And Multilevel Association Rules From Transaction Databases And Relational Databases – Moving To Correlation Analysis – Constraint Based Mining**.**

Unit – IV
Classification and prediction:
Decision tree induction – Bayesian Classification – Classification by Back propagation - other Classification Methods – Classifier Accuracy – Cluster Analysis – Partitioning Methods – Hierarchical Methods – Density-Based Methods – Grid-Based Methods – Outlier Analysis

Unit – V
Multidimensional analysis and descriptive mining of complex data objects:
Mining Spatial Databases, Multimedia Databases, Time-Series and Sequence Data, Text Databases and WWW - Data Mining Applications – Products And Research Prototypes – Social Impacts And Trends In Data Mining

Book(s) for Study:
1. Jiawei Han and Micheline Kamber, "Data Mining: Concepts and Techniques", Morgan Kaufman Publishers (Elsevier Science), 2001, (ISBN: 81-7867-023-2)

Book(s) for Reference:
1. Michael J.A. Berry, Gordon S. Linoff, "Data Mining Techniques", John Wiley & Sons, 1997.
2. David J. Hand, Heikki Mannila, Padhraic Smyth, " Principles of Data Mining", Massachusetts Institute of Technology, 2001.

C4 - DIGITAL IMAGE PROCESSING
Prof. D.P. JEYAPALAN

Objective: *To make the students understand the fundamental issues of Digital Image Processing so that they can read and understand the research articles and work further in Digital Image Processing*

Unit – I :
Introduction:
The origins of Image Processing – Fundamental steps in DIP – components of Image Processing System. Digital Image Fundamentals: Elements of Visual Perception – Light and the Electromagnetic Spectrum – Image Sensing and Acquisition – Image Sampling and Quantization – Basic Relationship Between Pixels – Linear and Nonlinear operations.

Unit – II
Image Enhancement in the Spatial Domain:
Basic Gray Level Transformations – Histogram Processing – Enhancement Using Arithmetic/Logic Spatial Filters – Combining Spatial Enhancement Methods. Image Enhancement in the Frequency Domain: Fourier Transform and the Frequency Domain – Smoothing Frequency – domain Filters – Sharpening Frequency Domain Filters – Sharpening Frequency Domain Filters – Homomorphic Filtering – Implementation.

Unit – III
Image Restoration:
Model of the Image Degradation/Restoration Process – Noise Models – Restoration in the Presence of Noise Only – Spatial Filtering – Periodic Noise Reduction by Frequency Domain Filtering – Linear, Position-Invariant Degradations – Estimating the Degradations – Estimating the Degradation Function – Inverse Filtering – Minimum Mean Square Error Filtering – Constrained Least Squares Filtering – Geometric Mean Filter – Geometric Transformations. Color Image Processing – Color Models – Color Transformations – Smoothing and Sharpening – Color Segmentation – Noise in Color Images – Compression.

Unit – IV
Wavelets and Multi-resolution Processing:
Background – Multi-resolution Expansions – Wavelet Transforms in One Dimension – The Fast Wavelet Transform – Wavelet Transform in Two Dimensions – Wavelet Packets. Image Compression: Fundamentals – Image Compression Models – Elements of Information Theory – Error-Free Compression – Lossy compression – Image Compression Standards. Morphological Image Processing: Dilation and Erosion – The Hit-or-Miss Transformation – Algorithms – Extensions to Gray-Scale Images.

Unit – V
Image Segmentation:
Detection of Discontinuities – Edge Linking and Boundary Detection – Thresholding – Region-Based Segmentation – Segmentation by Morphological Watersheds – The Use of Motion in Segmentation. Representation and Description: Representations – Boundary Descriptors – Regional Descriptors – Use of Principal Components of Description – Relational Descriptors. Object Recognition: Patterns and Pattern Classes – Recognition Based on Decision – Theoretic Methods – Structural Methods.

Book(s) for Study:
1. Rafael C. Gonzalez and Richard E. Woods, "Digital Image Processing", Pearson Education, New Delhi, Second Edition, 2002.
Book(s) for Reference:
1. Anil K.Jain "Fundamentals of Digital Image Processing", Pearson 2002.

C4 - NEURAL COMPUTING

Prof. A. CHARLES

Objective: *To give strong foundation of neural computing in the form of network structure, algorithm and uses of different models and further stimulating to use these concepts to problem solving, applications and research.*

Unit - I
Characteristics of biological Neuron:

Models of neuron –Terminology – Training of ANN – Preceptron – Preceptron learning – Training algorithms.

Unit – II
Back Propagation network:

Training algorithms – Applications Caveats –XOR function- Delta learning rule – Counter Propagation Networks – Normal operation of CPN – Training of Kohonen and Gross berg layers – data compression.

Unit – III Statistical
methods:

Training applications – general non-linear optimization problems – Boltzmann and Cauchy Training. Recurrent networks- Hop field net – applications.

Unit – IV
Bi Directional associative memory (BAM):

Structure - retrieving a stored association – encoding the associations – memory capacity - continuous, adaptive and competitive BAM. Adaptive Resonance Theory – architecture – characteristics – implementation – training example .

Unit – V
Optical neural networks:

Vector – matrix multipliers – Holographic correlators - Cognition and neocognition.

Book(s) for Study:

1. Philip D. Wassermann "Neural Computing: Theory and Practice", Van Nostrand Reinhold, Newyork, 1989
2. James A. Freeman, "Neural networks: Algorithms Applications and programming Techniques", Pearson, New Delhi, 2007.

