FACULTY OF ENGINEERING & TECHNOLOGY

SYLLABUS

FOR

Pre Ph.D Course in
COMPUTER SCIENCE & ENGINEERING

(Under Credit Based Continuous Evaluation Grading System)

Session: 2016-17

GURU NANAK DEV UNIVERSITY
AMRITSAR

(ii) Subject to change in the syllabi at any time.
Please visit the University website time to time.

Pre Ph.D Course in Computer Science & Engineering
(Under Credit Based Continuous Evaluation Grading System)

	Scheme		
S.No.	***Course Code***	***Course***	***Credits*** ***L T P***
1.	CSL901	Research Methodology in Computer Science	3 0 0
2.		Elective–I	3 0 0
3.		Elective–II	3 0 0
4.		Elective–III	3 0 0
5.		Elective–IV*	3 0 0
6.	CSS910	Seminar	0 0 1
		List of Electives**	3 0 0
1.	CSL902	Algorithm Analysis & Design	3 0 0
2.	CSL903	Advanced Software Engineering	3 0 0
3.	CSL904	Advanced Database Concepts	3 0 0
4.	CSL905	Advanced Network Technologies	3 0 0
5.	CSL906	Parallel Processing Architectures	3 0 0
6.	CSL 907	Advanced Computer Architecture	3 0 0

**To be opted from outside the department*
***Ph.D. Student may opt for courses at M.Phil/M.Tech./Post-graduate level in any faculty.*

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CSL901: Research Methodology in Computer Science

L	T	P
3	0	0

UNIT-I

Research Aptitude: Meaning of Research, Objectives of Research, Motivation in Research, Types of Research, Research Approaches, Research Methods versus Methodology, Research and Scientific Method, Importance of Knowing How Research is done.

Research Process: Reviewing the literature, Formulation of research problem, Nature and type of variables, Hypothesis - meaning, types, development of hypothesis and its testing, Meaning & Functions of Research Design

UNIT-II

Data Analysis: Sources, acquisition and interpretation of data, Quantitative and qualitative data, Graphical representation and mapping of data, Sensitivity Analysis with Data Tables, Optimization with EXCEL Solver, Summarizing Data with Histograms and Descriptive Statistics, Pivot Tables, Summarizing Data with database statistical functions, using correlation, Multiple Regression, Using Sampling to Analyze Data

UNIT-III

Significance of Report Writing: Different Steps in writing Report, Layout of the Research Report, Types of Reports, Mechanics of Writing a Research Report, Art of scientific writing-Steps to better writing, flow method, organization of material and style, Drawing figures, graphs, tables, footnotes, references etc. in a research paper

Use of Internet in Research Work : Use of internet networks in research activities in searching material, paper downloading, submission of papers, relevant websites for journals and related research work. Introduction to Patent laws etc., process of patenting a research finding, Copy right, Cyber laws.

References:

1. *Research Methodology Methods and Techniques*, Kothari, C. R., Wiley Eastern Ltd.
2. *Microsoft Excel Data Analysis and Business Modeling*, Wayne L. Winston, Microsoft Press, ISBN: 0735619018
3. *Research Methodology: A Step-by-Step Guide for Beginners*, Kumar, Pearson Education.
4. *Practical Research Methods*, Dawson, C., UBSPD Pvt. Ltd.
5. *Research Methodology*, Sharma, N. K., KSK Publishers, New Delhi.

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CSL902: Algorithm Analysis & Design

L T P
3 0 0

UNIT-I

Introduction: Algorithms, Analyzing Algorithms, Designing Algorithms, Asymptotic Notations.

Data Structures: Elementary Data Structures, Hash Tables, Binary Search Trees, Red Black Trees, Skip lists, Binomial Heaps, Fibonacci Heaps, Perfect Hashing, Cuckoo Hashing

UNIT-II

Design and Analysis Techniques: Divide-and-conquer, Dynamic Programming, Greedy Method, Amortized Analysis.

Sorting & Searching: Simple Sorting Algorithms, Radix Sorting, Heap sort, Quick sort, Linear and Binary search algorithms.

UNIT-III

Algorithms on Graphs: Elementary Graph Algorithms, Single Source Shortest Paths, All Pairs Shortest Paths, Minimum spanning trees, Steiner trees.

Advanced Algorithms: Matrix operations, String Processing, Approximation Algorithms.

References:

1. Cormen T.H., Leiserson C.E., Rivest R.L., *Introduction to Algorithms*, PHI, 2000
2. Horowitz E., Sahni S., Rajasekaran S., *Computer Algorithms*, Galgotia Publications, 1999.
3. Aho A.V., Hopcroft J.E. Ullman J.D., *The Design and Analysis of Computer Algorithms*, Pearson Education Asia, 1998, 1974.
4. Knuth D.E., *The Art of Computer Programming Volume 1 (Fundamental Algorithms)*, Narosa Publishing House, 1973
5. Knuth D.E., *The Art of Computer Programming Volume 3 (Sorting and Searching)*, Addison-Wesley, 1973.

CSL903: Advanced Software Engineering

L T P
3 0 0

UNIT-I

Software Project Management: Software Project Planning, Conventional Software Management, Evolution of Software Economics, Improvement of Software Economics, Project Metrics.

UNIT-II

Software Configuration Management: Configuration Management, Change Management, Version Management, Build and Release Management.
Software Quality: Introduction, Software Quality Assurance, Quality Models, Study of Quality Metrics.

