

**M. Phil.**  
**COMPUTER SCIENCE**  
**SYLLABUS - 2018**



**St. JOSEPH'S COLLEGE (Autonomous)**

Special Heritage Status Awarded by UGC  
Accredited at 'A' Grade (3<sup>rd</sup> cycle) by NAAC  
College with Potential for Excellence Conferred by UGC  
DBT-STAR & DST-FIST Sponsored College  
**TIRUCHIRAPPALLI - 620 002, INDIA**

## GUIDELINES FORM.PHIL.PROGRAMME

### 1. Duration

The programme runs for one year 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	4	C5	Dissertation (Topic selected should be relevant to the topic of the Guide Paper)	8
C2	Research Methodology	4			
C3	Core Course	4			
C4	Guide Paper	4			
<b>Total</b>		<b>16</b>	<b>Total</b>		<b>8</b>

A) Each Course should contain 5 units, covering the subject requirements of the courses offered. **Marks for CIA and SE are in the ratio 25: 75.**

CIA & SE	Tentatively on
Mid Semester Test	December 2 <sup>nd</sup> week
End Semester Test	February 2 <sup>nd</sup> week
Semester Examinations	February 4 <sup>th</sup> week

*A candidate shall be declared to have passed Course I, II, III and IV, if he / she secures not less than 40% of the marks in both CIA and the University Examination and 50% of the marks in the aggregate (i.e. continuous internal assessment and the written Examination taken together.*

B) In course C1 on ‘**Professional Skills for Teaching– Learning**’ the first three units are common to all the Departments of the College. 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 explore 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 Sector.

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.

### C) Evaluation:

#### C.1:

For CIA and 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 (15) and Practical Component(15). The total mark 100 will be converted into **25** marks.

#### C.2, C.3 & C.4:

The CIA components for C-2, C-3 and C-4 are Mid Semester Test (25), End Semester Test (25), Seminar (30), Objective Type test /Assignment (20). *(The marks of Mid semester test (75), End semester test (75) will be converted into 25 each.)*

The total mark 100 will be converted into 25 marks. The tests and Semester Examination are centrally conducted by COE for 3 hours.

- Question papers for C1, C2 & C3 are set by External Examiners.
- Question paper for C4 will be set and valued by the Research Advisor only.
- The evaluation method will be the same for both C2 and C3 Courses.

### 3. Credits

	Courses	Title		Contact hours	Library hours	Total hours	Credit	CIA marks	SE marks	Total marks
Semester-I	C1	Professional Skills for Teaching-Learning	T	3	2	5	3	25	50	100
			P	2	2	4	1			
	C2	Research Methodology		5	4	9	4	25	75	100
	C3	Core Paper		5	5	10	4	25	75	100
	C4	Guide Paper		5	5	10	4	25	75	100
<b>Total</b>				<b>20</b>	<b>18</b>	<b>38</b>	<b>16</b>	<b>100</b>	<b>300</b>	<b>400</b>

Semester-II	C5	Internal	Cr	Mk	External	Cr	Mk	
		Seminar & Review of Related Literature	8	10	10	Dissertation Evaluation	8	75
		Mid-term Review Presentation				Viva-voce		25
		Dissertation Work		50				
		Publication of Research Articles		20				
		Viva-voce		10				
<b>Total</b>	<b>8</b>	<b>100</b>			<b>8</b>	<b>100</b>		

#### 4. Question Pattern

Course	Mid & End Semester Tests		
<b>SCIENCE</b>			
<b>C1</b>	Section A: Short Answers Section B: Either/Or - Essay Type	7/9 3	7×2 = 14 3×7 = 21
<b>C2</b>	Section A: Short Answers Section B: Either/Or - Essay Type	10 5	10×3 = 30 5×9 = 45
<b>C3</b>	Section A: Short Answers Section B: Either/Or - Essay Type	10 5	10×3 = 30 5×9 = 45
<b>C4</b>	Open Choice: Comprehensive Type	5/8	5×15 = 75
<b>ARTS</b>			
<b>C1</b>	Section A: Short Answers Section B: Either/Or - Essay Type	7/9 3	7×2 = 14 3×7 = 21
<b>C2</b>	Open Choice: Comprehensive Type	5/8	5×15 = 75
<b>C3</b>	Open Choice: Comprehensive Type	5/8	5×15 = 75
<b>C4</b>	Open Choice: Comprehensive Type	5/8	5×15 = 75

Course	Semester Examination		
<b>SCIENCE</b>			
<b>C1</b>	Section A: Short Answers Section B: Either/Or - Essay Type	7/9 3	7×2 = 14 3×12 = 36
<b>C2</b>	Section A: Short Answers Section B: Either/Or - Essay Type	10 5	10×3 = 30 5×9 = 45
<b>C3</b>	Section A: Short Answers Section B: Either/Or - Essay Type	10 5	10×3 = 30 5×9 = 45
<b>C4</b>	Open Choice: Comprehensive Type	5/8	5×15 = 75
<b>ARTS</b>			
<b>C1</b>	Section A: Short Answers Section B: Either/Or - Essay Type	7/9 3	7×2 = 14 3×12 = 36
<b>C2</b>	Open Choice: Comprehensive Type	5/8	5×15 = 75
<b>C3</b>	Open Choice: Comprehensive Type	5/8	5×15 = 75
<b>C4</b>	Open Choice: Comprehensive Type	5/8	5×15 = 75

#### 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 1<sup>st</sup> 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 to the CoE through HOD in a sealed cover

### 5.3 Publications

All the M.Phil. Scholars should publish atleast one Research article in the reputed Journals before the submission of their dissertation. Publication of research article will be considered as CIA component. According to the type of Journals marks will be distributed to each article as follows.

UGC approved Journals	-	10 marks
Other Journals with ISSN number	-	8 marks
ReTeLL or Seminar /Conference Proceedings	-	6 marks

### 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 Curbing Plagiarism

According to The draft of University Grants Commission (Promotion of Academic Integrity and Prevention of Plagiarism in Higher Education Institutions) Regulations, 2017. Before submitting the thesis every students should submit the draft and get the certificate from the college library which will be issued after the verification of plagiarism. The certificate should be enclosed along with the thesis.