Book(s) for Reference:

1. Robert J. Schalkoff, "Artificial Neural Networks." McGraw Hill Book Company, Newyork, 1999.
2. Sathishkumar, "Neural Networks – a class room approach", Tata McGraw Hill, New Delhi, 2010.

C4 - SOFT COMPUTING

Prof. A. CHARLES

Objective: *To give the basic concepts of the various components of soft computing in the form of Neural Computing, Fuzzy Logic, evolutionary computing and artificial intelligence, and further stimulating to use combination of these concepts in their research, problem solving and applications.*

Unit – I
ARTIFICIAL NEURAL NETWORKS:

Basic concepts - Single layer perception - Multilayer Perception - Supervised and Unsupervised learning – Back propagation networks - Kohnen's self organizing networks - Hopfield network.

Unit – II
FUZZY SYSTEMS: Fuzzy sets and Fuzzy reasoning - Fuzzy matrices - Fuzzy functions - Decomposition - Fuzzy automata and languages - Fuzzy control methods - Fuzzy decision making.

Unit – III
NEURO - FUZZY MODELING:

Adaptive networks based Fuzzy interface systems - Classification and Regression Trees - Data clustering algorithms - Rule based structure identification - Neuro-Fuzzy controls - Simulated annealing.

Unit – IV
GENETIC ALGORITHMS:

Evolutionary computation. Survival of the Fittest - Fitness Computations - Crossover - Mutation - Reproduction - Rank method - Rank space method.

Unit – V
SOFT COMPUTING AND CONVENTIONAL AI:

AI search algorithm - Predicate calculus - Rules of inference – Semantic networks - Frames - Objects - Hybrid models - Applications.

Book for Study:
1   Jang J.S.R., Sun C.T. and Mizutani E, "Neuro-Fuzzy and Soft Computing", Prentice Hall, 1998.

Book(s) for Reference:
1.   Timothy J. Ross, "Fuzzy Logic with Engineering Applications", McGraw Hill, 1997.
2.   Laurene Fausett, "Fundamentals of Neural Networks", Prentice Hall, 1994.
3.   George J. Klir and Bo Yuan, "Fuzzy sets and Fuzzy Logic", Prentice Hall, USA 1995.
4.   Nih J. Nelsson, "Artificial Intelligence - A New Synthesis", Harcourt Asia Ltd., 1998.
5.   D.E. Goldberg, "Genetic Algorithms: Search, Optimization and Machine Learning", Addison Wesley, N.Y, 1989.

C4 - NETWORK SECURITY
Dr. S. ALBERT RABARA

Objective: *To understand the concepts of Computer Network Security and to study the Cryptographic techniques and procedures.*

Unit – I
Introduction:
Security Trends – The OSI Architecture – Security Attacks – Security Services – Security Mechanisms – A model for Network Security – Classic Encryption Techniques – Symmetric Cipher Model – Substitution Techniques – Transposition techniques – Rotor Machines – Stegnography.

Unit – II
Block Ciphers and Data Encryption Standards:
Block Cipher - Principles - Data Encryption Standard – The strength of DES – Differentila and Linear Cryptanalysis – Block Cipher design principles – Advanced encryption Standard – The AES Cipher

Unit - III
Public Key Encryption and Hash functions:
Principles of Public Key Crypto Systems – The RSA algorithm – Message Authentication – Authentication Requirements – Authentication Functions – Message Authentication codes – Hash Functions – Security of Hash Functions and MAC - Whirlpool – HMAC – CMAC – Digital Signatures – Authentication Protocols – Dig ital Signature standard

Unit - IV
Authentication Applications:
Kerberos – X.509 Authentication Service – PKI – Electronic Mail Security - Pretty Good Piracy – S/MIME – IP Security – IP Security Overview – IP Security Architecture – Authentication Header – Key Management – Web Security – Web Security Considerations- SSL and Transport Layer Security

Unit – V
System Security:
Intruders – Intrusion Detection – Password Management – Viruses – DOS and DDOS Attacks – Firewalls – Firewall Design Principles – Trusted Systems – IT Security Evaluation

Book for Study:
1. William Stallings, "Cryptography and network Security – Principles and Practices", Prentice Hall (Pearson Education), Fourth Edition, 2006

Book for References:
2. Atul Kahate, "Cryptography and Network Security", Tata MgGraw Hill Publications, New Delhi.

C4 – CLOUD COMPUTING

Dr. L. AROCKIAM

Objective: *To impart knowledge on the concepts of cloud computing, monitoring, management and applications of clouds*

Unit - I
Introduction to Cloud Computing:
Roots of Cloud Computing - Layers and Types of Cloud – Features of a cloud-Infrastructure Management-Cloud Services-Challenges and Risks. Migrating into a Cloud: Introduction - Broad Approaches – Seven Step Model. Integration as a Service-Integration Methodologies - SaaS.

Unit – II
Infrastructure as a Service:
Virtual Machines-Layered Architecture-Life Cycle-VM Provisioning Process- Provisioning and Migration Services. Management of Virtual Machines Infrastructure -Scheduling Techniques. Cluster as a service-RVWS Design-Logical Design. Cloud Storage - Data Security in cloud Storage- Technologies.