UNIT-III

Software Reuse: Motivation, Inhibitors, Techniques - Component Based Software Engineering, Process Models, Reuse Metrics
Software Re-engineering: Introduction Re-engineering, Restructuring and Reverse Engineering, Re-engineering existing systems, Data Re-engineering and migration, Software Reuse and Reengineering, Reengineering Metrics.

References:

1. *Software project management*, Walker Royce, Pearson Education, ISBN: 9780201309584, 2004.
2. *Software Re-engineering*, Robert S. Arnold, IEEE Comp. Society, ISBN: 9780818632723, 2003.
3. *Software Engineering: A Practitioner's Approach*, Pressman, 3rd Ed.
4. *An Integrated Approach to Software Engineering*, Pankaj Jalote, Narosa Publishers, 1992.
5. *Fundamentals of Software Engineering*, Ghezzi, Cario, PHI, 1994.
6. *Software Engineering*, Sommerville, Ian, 4th Edition, Addison Wesley, 1992.

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CSL904: Advanced Database Concepts

L	T	P
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UNIT-I

Data Base Analysis and Design Techniques: Database Design Methodologies: Conceptual, Logical, Physical Designs. ER Modeling: Specialization, Generalization, Aggregation, Normalization Theory.

UNIT-II

Distributed Databases Concepts: Functions and Architecture of a DDBMS, Data Allocation, Fragmentation and Query Optimization. Transparencies in DDBMS.

UNIT-III

Object Oriented DBMSS Concepts and Design: Abstraction, Encapsulation, object Identity, Methods, Classification and Inheritance, Overloading, Overriding, Polymorphism. Complex Objects, storing objects in Relational Databases. Pointer swizzling techniques, Persistence schemes, versions and schema evolution, Object Relational Databases and Nested Relational model.

References:

1. *Database Systems*, Thomas Conolly, Carolyn Begg, Pearson Education, Third Edition.
2. *Fundamentals of Database Systems*, Navathe and Ellmassri Pearson Education, Fourth Edition.

CSL905: Advanced Network Technologies

L T P
3 0 0

UNIT-I

Data Link Layer: Framing techniques, Flow control, Error Control, data link protocols, MAC protocols and IEEE standards.

UNIT-II

Network & Transport layer design Issues: Routing algorithms, Congestion control algorithms, Internetworking, Services and elements of Transport protocols.

Network Security, Authentication & E mail Security: Security attacks and their preventions

UNIT-III

IP Security: IP security overview, IP Security Architecture, Authentication Header Encapsulating Security Pay load.

Wireless LANs: Introduction, Benefits, WLANs Configurations and Standards, Security, IEEE 802.11, Wireless LAN Standard, Blue tooth.

References:

1. *Data Communication & Networking*, B.A. Forouzan.

2. *Computer Networks*, A.S. Tanenbaum, Prentice Hall, 1992, 3rd edition.

3. *Data & Computer Communication*, William Stallings, McMillan Publishing Co.

4. *Data Networks*, Black, PHI, 1988.

5. *Data Communications,* Fred Halsall, Pearson Education.

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CSL906: Parallel Processing Architectures

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UNIT-I

Introduction to Parallel Processing: Flynn's classification, SIMD and MIMD operations, Shared Memory vs. message passing multiprocessors, distributed shared memory, Hybrid multiprocessors

Shared Memory Multiprocessors: SMP and CC-NUMA architectures, Cache coherence protocols, Consistency protocols, Data pre-fetching, CC-NUMA memory management, SGI 4700 multiprocessor, Network Processors

UNIT-II

Interconnection Networks: Static and Dynamic networks, switching techniques, Routers, Internet techniques

UNIT-III

Message Passing Architectures: Message passing paradigms, Grid architecture, Workstation clusters, User level software

Scheduling: Multiprocessor Programming Technique, Scheduling and mapping, Internet web servers, P2P, Content aware load balancing

References:

1. *Parallel Computing: Theory and Practice*, Michael J. Quinn, Tata McGraw-Hill, 4th Edition, ISBN: 9780070512948, 2004.

2. *Introduction to Parallel Algorithms*, C. Xavier and S.S.Iyenger, Wiley-Interscience Publication, ISBN: 9780471251828, 1998.

3. *Parallel Programming*, Wilkinision, Prentice Hall, ISBN: 9780131405639, 2004.

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CSL907: Advanced Computer Architecture

L	T	P
3	0	0

UNIT-I

Parallelism in Uniprocessor Systems: Trends in parallel processing, Basic Uniprocessor Architecture, Parallel Processing Mechanism.
Parallel Computer Structures: Pipeline Computers, Array Computers, Multiprocessor Systems

UNIT-II

Architectural Classification Schemes: Multiplicity of Instruction-Data Streams, Serial versus Parallel Processing, Parallelism versus Pipelining
Pipelining: An overlapped Parallelism, Principles of Linear Pipelining, Classification of Pipeline Processors, Superscalar Pipeline Design, Superpipelined Design
Structures for Array Processors: SIMD Array Processors, SIMD Computer Organizations, Inter-PE Communications

UNIT-III

SIMD Interconnection Networks: Static versus Dynamic Networks, Mesh-Connected Illiac Network, Cube Interconnection Networks
Multiprocessor Architectures: Functional Structures: Loosely Coupled Multiprocessors, Tightly Coupled Multiprocessors
Interconnection Networks: Time Shared for Common Buses, Crossbar Switch and Multiport memories.

References:

1. *Computer Architecture and Parallel Processing*, Faye A. Briggs, McGraw-Hill International Editions
2. *Computer Systems Organization & Architecture*, John d. Carpinelli, Addison Wesley