Plagiarism would be quantified into following levels in ascending order of severity for the purpose of its definition:

Level-0: Similarities upto 10% Excluded

Level-1: Similarities above 10% to 40%

Level-2: Similarities above 40% to 60%

Level-3: Similarities above 60%

Penalties for Students Plagiarism Disciplinary Authority (PDA) of the HEI, based on recommendations of the Academic Misconduct Panel (AMP), shall impose penalty considering the severity of the Plagiarism.

- i. Level 0: Similarities upto 10% - Minor Similarities, no penalty.
- ii. Level 1: Similarities above 10% to 40% - Such student shall be asked to submit a revised script within a stipulated time period not exceeding 6 months.
- iii. Level 2: Similarities above 40% to 60% - Such student shall be debarred from submitting a revised script for a period of one year.
- iv. Level 3: Similarities above 60% -Such student registration for that programme shall be cancelled.

### 5.6 Viva-Voce

An open Viva-Voce examination shall be conducted by both the external examiner and the supervisor **and shall be attended by members of Department Research Committee members, all faculty members of the departments, other research scholars and other interested experts / researchers** and evaluated jointly by the Examiner and the Supervisor. The valuation of M.Phil. Dissertations and the viva-voce examination shall be carried out on the same day at the place of the Research Supervisor (viva is to be conducted only if the student passes in the valuation of the dissertation). The mark should be sent to the Controller of Examinations by the Research supervisor. A candidate shall be declared to have passed Part-II Examination if he secures not less than **55%** of the marks both in internal and external.

### 6. Classification of Final Results

- i. The classification of final results shall be based on the CGPA, as indicated in Table 2.
- ii. For the purpose of Classification of Final Results, the candidates who earn the CGPA 9.00 and above shall be declared to have qualified for the Degree as “Outstanding”. Similarly, the candidates who earn the CGPA between 8.00 and 8.99, 7.00 and 7.99, 6.00 and 6.99, and 5.00 and 5.99 shall be declared to have qualified for their Degree in the respective Programmes as “Excellent”, “Very Good”, “Good”, and “Above Average” respectively..
- iii. Absence from an examination shall not be taken as an attempt.

**Table-1: Grading of the Courses**

Marks Range	Grade Point	Corresponding Grade
90 and above	10	O
80 and above but below 90	9	A+
70 and above but below 80	8	A
60 and above but below 70	7	B+
50 and above but below 60	6	B
Below 50	NA	RA

**Table-2: Final Result**

CGPA	Corresponding Grade	Classification of Final Results
9.00 and above	O	Outstanding
8.00 to 8.99	A+	Excellent
7.00 to 7.99	A	Very Good
6.00 to 6.99	B+	Good
5.00 to 5.99	B	Above Average
Below 5.00	RA	Re-Appearence

- 6.1 Credit based weighted Mark System is to be adopted for individual semesters and cumulative semesters in the column 'Marks Secured' (for 100).
- 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 the guide concerned should be recorded in the 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.**

**Course Pattern - 2018 Set**

Sem.	Code	Title of the paper
<b>I</b>	18MCS101	Course – C1 : Professional Skills For Teaching – Learning
	18MCS102	Course – C2 : Research Methodology
	18MCS103	Course – C3 : Advanced Concepts in Computer Science
	18MCS104A	Course – C4 : Artificial Intelligence & Expert Systems
	18MCS104B	Course – C4 : Simulation and Modeling
	18MCS104C	Course – C4 : Data Mining
	18MCS104D	Course – C4 : Digital Image Processing
	18MCS104E	Course – C4 : Neural Computing
	18MCS104F	Course – C4 : Soft Computing
	18MCS104G	Course – C4 : Network Security
	18MCS104H	Course – C4 : Internet of Things
	18MCS104I	Course – C4 : Data Structures and Algorithms
	18MCS104J	Course – C4 : Mobile & Pervasive Computing
	18MCS104K	Course – C4 : Virtualisation& Cloud Computing
	18MCS104L	Course – C4 : Web Services
	18MCS104M	Course – C4 : Security in Computing
18MCS104N	Course – C4 : Big Data Techniques and Applications	
18MCS104O	Course – C4 : Software Metrics	
18MCS104P	Course – C4 : Grid Computing	
18MCS104Q	Course – C4 : Big Data Analytics	
18MCS104R	Course – C4 : Cloud Security	
<b>II</b>	18MCS205	Course – C5 : Dissertation

## M. Phil. Computer Science

### Programme outcomes (POs)

1. Scholars are to be adopted with a new paradigm of self-learning in the form of review of earlier knowledge acquired.
2. Scholars are brought to light from the previous investigation completed to the newer thrusts of knowledge and implementation in research.
3. Scholars are trained to design, implement and evaluate secured information (hard and soft) systems with assured quality and efficiency.
4. Scholars are to be oriented towards becoming globally competent.

### Programme Specific Outcomes (PSOs)

1. Have extensive knowledge on core concepts in Computer Science.
2. Ability to have a complete understanding of techniques, and extensive knowledge of the literature, applicable to the selected research areas.
3. Capability to apply reasoning and problem solving using research tools.
4. Proficiency to identify the problems and create and interpret knowledge in their chosen area.
5. Capacity to have critical evaluation in current research techniques and methodologies.
6. Mastery over analytical skills which are based on mathematical and statistical knowledge acquired.
7. Gain research skills in recent areas to compete globally.
8. Possess social, moral and ethical values.

## 18MCS101

### PROFESSIONAL SKILLS FOR TEACHING-LEARNING

#### Course Outcomes:

1. Inherit soft skills essential for teaching and research.
2. Adopt suitable techniques of teaching.
3. Understand the changing scenario of Teaching and growing expectation from effective teachers.
4. Use ICT tools and e-resources for Teaching.
5. Familiarize and to create a document using Latex
6. Get familiar with analytical tools and R.