Unit - III
Platform and Software as a Service:
Integration of Public and Private Cloud- Techniques and tools-framework architecture-resource provisioning services - Hybrid Cloud. Cloud based solutions for business Applications- Dynamic ICT services-Importance of quality and Security in clouds-Dynamic Data center-case studies. Workflow Engine in the cloud – Architecture - Utilization. Scientific Applications for cloud – Issues – Classification – SAGA – Map Reduce Implementation.

Unit – IV
Monitoring and Management:
An Architecture for federated Cloud Computing – Use case –Principles – Model - Security Considerations. SLA Management - Traditional Approaches to SLO -Types of SLA - Lifecycle of SLA - Automated Policy. Performance Prediction of HPC-Grid and Cloud - HPC Performance related issues.

Unit - V Applications:
Best Practices in Architecting cloud applications in the AWS cloud - Massively multiplayer online Game hosting on cloud Resources - Building content delivery Networks using clouds-Resource cloud Mashups.

Book(S) for Study:
1. Rajkumar Buyya, James Broberg, and Andrzej Goscinski, "CLOUD COMPUTING Principles and Paradigms", John Wiley & Sons, Inc, 2011, ISBN:978-0-470-88799-8

Book(S) for Reference:
1. George Reese, "Cloud Application Architectures", O'Reilly Media, Inc, First Edition, 2009, ISBN: 8184047142.

2. Michael Miller, "Cloud Computing: Web based Applications That Change the Way You Work and Collaborate Online", QUE Publishing, 2009 , ISBN-15: 978-0-7897-3803-5 ISBN-10: 0-7897-3803-1.

C4 – BIG DATA ANALYTICS AND MANGEMENT

Dr. L. AROCKIAM

Objectives:
· *To give an insight to the trends in Big Data Analytics*
· *To help the scholars to implement innovative ideas using Hadoop*

Unit – I : Introduction to Big Data:
Definition – Characteristics – Importance of Big Data – Understanding the waves of managing data – Architecture of Big Data – Examining Big Data types – Integrating data types into a big data environment. Distributed Computing: Understanding Distributed Technologies foundation of computing – Need of Distributed Computing in Big Data.

Unit – II : Technologies Foundation of Big Data:
Big Data Technology Components: - Exploring the Big Data Stack – Big Data Analytics – Big Data Applications. Big Data Virtualization and Distributed Computing: Basics and importance of virtualization – Network virtualization – Data and Storage virtualization – Management and Security challenges with virtualization – Abstraction and Virtualization. Examining the Cloud and Big Data: Defining the cloud in the context of Big Data – Understanding cloud deployment and delivery models – Making use of the cloud for Big Data.

Unit – III : Big Data Management:
Operational Databases: RDBMS – Non Relational Databases – Key-value pair Databases – Riak-key Value Databases – Document Databases – Mongo DB- CouchDB – Columnar Databases – Graph Databases – Spatial Databases. Map Reduce Fundamentals – Exploring the world of Hadoop.

Unit – IV : Analytics and Big Data:
Using Big Data to get results – Basic Analytics – Advance Analytics – Operationalized Analytic – Modifying Business Intelligence products to handle Big Data. Analytical Algorithms – Big Data Analytics Solutions: Understand Text Analytics and Big Data – Text Analytics tools for Big Data – Building new models and approaches to support Big Data – Big Data Analytics Framework.

Unit – V : Big Data Implementation
Integrating Data Sources: Identifying the Data, Fundamentals of Big Data Integration – Defining Traditional ETL – Using Hadoop as ETL – Best Practices for Data Integration in a Big Data World.

Book for Study:
1. "Big Data for Dummies" by Judith Hurwitz, Alan Nugent, Dr,Ferm Halper, Marcia Kaufman, Wiley Publications, 2013.

Book(s) for Reference:
1. "Big Data Now" Current Perspectives from O' Reilly Media, 2012.
2. Big Data Analytics : Disruptive Technologies for Changing the game by Dr. Arvind Sathi, ISBN 978-1-58347-380-1.
3. Taming the Big Data Tidal wave – finding opportunities in huge data streams with advanced analytics – John willey & Sons, Inc – ISBN 978-1-118-20878-6.

C4 - DATA STRUCTURES AND ALGORITHMS

Prof. V. S. Joe Irudayaraj

Objective: *To empower the students with a detailed knowledge on data structures and to give an exposure to the design and development of algorithms*

Unit – I
Trees:

Operations on binary trees-tree search and insertion-tree deletion-Analysis of tree search and insertion-balanced tree insertion – balanced tree deletion-optimal search trees

Unit – II
Multi way trees and hashing:

B-trees-binary B-trees-choice of a transformation function-collision handling-analysis of key transformation.

Unit – III
Greedy Methods:

The general method-Knapsack problem-job sequencing with deadlines-minimum cost spanning tree-Optimal storage on tapes – optimal merge patterns.

Unit – IV
Dynamic Programming:

The general method-All-pairs shortest paths-single source shortest paths-optimal binary search trees-The traveling salesman problem-Flow shop scheduling

Unit – V
Back tracking:

The general method – the 8-queen problem-sum of sub sets-graph coloring-Hamiltonian cycles.

Book(s) for Study:
1. Niklaus Wirth, "Algorithms + Data structures = Programs", Prentice Hall of India Limited, New Delhi 2002. (Units I and II)
2. Ellis Horowitz and Sartaj Sahani, "Fundamentals of Computer Algorithms", Galgotia publications, New Delhi, 1985. (Units III,IV and V)

Book for Reference:
1. Jean-Paul Trembblay and Paul G Sorenson, "An Introduction to Data Structures with Appplications", Tata McGraw Hill Publishing Company   Limited, 2nd Edition, NewDelhi, 1995.