#### Unit-I: Soft Skills

- a. Introduction to Soft Skills, Soft Skills Vs. Hard Skills, types of Soft Skills
- b. Communication skills- Basics in communication, structure of written and oral sentences, Verbal, non-verbal, body language, JOHARI Window, Intrapersonal and Interpersonal Communications, Activities in Effective Communication
- c. Behavioral Skills- Leadership skills, Time Management, Creativity and Lateral thinking
- d. Interview Skills- Resume Writing, Different types of interviews, Etiquettes in interviews, Mock interviews
- e. Team Building and Group Discussion- Progressive stages of Team Building, Parameters of GD (special reference to attending, listening, responding skills), Mock Group GDs

#### Unit-II: Techniques and Dynamics of Teaching- Learning

- a. Emerging trends in Educational Psychology- Meaning, Scope and Methods
- b. Learning- Different Theories of learning, Approaches to learning(Classical Conditioning- Ivan Pavlov; Operant conditioning-B.F.Skinner); kinds of learning, factors affecting learning
- c. Motivation: Intrinsic and extrinsic motivation, Development of memory and intelligence

#### Unit-III: e-Learning and e-Teaching

An overview of Microsoft office-2007: MS WORDS-2007- MS Excel-2007- MS Powerpoint-2007, Concepts in e-Resources and e-design: World Wide Web Concepts - Making use of Web Resources- Web site creation concepts – Creating Web Page Editors- Creating Web graphics – Creating Web Audio files

#### Unit-IV: 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-V:

R: Introduction to R – Datasets in R (Iris and Body Fat Date sets) – Data Import and Export – Data Exploration and Visualization – Decision Trees and Random Forest – Regression – Clustering – Outlier Detection.

(Units IV and V are Computer practical oriented units)

#### References:

##### Unit-I

1. JASS (2013). Winners in the making. Introduction to soft skills. St. Joseph’s college, Trichy
2. Murphy, Raymond. (1998). Essential English grammar. 2nd ed. Cambridge university press
3. Trishna (2004). Knowledge system how to do well in GDs and interviews. Reprographic and printing services, secunderabad

##### Unit-II

1. Covey, Stephen. (2004). 7 habits of highly effective people, free press
2. Driscoll, MP (1994). Psychology of learning for instruction, needham, ma: allyn and bacon
3. Gardner, Howard (1983; 1993). Frames of mind: the theory of multiple intelligences, new York; basic books

##### Unit-III

1. Joyce cox, curtisfrye etc (2007), step by 2007 microsoft office system, prentice hall of india pvt Ltd, new delhi

##### Unit-IV & V

1. Krishnan. E, “Latex Tutorials: A Primer”, Indian TeX Users Group, 2003.
2. Yanchang Zhao, “R and Data Mining: Examples and Case Studies”, Published by Elsevier in December 2012
3. “Leslie Lamport”, “Latex: A Document Preparation System”, 2nd Edition, Pearson Education, 2007.
4. Michael J. Crawley, “The R Book”, Wiley Publications, 2nd Ed., 2007.

#### Web Reference:

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

Relationship Matrix for Course Outcomes, Programme Outcomes and Programme Specific Outcomes

Semester I	Code 18MCS101	Title of the Paper <b>PROFESSIONAL SKILLS FOR TEACHING-LEARNING</b>										Hours 5	Credits 3	
		Programme Outcomes (POs)		Programme Specific Outcomes (PSOs)										Mean Score of COs
		PO1	PO2	PO3	PO4	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6			
CO1	5	4	3	4	4	4	3	4	4	4	4	4	4	3.92
CO2	4	4	3	4	4	4	4	4	4	4	4	4	4	3.92
CO3	4	4	3	5	4	4	4	4	4	4	4	4	4	4.00
CO4	5	4	3	4	4	4	3	4	4	4	4	4	4	3.92
CO5	4	4	3	4	4	4	4	4	4	4	4	4	4	3.92
CO6	5	4	3	4	5	4	4	4	4	4	4	4	4	4.08
<b>Overall Mean Score for COs</b>												<b>3.96</b>		

**Result: The Score for this Course is 3.9 (High Relationship)**

*Note:*

Mapping Scale	1-20% 1	21-40% 2	41-60% 3	61-80% 4	81-100% 5
Relation Quality	0.0-1.0 Very poor	1.1-2.0 Poor	2.1-3.0 Moderate	3.1-4.0 High	4.1-5.0 Very High

*Values Scaling:*

Mean Score of COs = $\frac{\text{Total of Values}}{\text{Total No. of POs \& PSOs}}$	Mean Overall Score for COs = $\frac{\text{Total of Mean Scores}}{\text{Total No. of COs}}$
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## 18MCS102

### RESEARCH METHODOLOGY

#### Course Outcomes:

1. To acquire the knowledge about various Research types
2. To get a deep knowledge about analysis of Algorithms and NP
3. To regain the concepts in Formal Languages and Finite Automata
4. To attain mathematical knowledge to approach a research type
5. To provide the concept of probability and reliability and apply real life applications
6. To get exposure to Logics and Graphs

#### 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 statements 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

Logic and Graph:

- a) Mathematical Logic: Statements and Notation - Connectives - Statement Formulas and Truth Tables - Tautologies - Equivalence of Formulas - Duality Law. Tautological implications - Theory of inference - validity using truth tables - Rules of Inference.
- b) Graph: Definition - Edge Sequences, Walks, Paths and Circuits - Directed Graphs - Subgraphs and Operations on Graphs - Isomorphisms of Graphs.

Connected Graphs - Examples of Special Graphs - Euler Graphs - Hamiltonian Circuits and Paths - Planar Graphs - Matrix Representation of Graphs. (Stress can be given to graph definitions and applications only. Proof for theorems not required)

#### Books for Study:

1. Kothari C R, "Research Methodology - methods and techniques", WishwaPrakashjan, New Delhi, 2<sup>nd</sup> Edition, 1999. (Unit 1)
2. Berny H. Durston, M. Poole, "Thesis and Assignment writing", Wiley Eastern Ltd, ND, 1970. (Unit-I)
3. Misra R P, "Research Methodology - A Hand Book", Concept publishing Company, New Delhi, 1988. (Unit-I)
4. Ellis Horowitz and Sartaj Sahni, "Fundamentals of Computer algorithms", Galgotia Publications, New Delhi, 2000. (Unit-II)
5. Thomas. H. Cormen, Charles E. Leiserson, Ronald L. Rivest "Introduction to Algorithms", Prentice Hall of India, 1998. (Unit-II)
6. John E. Hopcroft, Jeffery D. Ullman, "Introduction to Automata Theory Language & Computation", Narosa Publishing House, 1979. (Unit-III)
7. L.S. Srinath, "Reliability engineering", Affiliated East. West Press Pvt. Ltd., New Delhi, Third Edition, 2005. (Unit-IV)
8. E. BalaGurusamy, "Reliability Engineering", Tata McGraw Hill Publishing Ltd, New Delhi, 2003. (Unit-IV)
9. J.P. Tremblay, R. Manohar, "Discrete Mathematical Structure with Applications to Computer Science", McGraw-Hill International Edition, 2008. (Unit V)
10. N. Chandrasekaran, M. Umamavathi, "Discrete Mathematics", Second Edition, PHI Learning Pvt. Ltd.. 2015. (Unit V)

#### Books for References:

1. David. Evans, Paul Gruba and Justin Zobel, "How to write a better thesis", Third Edition, Springer, 1995.
2. Robert Sedgewick and Philippe Flajolet, "An Introduction to the Analysis of Algorithms", Second Edition, Addison-Wesley, 1996.
3. Peter Linz, "An Introduction to Formal Languages and Automata", Sixth Edition, 2016.
4. Anirban DasGupta, "Probability for Statistics and Machine Learning - Fundamentals and Advanced Topics", Springer, 2011.
5. Alberto Policriti, Alexandru I. Tomescu and Eugenio G. Omodeo, "On Sets & Graphs: Perspectives on Logic & Combinatorics", Springer, 2017.



**Relationship Matrix for Course Outcomes, Programme Outcomes and Programme Specific Outcomes**

Semester <b>I</b>	Course Outcomes (COs)	Code 18MCS102		Title of the Paper <b>RESEARCH METHODOLOGY</b>													Hours 5	Credits 4
		Programme Outcomes (POs)						Programme Specific Outcomes (PSOs)							Mean Score of COs			
		PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7		PSO8		
	CO1	5	4	3	4	4	5	4	3	4	5	4	5	4	5	4	4.16	
	CO2	4	4	4	4	4	4	4	4	4	4	4	4	4	5	4	4.08	
	CO3	4	5	4	5	4	4	5	4	4	5	4	5	4	5	4	4.50	
	CO4	5	5	4	4	4	4	4	3	4	4	4	5	4	4	4	4.16	
	CO5	4	4	4	4	4	5	5	4	4	4	4	5	4	5	4	4.33	
	CO6	5	4	3	4	4	5	4	4	4	4	4	5	4	4	4	4.16	
<b>Overall Mean Score for COs</b>																<b>4.23</b>		

**Result: The Score for this Course is 4.2 (High Relationship)**

*Note:*

<b>Mapping</b>	1-20%	21-40%	41-60%	61-80%	81-100%
<b>Scale</b>	1	2	3	4	5
<b>Relation</b>	0.0-1.0	1.1-2.0	2.1-3.0	3.1-4.0	4.1-5.0
<b>Quality</b>	Very poor	Poor	Moderate	High	Very High

*Values Scaling:*

<b>Mean Score of COs</b> = $\frac{\text{Total of Values}}{\text{Total No. of POs \& PSOs}}$	<b>Mean Overall Score for COs</b> = $\frac{\text{Total of Mean Scores}}{\text{Total No. of COs}}$
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**18MCS103**

**ADVANCED CONCEPTS IN COMPUTER SCIENCE**

**Course Outcomes:**

1. Gain deep knowledge in Distributed Database Systems
2. Get acquaintance over Distributed Architecture and SOA
3. Understand XML related techniques
4. Acquire familiarity with Distributed Operating Systems
5. Understand security architecture and design concepts for Web Services
6. Design new methodologies for Securing Web Services

**Unit-I**

Distributed Database Systems: Introduction in DDS - Object management process, issues and application examples - Competitive analysis: Concepts and solution techniques - Object management in stationary computing environments- Object management in mobile computing environments - Object management in regular network topologies.

**Unit-II**

Distributed Computing: Distributed Architecture - Presentation Techniques - Interaction Techniques - Components - Web Services - SOA - XML - XML related techniques.

**Unit-III**

Distributed Operating Systems: Introduction - Architectures of Distributed System - Distributed Mutual Exclusion - Distributed Deadlock Detection

**Unit-IV**

Security for Web Services: Introduction - Security Architecture and Design: Security Frameworks - Secure Coding Principles - Threat Risk Modelling - Authentication - Authorization - Denial of Service Attacks.

**Unit-V**

Information Security: Cryptography - Introduction -Submission Ciphers - TranspositionCiphers - 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.

**Books for Study:**

1. Wujian Lin and BharadwajVeeravalli, “Object Management in Distributed Database Systems for Stationary and Mobile Computing Environments: A Competitive Approach” 2013. (Unit-I)
2. Thomas Erl, “Service Oriented Architecture Concepts, Technology and Design”, Pearson Education, 2005. (Unit-II)
3. Frank P.Coyle, “XML, Web Services and the Data Revolution”, Pearson Education, 2002. (Unit-II)
4. MukeshSingdal, Niranjana G. Shivratri, “Advanced concepts in Operating Systems”, Tata Mc-Graw Hill Publishing Company Limited, New Delhi, 2001. (Unit-III)
5. Adrian Wiesmann, Andrew van der Stock, Mark Curphey and Ray Stirbei, “A Guide to Building Secure Web Applications and Web Services”, 2.0 Black Hat Edition, 2005 (Unit-IV)
6. William Stallings, “Cryptography and Network Security”, Pearson Education, New Delhi, 2006. (Unit V)

**Books for References:**

1. M. Tamer Ozsu and Patrick Valduriez, “Principles of Distributed Database Systems”, Third Edition, Springer, 1991.
2. Ajay D. Kshemkalyani and MukeshSinghal, “Distributed Computing: Principles, Algorithms, and Systems”, Cambridge, 2008.
3. Pradeep K. Sinha, “Distributed Operating Systems: Concepts and Design”, PHI, 1997.
4. Elisa Bertino, Lorenzo Martino, Federica Paci and Anna Squicciarini, “Security for Web Services and Service-Oriented Architectures” Springer, 2010.
5. Michael E. Whitman and Herbert J Mattord, “Principles of Information Security”, Fourth Edition, Information Security Professionals, 2003.