C4 - MOBILE AND PERVASIVE COMPUTING

Dr. D. Ravindran

Objective: *To understand the concepts of pervasive computing and learn the technologies for developing applications on mobile platforms .*

Unit – I:

Wireless networks- emerging technologies- Blue tooth, WiFi, WiMAX, 3G ,WATM.-Mobile IP protocols -WAP push architecture-WML scripts and applications.

Unit – II:

Mobile computing environment—functions-architecture -design considerations ,content architecture -CC/PP exchange protocol ,context manager. Data management in WAECoda file system- caching schemes- Mobility QOS. Security in mobile computing.

Unit – III\:

Handoff in wireless mobile networks-reference model-handoff schemes. Location management in cellular networks - Mobility models- location and tracking management schemes- time, movement ,profile and distance based update strategies. ALI technologies.

Unit – IV:

Pervasive Computing- Principles, Characteristics- interaction transparency, context aware, automated experience capture. Architecture for pervasive computing- Pervasive devices-embedded controls.- smart sensors and actuators -Context communication and access services

Unit – V:

Open protocols- Service discovery technologies- SDP, Jini, SLP, UpnP protocols–data synchronization- SyncML framework - Context aware mobile services -Context aware sensor networks, addressing and communications. Context aware security.

Book(s) for Study:

1. Ivan Stojmenovic , Handbook of Wireless Networks and Mobile Computing, John Wiley & sons Inc, Canada, 2002.
2. Asoke K Taukder,Roopa R Yavagal,Mobile Computing, Tata McGraw Hill Pub Co. , New Delhi, 2005.
3. Seng Loke, Context-Aware Computing Pervasive Systems, Auerbach Pub., New York, 2007.
4. Uwe Hansmannetl , Pervasive Computing, Springer, New York,2001.

C4 - VIRTUALISATION AND CLOUD COMPUTING

Dr. D. Ravindran

Objective: *To understand the basic concepts of Cloud computing, the infrastructure and the security aspects.*

UNIT – I: Introduction

Evolution of Cloud Computing –System Models for Distributed and Cloud Computing – NIST Cloud Computing Reference Architecture – Infra structure as a Service (IaaS) – Resource Virtualization – Platform as a Service (PaaS) – Cloud platform & Management – Software as a Service (SaaS) – Available Service Providers.

UNIT – II: Virtualization

Basics of virtualization - Types of Virtualization - Implementation Levels of Virtualization - Virtualization Structures - Tools and Mechanisms - Virtualization of CPU, Memory, I/O Devices - Desktop virtualization – Server Virtualization – Linux KVM, Xen, Qemu, LXC, OpenVZ

UNIT – III: Cloud Infrastructure

FOSS Cloud Software Environments -Eucalyptus, Open nebula, OpenStack – OpenStack Architecture – Compute, Object Storage, Image Service, Identity, Dashboard, Networking, Block Storage, Metering, Basic Cloud Orchestration and Service Definition**.**

UNIT – IV: Programming Model

Parallel and Distributed programming Paradigms – MapReduce , Twister and Iterative MapReduce – Mapping Applications - Programming Support – Apache Hadoop – HDFS, Hadoop I/O, Hadoop configuration, MapReduce on Hadoop.

UNIT – V: Security in the Cloud

Security Overview – Cloud Security Challenges – Software-as-a-Service Security – Security Governance – Risk Management – Security Monitoring – Security Architecture Design – Data Security – Application Security – Virtual Machine Security – Qubes – Desktop security through Virtualization

Book(s) for Study:

1. Kai Hwang, Geoffrey C Fox, Jack G Dongarra, "Distributed and Cloud Computing, From Parallel Processing to the Internet of Things", Morgan Kaufmann Publishers, 2012.
2. John W.Rittinghouse and James F.Ransome "Cloud Computing: Implementation, Management, and Security", CRC Press, 2010

C4 - ARTIFICIAL NEURAL NETWORKS

Rev. Fr. FRANCIS THAMBURAJ

Objective: *To introduce some of the fundamental techniques and principles of neural network systems and investigate some common models and their applications.*

Unit – I:
Introduction:

Definition, fundamental concepts, applications, advantages and disadvantages, classifications, biological neural network, Artificial neural structure, activation function, adding bias, perceptron, MLP

Unit – II:
Feed forward ANNs:

Structure, delta rule, architecture and training, radial basis function, cognitron, neocognitron

Unit – III:
Attractor ANNs:

Associative learning, Attractor NN, Linear associative memory, hopfield network, content addressable memory, simulated annealing, Boltzman machine, Bidirectional associative memory

Unit – IV:
Unsupervised ANNs:

Clustering procedures, c-means algorithm, learning vector quantization, maxnet,self-organizing feature maps, Adaptive resonance architecture, ART1, ART2

Unit – V:
Soft Computing:

Spiking Neuron model, linguistic processing, Uncertainty, Fuzzy sets, membership functions, geometry of fuzzy sets, fuzzy operations, fuzzy rules for approximate reasoning, genetic algorithm, neural network and fuzzy logic

Book(s) for Study:

1.   Robert J. Schalkoff, Artificial neural networks, McGraw-Hill, New Delhi, 1997.

2.   Haykin Simon, Neural Networks: A comprehensive foundation, 2nd edition, Addison Wesley, Singapore, 2001

3.   Freeman A. James and Skapura M. David, Neural Networks: Algorithms, Applications, and programming techniques, Addison-weslwy longman, California, 1999.