**Relationship Matrix for Course Outcomes, Programme Outcomes and Programme Specific Outcomes**

Semester I	Code 18MCS103	Title of the Paper <b>ADVANCED CONCEPTS IN COMPUTER SCIENCE</b>										Hours 5	Credits 4		
		Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)							Mean Score of COs	
		PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5				PSO6
CO1	4	4	4	4	4	5	4	3	4	5	4	5	4	4	4.16
CO2	4	3	4	4	4	5	4	4	4	4	5	4	4	4	4.08
CO3	3	4	4	4	5	4	3	4	5	4	4	4	4	5	4.08
CO4	4	3	4	4	4	4	4	5	4	4	4	4	5	4	4.16
CO5	4	4	4	4	4	4	4	4	4	4	4	4	5	4	4.08
CO6	4	4	4	4	4	5	4	4	4	4	5	4	4	4	4.16
<b>Overall Mean Score for COs</b>												<b>4.12</b>			

**Result: The Score for this Course is 4.1 (Very High Relationship)**

*Note:*

Mapping Scale	1-20%	21-40%	41-60%	61-80%	81-100%
Relation Quality	1 Very poor	2 1.1-2.0 Poor	3 2.1-3.0 Moderate	4 3.1-4.0 High	5 4.1-5.0 Very High

*Values Scaling:*

Mean Score of COs = $\frac{\text{Total of Values}}{\text{Total No. of POs \& PSOs}}$	Mean Overall Score for COs = $\frac{\text{Total of Mean Scores}}{\text{Total No. of COs}}$
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## 18MCS104A

### ARTIFICIAL INTELLIGENCE AND EXPERT SYSTEMS

#### Course Outcomes:

1. Gain basic knowledge about AI
2. Acquire knowledge about searching technique
3. Get acquaintance over Knowledge representation techniques
4. Familiarize with Natural Language Processing
5. Understand the concepts of learning
6. Understand concepts of Expert System

#### 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 uncertainty.

#### 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 each narrative grammar - applications of semiotic theory of artificial intelligence.

#### Books 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.

#### Book for Reference:

1. Dan W. Patterson, "Introduction to Artificial Intelligence and Expert & Systems", PHI, 2001.

## 18MCS104B

### SIMULATION AND MODELLING

#### Course Outcomes:

1. Understand the concepts of simulation
2. Gain knowledge on types of models
3. Apply statistical models in simulation
4. Gain fundamental knowledge on modeling random number generation
5. Design discrete systems
6. Understand data collection techniques

#### 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 - Direct 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.

#### Books 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. NarsingDeo, "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.

#### Book for Reference:

1. John A. Sokolowski and Catherine M. Banks, "Principles of Modeling and Simulation: A Multidisciplinary Approach", Wiley Publications, 2009.

**DATA MINING**

**Course Outcomes:**

1. Understand the basic techniques of data mining
2. Gain knowledge of data processing techniques
3. Learn and identify the features of concept description
4. Comprehend classification and prediction techniques
5. Acquire knowledge on Multidimensional analysis and descriptive mining of complex data objects
6. Gain knowledge to check the correctness of classification and clustering

**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 - Descretization and Concept Hierarchy Generation - Data Mining Primitives, Languages 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

**Books for Study:**

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

**Books 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.

## 18MCS104D

### DIGITAL IMAGE PROCESSING

#### Course Outcomes:

1. Understand the fundamental issues of Digital Image Processing
2. Gain knowledge of Image Enhancement techniques
3. Learn and identify the features of Image Restoration
4. Comprehend classification and prediction techniques
5. Acquire the basic concepts of Wavelets and Multi-resolution Processing
6. Handle the Image Segmentation techniques

#### 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.

#### Books for Study:

1. Rafael C. Gonzalez and Richard E. Woods, "Digital Image Processing", Pearson Education, New Delhi, Second Edition, 2002.

#### Book for Reference:

1. Anil K. Jain "Fundamentals of Digital Image Processing", Pearson 2002.

## 18MCS104E

### NEURAL COMPUTING

#### Course Outcomes:

1. Understand about neural computing in the form of network structure.
2. Gain knowledge of training algorithms in back propagation network.
3. Learn the uses of different simulation models and statistical methods.
4. Apply the concepts to problem solving, applications and research.
5. Acquire the basic concepts in Bi Directional Associative Memory.
6. Familiarize with Adaptive Resonance Theory concepts.

#### 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.

#### Books 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.

#### Books 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.

## 18MCS104F

### SOFT COMPUTING

#### Course Outcomes:

1. Understand the basic concepts of the various components of soft computing
2. Gain basic knowledge on Artificial Neural Networks
3. Gain knowledge of Fuzzy Logic
4. Design and develop Fuzzy system
5. Apply the concepts of Neuro - Fuzzy Modeling.
6. Acquire the basic knowledge on Genetic algorithms

#### Unit-I

Artificial Neural Networks: Basic concepts - Single layer perception - Multilayer Perception - Supervised and Unsupervised learning - Back propagation networks - Kohonen'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.

#### Books 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.



## 18MCS104G

### NETWORK SECURITY

#### Course Outcomes:

1. Know the security Trends and Security Techniques
2. Gain knowledge of Data Encryption Standards
3. Learn the uses of Hash functions
4. Apply the concepts of Public Key Encryption.
5. Identify the various authentication mechanisms in applications
6. Understand system security breaches and principles

#### 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 - Steganography.

#### Unit-II

Block Ciphers and Data Encryption Standards: Block Cipher - Principles - Data Encryption Standard - The strength of DES - Differential 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 Cryptosystems - 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 - Digital Signature standard

#### Unit-IV

Authentication Applications: Kerberos - X.509 Authentication Service - PKI - Electronic Mail Security - Pretty Good Privacy - 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 Reference:

1. AtulKahate, "Cryptography and Network Security", Tata McGraw Hill Publications, New Delhi.

## 18MCS104H

### INTERNET OF THINGS

#### Course Outcomes:

1. Posses knowledge on basic concepts of Internet of Things
2. Acquire knowledge on enabling technologies of IoT
3. Design machine to machine communication systems
4. Analyze the real life problems for providing technology based solutions
5. Identify the problems for providing technology based solutions
6. Have skills on the Design of IoT based Applications

#### Unit-I

Introduction and Concepts: Introduction - Physical Design of IoT- Logical Design of IoT - IoTEnabling Technologies - IoT Levels and Deployment Templates.