C4- OBJECT ORIENTED SOFTWARE METRICS

Rev. Fr. Francis Thamburaj SJ

Objectives: To impart knowledge on software measurement, metrics, and internal, external attributes of data to achieve qualitatively better software products.

UNIT I: Introduction:
Definition, importance, scope, types, scales, meaningfulness and validation of measurement – Goal-Question-Metric approach and Process Maturity levels – Good data, failures, faults, changes – Data Analysis Techniques: Nature of data, Box plots, Scatter plots, Control charts, Measures of association, Robust correlation, Linear regression, Robust regression, Multivariate regression, Classification tree analysis, Transformations, Multivariate data analysis

UNIT II : Data Attributes:
INTERNAL Attributes: Size, Length, Reuse, Functionality: Function Point analysis, COCOMO, DeMarco's approach, Complexity – Structural Measures: Control-flow, Modularity and Information flow: Models, Global modularity, Morphology, Tree impurity, Internal reuse, Coupling, Cohesion, Information flow – EXTERNAL Attributes: SW Quality Models, Measuring Aspects of Quality based on Defects, Usability, Maintainability

UNIT III : Moose, Emoose Metrics:
Weyuker's properties of software metrics – Abreu's criteria for object-oriented metrics – MOOSE Metrics: Weighted Methods per Class, Depth of Inheritance Tree, Number of Children, Coupling Between Object classes, Response For a Class, Lack of Cohesion of Methods – EMOOSE Metrics: Message Pass Coupling, Data Abstraction Coupling, Number of Methods, Size1, Size2 – SATC Metrics: Line of Code for OO paradigm, Comment Percentage for OO paradigm, Cyclomatic for OO paradigm.

UNIT IV : OO Metricsets:
MOOD Metrics: AHF, MHF, MIF, AIF, POF, CF, AHEF, OHEF, PPF – QMOOD Metrics: Average Number of Ancestors, Cohesion Among Methods of class, Class Inheritance Size, Data Access Metric, Direct Class Coupling, Measure Of Aggregation, Measure of Functional Abstraction, Number of Polymorphic methods, Design Size of Class, Number Of class Hierarchies, Number Of Methods. LK Set: Method Size, Method Internals, Class Size, Class Inheritance, Class Internals, Class External,– LI& HENRY Set: NAC, NLM, CMC, NDC, CTA, CTM.

UNIT V: Cognitive Complexity Metrics:
Cognitive complexity – Rationale for Cognitive Complexity Metrics – Basic Control Structures – Cognitive complexity metrics for object-oriented paradigm: Class Complexity, Weighted Class Complexity, Extended Weighted Class Complexity, Class Complexity due to Inheritance, Average Complexity of a program due to Inheritance, Weighted Composite Complexity metric, Attribute Weighted Class Complexity, Cognitive Weighted Response For a Class, Cognitive Weighted Coupling Between Objects.

Book & Articles for Study:

1. Orman E. Fenton and Shari Lawrence Pfleeger, "Software Metrics: A Rigorous and Practical Approach", PWS Publishing Company, USA, 3nd Ed., 2014.
2. Aloysius A.,"A Cognitive Complexity Metrics Suite for Object Oriented Design", PhD Thesis,2012.
3. Bansiya and C.G. Davis, "A Hierarchical Model for Object-Oriented Design Quality Assessment", IEEE Transactions on Software Engineering, Vol. 28, No. 1, 2002.
4. W. Li, "Another Metric Suite for Object Oriented Programming", The Journal of Systems and Software, Vol. 44, No. 2, pp. 155-162, 1998.
5. F. B. Abreu, "The MOOD Metrics Set", In Proc. ECOOP'95, Workshop on Metrics, 1995.
6. Lorenz. M and Kidd. J, "Object Oriented Software Metrics", Prentice Hall Inc, USA, 1994.
7. Chidamber R. Shyam and Kemerer F. Chris, "A Metrics Suite for Object Oriented Design", IEEE Tr. Software Engineering, Vol.20, No.6, 1994.

C4 – WEB SERVICES

Dr. S. Britto Ramesh Kumar

Objective: *To understand the basic standards and technologies of web services including security and QoS.*

Unit – I:
Introduction:
Concepts of Web services - SOAP WSDL UDDI- Importance of web services – Evolution of web applications - Distributed computing platform – Web services and enterprises.

Unit – II: Basic Web Services Standards, Technologies, and Concepts:
XML Fundamentals- XML : The Lingua Franca of Web Services - XML Documents - XML Namespaces - XML Schema - Processing XML. **SOAP and WSDL:** The SOAP Model - SOAP - SOAP Messages - SOAP Encoding - SOAP RPC - Using Alternative SOAP Encodings - Document, RPC, Literal, Encoded SOAP , Web Services, and the REST Architecture - WSDL Using SOAP and WSDL. **UDDI:** UDDI at a Glance - The UDDI Business Registry - UDDI Under the Covers - Accessing UDDI.