#### Unit-II

Domain Specific IoTs: Home Automation - Cities - Environment - Energy - Retail - Logistics - Agriculture - Industry - Health and Lifestyle. IoTand M2M: M2M -Difference between IoTand M2M - SDNandNFVforIoT. IoT System Management with NETCONF-YANG:Need for IoTSystems Management - Simple Network Management Protocol(SNMP) - Network Operator Requirements - NETCONF- YANG- IoTSystems Management with NETCONF-YANG

#### Unit-III

IoTPlatforms Design Methodology: Introduction -IoTDesign Methodology -Case Study on IoT System for Weather Monitoring - Motivation for using Python. IoT Systems-Logical Design using Python: Introduction - Installing Python - Python Data Types and Data Structures - Control Flow - Functions -Modules - Packages - File Handling - Date/Time Operations - Classes - Python Packages of Interest for IoT.

#### Unit-IV

IoT Physical Devices and Endpoints: Meaning of IoTDevice - Exemplary Device: Raspberry Pi Board - Linux on Raspberry Pi - Raspberry Pi Interfaces - Programming Raspberry Pi with Python - Other IoTDevices.

#### Unit-V

IoT Physical Servers and Cloud Offerings: Introduction to Cloud Storage Models and Communication APIs - Xively Cloud for IoT - Python Web Application Framework-Django - Designing a RESTful Web API - Amazon

Web Services for IoT - SkyNetIoT Messaging Platform. Case Studies Illustrating IoT Design:Home Automation - Cities - Environment - Agriculture - Productivity Applications.

#### Book for Study:

1. ArshdeepBahga and Vijay Madiseti, "Internet of Things-A Hands-on Approach", Universities Press (India), 2015.

#### Books for Reference:

1. Daniel Kellmerit and Daniel Obodovski, "The Silent Intelligent - The Internet of Things", Published by DND Ventures LLC, 1<sup>st</sup> Edition, 2013.
2. RajkumarBuyya and Amir VahidDastjerdi, "Internet of Things:Principles and Pradigms", Cloud Computing and Distributed Systems (Clouds) Laboratory, Manja Soft Pty Ltd., Australia, 2016.

## **18MCS104I**

### **DATA STRUCTURES AND ALGORITHMS**

#### **Course Outcomes:**

1. Know about the key transformation
2. Develop various types of algorithms
3. Understand the basic operations in Tree
4. Gain knowledge of Multi-way trees and hashing
5. Identify the uses of Greedy methods
6. Develop and design the applications using Dynamic programming.

#### **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.

#### **Books 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 SartajSahani, "Fundamentals of Computer Algorithms", Galgotia publications, New Delhi, 1985. (Units III, IV and V)

#### **Book for Reference:**

1. Jean-Paul Tremblay and Paul G Sorenson, "An Introduction to Data Structures with Applications", Tata McGraw Hill Publishing Company Limited, 2nd Edition, NewDelhi, 1995.

## **18MCS104J**

### **MOBILE AND PERVASIVE COMPUTING**

#### **Course Outcomes:**

1. Posses knowledge on Wireless networks
2. Compute the web with WAP architecture
3. Acquire knowledge on Mobile computing environment
4. Understand handoff mechanisms in wireless mobile networks
5. Identify the principles and characteristics of pervasive computing
6. Develop and implement Mobile and pervasive computing applications

#### **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.

#### **Books 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.

#### **Books for Study:**

1. Uwe Hansmannet, Pervasive Computing, Springer, New York, 2001.

## **18MCS104K**

### **VIRTUALISATION AND CLOUD COMPUTING**

#### **Course Outcomes:**

1. Posses knowledge on Cloud Computing and its architecture
2. Acquire knowledge on Virtualization techniques
3. Understand cloud infrastructure services
4. Identify the parallel and distributed programming paradigms
5. Handle various cloud computing tools
6. Learn the Cloud security and security challenges

#### **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

#### **Books 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.

#### **Book for Reference:**

1. Prashanta Kumar Das and Ganesh Chandra Daka, “Design and Use of Virtualization Technology in Cloud Computing”, IGI Global, 2017.

## 18MCS104L

### WEB SERVICES

#### Course Outcomes:

1. Posses knowledge on Web Services
2. Identify and learn various Web Services Standards, Technologies and Concepts
3. Acquire knowledge on advanced technologies and standards of Web Services
4. Identify and apply the security mechanisms for Web Services
5. Familiarize with QoS concepts for Web Services
6. Understand new methodologies for building Enterprise Web Services and Applications

#### 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 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 OASIS WSBPEL - BPEL and its relation to BPML, WSCI, WSFL, Xlang, and others.

#### 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.

#### Books 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.

## 18MCS104M

### SECURITY IN COMPUTING

#### Course Outcomes:

1. Have an idea about security problems in computing
2. Acquire knowledge on program security threads and its mechanisms
3. Design Trusted Operating System
4. Provide Database security
5. Identify the security policies in Computer Networks
6. Learn Legal and Privacy Issues in Computer Security.

#### 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 encryption 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.

#### Books for Reference:

1. Eric Maiwald, "Network Security a Beginner's Guide", Second Edition, Tata-Mcgraw Hill Publication Ltd., New Delhi, 2003.
2. AtulKahate, "Cryptography and Network Security", Tata-Mcgraw Hill Publication Ltd., New Delhi, 2003.

## 18MCS104N

### BIG DATA TECHNIQUES AND APPLICATIONS

#### Course Outcomes:

1. Have an idea about Big Data concepts
2. Acquire knowledge on Big Data Mining and its techniques
3. Deal with uncertainty data using mining techniques
4. Handle Big Data tools
5. Familiarize with database transactions
6. Identify the database applications

#### Unit-I

Big Data: Introduction to Big Data Platform- Challenges of Conventional Systems- Intelligent Data Analysis - Nature of Data - Analytic Processes and Tools - Analysis vs. Reporting - Modern Data Analytics Tools - Statistical Concepts - Sampling Distributions - Statistical Inference - Prediction Error.

#### Unit-II

Big Data Mining: Classification - Clustering - Mining and Information Extraction - Regression - Feature Extraction - Reasoning: Logic and its Limits - Dealing with Uncertainty - Bayesian Inference - Forecasting, -Neural Models - Intro to Deep Learning

#### Unit-III

Hadoop: History of Hadoop - HDFS Components - Analysing data with Hadoop - Scaling Out - Hadoop Streaming - Design of HDFS - Java Interfaces to HDFS basics - Developing Map Reduce Applications - How Map Reduce Works - Anatomy of Map Reduce Job - Failures, Job Scheduling, Shuffle and Sort, Task Execution

#### Unit-IV

NoSQL: NoSQL Databases - Evolution of Document Databases - Design and use of NoSQL databases - Storage and Retrieval of Unstructured Data - NoSQL Applications and Query Options - Types of NoSQL Databases - Graph Databases - Neo4J and Cypher - Case Studies

#### Unit-V

Big Data Applications: Applications of Big Data using PIG and Hive - Data Processing in PIG - Hive Services - Hive QL - Querying data in Hive - HBase and Zookeeper - Data Visualizations - Visual Data Analysis Techniques - Interaction Techniques - Introduction to Tableau - Tableau for Visualization

#### Books for Study

1. Philip (flip) Kromer and Dieterich Lawson, "Big Data for Chimps - A Guide to Massive-Scale Data Processing in Practice", O'Reilly Media, 2014. (Units: I & II)
2. Tom White, "Hadoop: The Definitive Guide", O'Reilly Media, 2012. (Unit: III)
3. Anand Rajaraman and Jeffrey Ullman, "Mining of Massive Datasets", Cambridge University Press, 2012 (Units: IV & V)

#### Books for References:

1. Viktor Mayer-Schonberger and Kenneth Cukier, "Big Data: A Revolution That Will Transform How We Live, Work, and Think", Houghton Mifflin Harcourt, 2013.
2. Pete Warden, "Big Data Glossary", O'Reilly, 2011.



## 18MCS104O

### SOFTWARE METRICS

#### Course Outcomes:

1. Impart knowledge on software measurement principles and practices
2. Understand the scope of software measures
3. Get exposure in software data collection
4. Understand various traditional metrics
5. Familiar with Object-Oriented Concepts
6. Know various Object-Oriented metrics.

#### Unit-I

Measurement in Software Engineering - The scope of software Metrics- The basics of measurement- The representational theory of measurement and models - Scales- Classification of software measures - Empirical investigation - Planning formal experiments.

#### Unit-II

Software metrics data collection - Storing and extracting. Analyzing the results of experiments - Simple analysis technique - Advanced methods - Statistical tests- Measuring internal product attributes- Reuse - Complexity.

#### Unit-III

Overview - Benefits of Software Measurement - Challenges in Software Measurement- Basic Object-Oriented Concepts - Properties of Metrics - Traditional and Object Oriented Metrics - Traditional Metrics Applied to OO Systems- Object Oriented Metrics - Chidamber and Kemerer's Metrics Suite - MOOD (Metrics for Object Oriented Design) Lorenz and Kidd's suite of design metrics.

#### Unit-IV

Cognitive Complexity Metrics - Cognitive Complexity Metrics for Procedure Oriented System - Cognitive Complexity Metrics for Object Oriented System. Class Complexity (CC) - Weighted Class Complexity (WCC) - Extended Weighted Class Complexity (EWCC) - Class Complexity due to Inheritance (CCI) - Cognitive Code Complexity (CCC) - Weighted Composite Complexity Measure (CWP).

#### Unit-V

Overview- Defining the Metric: AWCC - Calibration of Cognitive Weights for Attributes - Experimentation and Case Study - Analytical Evaluation of

AWCC Comparison of AWCC with Existing Metrics. Defining the Metric: CWCBO - Calibration of Cognitive Weights for Couplings - Experimentation and Case Study - Analytical Evaluation of CWCBO - Comparison of CWCBO with CBO.

#### Book for Study:

1. Norman E. Fenton and Shari Lawrence Pfleeger, "Software Metrics: A Rigorous and Practical Approach", PWS Publishing Company, USA, 3<sup>rd</sup> Edition, 2014.

#### References:

1. Arockiam L, Aloysius A., "Attribute Weighted Class Complexity: A New Metric for Measuring Cognitive Complexity of OO Systems", WASET, Vol. 5, pp. 10-21, 2011.
2. Aloysius A, Arockiam L, "Coupling Complexity Metric: A Cognitive Approach", International Journal of Information Technology and Computer Science, Vol. 4, pp. 29-35, 2012.

## 18MCS104P

### GRID COMPUTING

#### Course Outcomes:

1. Understand the genesis of grid computing ·
2. Know the application of grid computing ·
3. Understand the technology and tool kits to facilitate the grid computing·
4. Learn and identify Grid computing technologies·
5. Use various Grid Computing Tool Kits·
6. Learn Grid Computing techniques to solve large scale scientific problems·

#### 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 - Global 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 - GridComputing road map.

#### Unit-III

Grid Computing Applications: Merging the Grid sourcesArchitecture 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 Grid 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 Programmingmodel - GT3High level services.

#### Book for Study

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

#### Book for Reference:

1. Jinjun Chen, Lizhe Wang, and Wei Jie, “Grid Computing: Infrastructure, Service, and Applications”, CRC Press, 2009.

## 18MCS104Q

### BIG DATA ANALYSIS

#### Course Outcomes:

1. Acquired knowledge on the basics of Big Data
2. Knowing the role and use of Big Data in various relevant industries
3. Having a clear idea on the various tools and techniques used with big data
4. Acquired the techniques of Big Data Analytics
5. Learnt to cutting edge tools and technologies to analyze Big Data.
6. Ability to appreciate the Big Data Storage concepts and technologies

#### Unit-I

Overview of Big Data: Big Data - History of Data Management – Evolution of Big Data - Structuring Big Data - Types of Data - Elements of Big Data – Volume – Velocity – Variety – Veracity - Big Data Analytics - Advantages of Big Data Analytics - Careers in Big Data.

Use of Big Data in Business Context: Use of Big Data in Social Networking - Business Intelligence – Marketing - Product Design and Development - Use of Big Data in Preventing Fraudulent Activities - Preventing Fraud Using Big Data Analytics - Use of Big Data in Detecting Fraudulent Activities in Insurance Sector - Fraud Detection Methods - Use of Big Data in Retail Industry - Use of RFID Data in Retail.

#### Unit-II

Understanding Hadoop Ecosystem: Hadoop Ecosystem - Hadoop Distributed File System - HDFS Architecture - Features of HDFS – MapReduce - Features of MapReduce -Hadoop YARN – Hbase - Features of HBase – Hive - Pig and Pig Latin – Sqoop – ZooKeeper – Flume – Oozie.