Unit – III: Advanced Web Services Technologies and Standards:
Conversations- Overview - Web Services Conversation Language - WSCL Interface Components - The Bar Scenario Conversation - Relationship Between WSCL and WSDL. **Workflow:** Business Process Management - Workflows and Workflow Management Systems – BPEL for Web Services - BPEL 1.1 and OASI S WSBPEL - BPEL and Its Relation to BPML, WSCI, WSFL, Xlang, and Others. **Transactions:** ACID Transactions - Distributed Transactions and Two-Phase Commit - Dealing with Heuristic Outcomes - Scaling Transactions to Web Services - OASIS Business Transaction Protocol - Other Web Services Transaction Protocols.

Unit – IV: WS-Security and QoS:
Security Basics - Security Is An End-to-End Process - Web Service Security Issues - Types of Security Attacks and Threats - Web Services Security Roadmap - WS-Security. **Quality of Service:** Meaning – Importance for Web Services - QoS Metrics for WS - Design Patterns and Best Practices - Building QoS into Web Services and Applications - QoS-Enabled Web Services - QoS-Enabled Applications.

Unit – V: Building Enterprise Web Services and Applications:
Mobile Web Services - Challenges with Mobile - Proxy-Based Mobile Systems - Direct Mobile Web Service Access - J2ME Web Services. **Web Service Application Development—Foundations:** Enterprise Procurement - System Functionality and Architecture - Running the EPS Application - System Implementation - **WS Development— Advanced Technologies:** Building Evolvable and Composable Workflows - Adding Transaction Support - Programming for Mobility - Securing the Application.

Book for Study:
1. Sandeep Chatterjee, James Webber, "Developing Enterprise Web Services - An Architect's Guide", Prentice Hall PTR, 2003.

Book(s) for Reference:
1. Eric Newcomer, Greg Lomow, "Understanding SOA with Web Services", Pearson Education, First Indian Reprint, 2005.
2. Ron Schmelzer et al, "XML and Web Services", Pearson Education, 2002.
3. Ethan Cerami, "Web Services Essentials", O'Reilly, First Edition February 2002.

C4 - SECURITY IN COMPUTING

Dr. A. Aloysius

Objective: *To give overall security aspects of database, network and operating system with various protection mechanism.*

Unit – I
Security Problem in Computing:
Protecting variables – Characteristics of computer intrusion – Attacks - Security goals – Vulnerabilities- Computer criminals – methods of defense- Elements of cryptography : Terminology and background – Substitution ciphers – Transpositions – Encryption algorithms – Data encryption standard - AES encrypt ion algorithm – uses of encryption

Unit – II
Program Security:
Secure program - Non Malicious program errors – Virus and other malicious code – controls against program threads - – Protection in general purpose operating system: protected objects and methods of protection - Memory and address protection – control of access to general objects – file protection mechanism -user authentications

Unit – III
Designing Trusted Operating System:
Security policy – Models of security – Trusted OS Design - Assurance in trusted OS - implementation - Database security

Unit – IV
Security in Networks:
NT concepts – Threads in NT – Network Security controls – firewalls - Intrusion detection system – Secure Email– Administering security: Security planning – Risk analysis – Organisation security policies – Physical security

Unit – V
Legal, Privacy and Ethical Issues in Computer Security:
Protecting programs and data – Information of Computer objects –Rights of employees and Employeers- Software failure – Computer crime – Privacy - Ethical issues in Computer Security- Cryptography: Mathematics for Cryptography – Symmetric encryption – Public key encryption system – Quantum Cryptographic results.

Book for Study:
1. Charles P.Pfleeger and Shari Lawrence Pfleeger, "Security in Computing", Second Edition, Pearson Education (Singapore) Pvt. Ltd, 2004.

Book(s) for Reference:
1. Eric Maiwald, "Network Security a Beginner's Guide", Second Edition, Tata-Mcgraw Hill Publication Ltd., New Delhi, 2003.
2 Atul Kahate, "Cryptography and Network Security", Tata-Mcgraw Hill Publication Ltd., New Delhi, 2003.

C4 - PSYCHOLOGY OF COMPUTER PROGRAMMING

Dr. A. Aloysius

Objective: *To introduce the basic Psychology of Computer Programming and the various programming Tools.*

Unit – I
Programming as Human Performance:
Reading Programs: An example – Machine Limitations – Language Limitations – Programmer Limitations – Historical Traces – Specifications – Making a Good Program: Specifications – Schedule – Adaptability – Efficiency – Study of Programming: Introspection
– Observation – Experiment – Psychological Measurement – Using Behavioral Science Data.

Unit – II
Programming as a Social Activity:
The Programming Group: Formal and Informal Organization – Physical Environment and Social Organization – Error and Ego – Ego less Programming – Creating and Maintaining the Programming Environment – The Programming Team: Tea m Forms – Establishing and Accepting Goals – Team Leadership and Team Leaders – The team in Crisis – The Programming Project: Stability through Change – Measuring Performance – Project Structure
– Common Social Problems of Large Projects.

Unit – III
Programming as an Individual Activity:
Variations in the Programming Task: Professional Versus Amateur Programming – The programmer is trying to do – Stages of programming work – Personality Factors: Personality Changes – Personality Invariants – Critical Personality traits – Personality Testing – Personality Testing of Programmers.

Unit – IV
Intelligence, or Problem-Solving Ability: Psychological Set – Some Dimensions of Problem Solving – Facets of Programming Intelligences – Aptitude Tests – Aptitude Tests for Programming – Motivation, Training, and Experience: Motivation – Training, Schooling, and Education – Forces against Learning – Learning Program.

Unit – V
Programming Tools:
Programming Languages: Programming Language and Natural Language – Programming Language Design – Some Principles for Programming Language Design: Uniformly – Compactness – Locality and Linearity – Tradition and Innovation – Special-Purpose, Multipurpose, and Toy Languages – Other Programming Tools: Program Testing Tools – Operating Systems – Time Sharing Versus Batch – Documentation.

Book(S) for Study:
1. Gerald M. Weinberg, "The Psychology of Computer Programming", Dorest House Publishing, New York.

C4 - PARALLEL PROCESSING

Dr. S. Charles

Objectives: *To impart Knowledge on some advanced topics in parallel architectures, processing and programming paradigms*

Unit – I: Parallel Programming Platforms:

Motivating Parallelism -Implicit Parallelism: Trends in Microprocessor Architectures - Limitations of Memory System Performance Dichotomy of Parallel Computing Platforms - Communication Model of Parallel Platforms - Physical Organization of Parallel Platforms - Communication Costs in Parallel Machines. Principles of Parallel Algorithm Design: Introduction to Parallel Algorithm Design - Decomposition Techniques - Characteristics of Tasks and Interactions - Mapping Techniques for Load Balancing - Methods for Containing Interaction Overheads - Parallel Algorithm Models Analytical Modeling of Parallel Programs : Performance Metrics for Parallel Systems - Effect of Granularity and Data Mapping on Performance - Scalability of Parallel Systems - Minimum Execution Time and Minimum Cost-Optimal Execution Time

Unit – II: Parallel Programming:

Programming Shared Address Space Platforms. Thread Basics -Why Threads -The POSIX Thread Application Programmer Interface - Synchronization Primitives in POSIX - Controlling Thread and Synchronization Attributes - Composite Synchronization Constructs - Tips for Designing Asynchronous Programs - OpenMP: A Standard for Directive Based Parallel – Programming

Unit – III: Programming Message Passing Platforms:

Message Passing Interface (MPI) Basics - Topologies and Embedding - Overlapping Communication with Computation - Collective Communication and Computation Operations - Groups and Communicators - Parallel Algorithms And Applications : Dense Matrix Algorithms - Mapping Matrices onto Processors - Matrix Transposition - Matrix-Vector Multiplication - Matrix Multiplication - Solving a System of Linear Equations

Unit – IV: Sorting:

Issues in Sorting on Parallel Computers -Sorting Networks -Bubble Sort and its Variants – Quicksort - Other Sorting Algorithms. Graph Algorithms: Definitions and Representation - Minimum Spanning Tree: Prim's Algorithm Single-Source Shortest Paths: Dijkstra's Algorithm - All-Pairs Shortest Paths Transitive Closure - Connected Components - Algorithms for Sparse Graphs.

Unit – V: Discrete Optimization Problems:

Sequential Search Algorithms - Search Overhead Factor - Parallel Depth-First Search - Parallel Best-First Search - Speedup Anomalies in Parallel Search Algorithms. Dynamic Programming: Serial Monadic DP Formulations - Nonserial Monadic DP Formulations - Serial Polyadic DP Formulations Nonserial Polyadic DP Formulations

Book for Study:

1. Ananth Grama, George Karypis, Vipin Kumar, Anshul Gupta, "Introduction to Parallel Computing"2 [nd] edition, Addison Wesley , Pearson Education, 2003.

Book for Reference:

1. Michael J Quinn, "Parallel Computing, Theory and Practice", McGraw Hill International Edn. Singapore, 1994

C4 – DATA MINING CONCEPTS AND TECHNIQUES

Prof. S. Charles

Objective: *To understand the basic concepts, tasks, methods and techniques in data mining.*

Unit – I
Introduction:
Data Mining – Data Mining Functionalities – Classification of Data Mining Systems – Data Mining Task Primitives – Integration of a Data Mining System with a Database or Data Warehouse System – Major Issues in Data Mining.

Unit – II
Data Preprocessing:
Descriptive Data Summarization – Data Cleaning – Data Integration and Transformation – Data Reduction – Data Discretization and Concept Hierarchy Generation.

Unit – III
Mining Frequent Patterns, Associations, and Correlations:
Basic Concepts and a Road Map – Efficient and Scalable Frequent Itemset Mining Methods – Mining Various Kinds of Association Rules – From Association Mining to Correlation Analysis – Constraint-Based Association Mining.

Unit – IV
Classification and Prediction:
Issues Regarding Classification and Prediction – Classification by Decision Tree Induction – Bayesian Classification – Rule-Based Classification – Classification by Backpropagation – Support Vector Machines –Other Classification Methods

Unit – V
Cluster Analysis:
Cluster Analysis – Types of Data in Cluster Analysis – A Categorization of Major Clustering Methods – Partitioning Methods – Hierarchical Methods – Density-Based Methods – Grid-Based Methods – Model-Based Clustering Methods – Clustering High-Dimensional Data – Constraint-Based Cluster Analysis – Outlier Analysis.

Book for Study:

1. Han. J, Kamber. M, "Data Mining: Concepts and Techniques", Morgan Kaufmann Publishers, 2nd Edition, 2006.

Book(s) for Reference:

1. Michael J.A. Berry, Gordon S. Linoff, "Data Mini ng Techniques", John Wiley & Sons, 1997.
2. David J. Hand, Heikki Mannila, Padhraic Smyth, " Principles of Data Mining Mining", Massachusetts Institute of Technology, 2001.