Understanding Analytics and Big Data: Analysis - The Analytic Process - Types of Analytics -Basic Analytics - Advanced Analytics - Operationalized Analytics - Monetized Analytics -Characteristics of Big Data Analysis - Points to Consider during Analysis - Frame the Problem Correctly - Making Inferences versus Computing Statistics - Skills Required for an Analyst - Convergence of IT and Analytics - Understanding Text Analytics.

#### Unit-III

Analytical Approaches and Tools to Analyze Data: Analytical Approaches - Ensemble Methods - Text Data Analysis - History of Analytical Tools - Graphical User Interfaces - Point Solutions - Data Visualization Tools - Introducing Popular Analytical Tools - The R Project for Statistical Computing - IBM SPSS – SAS - Comparing Various Analytical Tools.

NoSQL Data Management: Introduction to NoSQL - Characteristics of

NoSQL - Evolution of Databases - Aggregate Data Models - Key Value Data Model - Document Databases –Relationships - Graph Databases - Schema-Less Databases - Materialized Views - Distribution Models - CAP Theorem – Sharding - MapReduce Partitioning and Combining - Composing MapReduce Calculations.

#### Unit-IV

Social Media Analytics and Text Mining: Introducing Social Media - Introducing Key Elements of Social Media - Introducing Text Mining - Understanding Text Mining Process - Sentiment Analysis - Performing Social Media Analytics and Opinion Mining on Tweets - Online Social Media Analysis.

Mobile Analytics: Introducing Mobile Analytics - Define Mobile Analytics - Mobile Analytics and Web Analytics - Types of Results from Mobile Analytics - Types of Applications for Mobile Analytics - Introducing Mobile Analytics Tools - Location-based Tracking Tools - Real-time Analytics Tools - User Behavior Tracking Tools - Performing Mobile Analytics - Challenges of Mobile Analytics.

#### Unit-V

Data Visualization: Introducing Data Visualization - Techniques Used for Visual Data Representation - Types of Data Visualization - Applications of Data Visualization - Visualizing Big Data - Deriving Business Solutions - Turning Data into Information - Tools Used in Data Visualization - Proprietary Data Visualization Tools - Open-Source Data Visualization Tools - Analytical Techniques Used in Big Data Visualization.

Data Visualization with Tableau: Introduction to Tableau Software - Tableau Desktop Workspace - Operations on Data - Data Analytics in Tableau Public - Using Visual Controls in Tableau Public.

#### Book for Study:

1. Big Data (Hadoop 2, MapReduce, Hive, YARN, Pig, R and Data Visualization) Black Book, published by Dreamtech Press, 2016.

#### Book(s) for Reference:

1. Paul Buhler, WajidKhattak and Thomas Erl, “Big Data Fundamentals: Concepts, Drivers & Techniques”, Prentice Hall Publications, January 2016, ISBN: 9780134291185.
2. SoumendraMohanty, MadhuJagadeesh, and HarshaSrivatsa, “Big Data Imperatives: Enterprise Big Data Warehouse, BI Implementations and Analytics”, Published by Apress Media, 2013.
3. Tom White, “Hadoop: The Definitive Guide”, Third Edition, O’reilly Media, 2012.

## 18MCS104R

### CLOUD SECURITY

#### Course Outcomes:

1. Knowing the various basic concepts related to cloud security fundamentals
2. Describe the cloud security policies
3. Understanding and applying the data encryption techniques
4. Analyzing the need to incorporate security requirements for the cloud
5. Learn to build a private cloud
6. Acquiring the knowledge of authentication algorithms

#### Unit-I

Cloud Security Fundamentals: Confidentiality, Integrity and Availability – Cloud Security Services : Authentication, Authorization, Auditing, Accountability – Secure Development Practices – Cloud Security Policy Implementation and Decomposition : Implementation Issues – Secure Cloud Software Testing.

#### Unit-II

Security: Infrastructure Security : The network level – The host level – The application Level – Data Security and Storage : Aspects of Data Security Mitigation – Provider Data and its Security.

#### Unit-III

Securing the Cloud: Architecture : Security Requirements for the Architecture – Security Patterns and Architectural Elements – Cloud Security Architecture – Planning Key Strategies for Secure Operation.

#### Unit-IV

Securing the Cloud: Data Security : Overview of Data Security in Cloud Computing – Data Encryption: Applications and Limits – Cloud Data Security: Sensitive Data Categorization – Cloud Data Storage – Cloud Lock-in(the Roach Motel Syndrome). Security Criteria : Building an Internal cloud: Private Clouds : Motivation and Overview – Security Criteria for Ensuring a Private Cloud.

#### Unit-V

Access Management: Authentication: Requirements and Challenges – Authentication : Solutions and Recommendations : SaaS, PaaS and IaaS –

Strong Authentication – Single Sign-on – SAML for Web SSO – IdaaS : Security Challenges. Authentication Functions and Algorithms: Authentication Functions- Message Authentication Codes- Hash Functions- Security of Hash Functions and MACs- Secure Hash Algorithm- HMAC- Digital Signatures- ElGamal Digital Signature Scheme

#### Book(s) for Study:

1. Ronald L. Krutz, Russell Dean Vines, “Cloud Security: A Comprehensive Guide to Secure Cloud Computing”, Wiley’s Publications, 2010. (Unit-I)
2. Tim Mather, Subra Kumaraswamy, and Shahed Latif, “Cloud Security and Privacy”, Published by O’Reilly Media, Inc., first Edition, 2009. (Unit-II)
3. Vic (J.R.) Winkler, “Securing the Cloud”, Published by Elsevier Inc., 2011. (Unit III & IV)
4. Michael Reiter, Joseph Stein and Subra Kumaraswamy, “Identity and Access Management”, Published by Cloud Security Alliance, Second Edition, 2010. (Unit V)

#### Book(s) for Reference:

1. RajkumarBuyya, James Broberg, and Andrzej Goscinski, “Cloud Computing Principles and Paradigms”, John Wiley & Sons, Inc, 2011.
2. William Stallings, “Cryptography and Network Security: Principles and Practice”, Prentice Hall, Fifth Edition, 2010.
3. George Reese “Cloud Application Architectures”, O’Reilly Media, Inc., First Edition, 2009.