C4 -OBJECT ORIENTED TECHNOLOGY

Prof. B. Gerlad Marvin

Objective: *To provide the fundamental concepts on object modeling and to give a deep knowledge on object oriented analysis and design.*

Unit – I:
Introduction to object oriented development:
Modeling as a design technique: Modeling - Object Modeling Techniques - Object Modeling: Objects and Classes - Links and Association - Advanced Link and Association Concepts - Generalization and Inheritance - Grouping Constructs - a sample Object Model - Advanced

Unit – II:
Object Modeling Techniques:

Aggregation - Abstract Classes - Generalization as extension and restriction - Multiple Inheritance – Meta data -Candidate Keys and Constraints. Events and States - Operations - Nested state diagrams - Concurrency - Advanced dynamic modeling concepts - A sample Dynamic model - Relation of object and Dynamic models - Functional Modeling : Functional Models - Data flow diagrams - Specifying operation - Constraints - A sample functional model - Relation of functional to Object and Dynamic Models.

Unit – III:
Analysis:
Overview of Analysis - Problem statement - Automated Teller Machine example - Object modeling -Dynamic Modeling - Functional Modeling - Adding Operations - Iterating the analysis.

Unit – IV:
System Design:
Overview of System Design - Breaking a System into Subsystems - Identifying Concurrency - Allocating subsystems to processes and tasks - Management of Data stores - Handling Boundary conditions - Setting Trade-off priorities- Common Architectural frameworks - Architecture of the ATM System.

Unit – V:
Object Design:
Overview of Object Design - Combining the three models -Designing algorithms -Design Optimization - Implementation of Control - Adjustment of Inheritance -Design of associations - Object Representations - Physical packaging - Documenting Design Decisions.

Book(S) for Study:

1   James Rumbaugh, Michael Blaha, William Premerlani, Fredrick Eddy, William Lorensen, "Object-Oriented Modelling and Design", Prentice Hall of India, New Delhi, 2001.

2   Grady Booch, "Object Oriented Analysis and Design with Applications", Addison-Wesley Publishing Company, New York, 2000.

SOFTWARE METRICS

Prof. K. Maheswaran

Objectives: *To impart knowledge on software measurement principles and practices in order to achieve quality in software products.*

1. Introduction   Measurement   in Software   Engineering -   The scope   of software Metrics -   The representational theory of measurement and models - Scales - Classification of software measures - Applying the frame work - Validation.

2. Principles of Investigation

   Planning formal experiments - Data collection - Storing and extracting. Analyzing the results of experiments - Simple analysis technique - Advanced methods - Statistical tests.

3. Measuring Internal Product Attributes   Aspects of Software size   - reuse, functionality and complexity - types   of structural measures - control flow   structure - modularity and information flow.   Difficulties in general complexity measures. Software quality models and measuring aspects.

4. Reliability Theory and Problems   Parametric models - predictive   accuracy - the   importance   of   operational   environments   - Software   reliability. Resources measurements - productivity - Making process predictions - Cost estimations - Effort and cost models - Current   estimation methods - implication for process prediction.

5. Object - Oriented Product Metrics Module metrics - size and logic metrics - Cognitive complexity model - Contingency model of programmer task - Application to Object - oriented systems.

Books for Study:

1. Noman E. Fenton and Shari Lawrence Pfleger, "Software Metrics", PWS publishing Company, USA, Second edition 1996.
2. Brian Henderson -   Sellers, " Object - oriented metrics - Measures of Complexity", Prentice Hall, New Jersy, 1996.

Books for Reference:

1. Lem O. Ejiogu, "Software Engineering with formal metrics", QED technical publishing group, Boston, 1991.
2. Daniel   Hoffman   and Paul Strooper, " Software   Design, Automated Testing   and Maintenance", International Thomson Computer Press, Boston,1995.
3. Stephen   H. Kan, "Metrics and models in Software Engineering", 2nd edition, Pearson   Education(Singapore), Pvt. Ltd., 2004.

C4 - GRID COMPUTING

Prof. T. Kokilavani

OBJECTIVE: *To understand the genecise of grid computing - To know the application of grid computing - To understanding the technology and tool kits to facilitated the grid computing*

Unit – I: Grid Computing
Introduction – Definition and Scope of grid computing – Grid Activities – Grid Business Areas – Grid Applications – Grid Infrastructure

Unit – II: Grid Computing Initiatives
Grid Computing Organizations and their roles – Glob al Grid Forum – Organizations Developing Grid Computing Toolkits and the Framework – Organizations building and using Grid-Based Solutions to solve Computing, Data and Network Requirements – Commercial Organizations building and using Grid-Based solutions – The Grid Computing Anatomy – Grid Computing road map.

Unit – III: Grid Computing Applications
Merging the Grid sources Architecture with the Web Devices Architecture – Service-Oriented Architecture – Web Service Architecture – XML, Related Technologies, and their Relevance to Web Services – XML Messages and Enveloping – Service Message Description Mechanisms – Relationship between Web Service and G rid Service – Web Service Interoperability and the Role of the WS-I Organization

Unit – IV: Technologies
OGSA – Sample use cases – Online Media and Entertainment - OGSA platform components – OGSI – Grid Services – A High-Level Introduction to OGSI – Technical Details of OGSI Specification - OGSA Basic Services.

Unit – V: Grid Computing Tool Kits
Globus GT 3 Toolkit – GT3 Software Architecture Model –GT3 Programming model - GT3High level services.

Book for Study

1.   Joshy Joseph & Craig Fellenstein, "Grid Computing", PHI, PTR-2003.