JHARKAHAND UNIVERSITY OF TECHNOLOGY, RANCHI

Syllabus for B. Tech course in Computer Science & Engineering and Information Technology

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5th Sem CSE

Sl. No	Course Code	Category	Subject	L	T	P	Credit
1		Professional Core-I	Computer Organization and Architecture	4	1	0	4
2		Professional Core-II	Compiler Design	3	1	0	3
3		Professional Core-III	Computer Graphics	3	1	0	3
4		Professional Electives-I	List of Professional Electives-I	3	1	0	3
5		Open Elective-1	List of Open Elective-1	3	1	0	3
Laboratory/Sessional							
1		Laboratory-I	Computer Organization and Architecture Lab.	0	0	3	1
2		Laboratory-II	Compiler Design Lab.	0	0	3	1
3		Laboratory-III	Computer Graphics Lab.	0	0	3	1
4		Laboratory-IV	Professional Electives-I Lab.	0	0	3	1
5		Laboratory-V	General Proficiency / Seminar	0	0	2	2
Total Credits (Theory + Sessional)							22

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List of Electives 5th Semester CSE

Professional Elective-I	
Course No.	Subject Name
	Web Technology
	Linux Programming
	System Analysis and Design
	Semantics Web
Open Elective-I	
Course No.	Subject Name
	Data Science
	Computer Architecture*
	Data Base Management Systems*
	Data Communication

*These subjects are open for all the branches other than CSE and IT.

Detailed Syllabus

Computer Science & Engineering					
Code: CS	**Computer Organization and Architecture**	**L**	**T**	**P**	**C**
		4	**1**	**0**	**4**

This course open to all branch except CSE/IT.

Course Outcomes:

1. Ability to describe the organization of computer and machine instructions and programs
2. Ability to analyze Input / Output Organization
3. Analyze the working of the memory system and basic processing unit.
4. Ability to solve problems of multicores, multiprocessors and clusters.
5. Choose optical storage media suitable for multimedia applications.

CO-PO Mapping:

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**P10**	**P11**	**P12**
CO1	-	3	-	2	2	-	-	-	-	-	-	1
CO2	2	2	2	2	2	-	-	-	-	-	-	2
CO3	2	2	2	2	3	-	-	-	-	-	-	2
CO4	3	3	3	2	2	-	-	-	-	-	-	2
Average												

**3: high, 2: moderate, 1 low*

MODULE-I:

Basics of Digital Electronics: Multiplexers and De multiplexers, Decoder andEncoder, Codes, Logic gates, Flip flops, Registers.
Register Transfer and Micro Operations: Bus and Memory Transfer, Logic Micro Operations, Shift Micro Operations, Register transfer and register transfer language, Design of arithmetic logic unit.

MODULE II:

Basic Computer Organization: Instruction codes, Computer instructions, Timing and Control, Instruction cycle, Memory reference Instruction, Complete computer description, Design of basic computer, Input output and interrupt.

MODULE III:

Control Unit: Hardwired controls, Micro programmed controls.
Central Processing Unit : Program control, Reduced instruction set computer, Complex instruction set computer, Data Transfer, Manipulation, General register and stack organization, Addressing mode.

MODULE IV:

Computer Arithmetic: Addition and subtraction algorithm, Multiplication algorithm, Division algorithms.

MODULE V:

Input-Output Organization: Priority interrupt, Peripheral devices, Input output interface, Data transfer schemes, Program control and interrupts, Direct memory access transfer, Input/output processor.
Memory Unit: High speed memories, Memory hierarchy, Processor Vs Memory speed, Cache memory, Associative memory, Inter leave, Virtual memory, Memory management.

MODULE VI :

Introduction to Parallel Processing: Pipelining, Characteristics of multiprocessors, Interconnection structures, Inter processor arbitration, Inter processor communication, Synchronization.

Text Books:

1. Computer System Architecture by Morris Mano, Prentice hall, 3rd Edition, (2007)

References:

1. Computer Organization by Carl Hamacher, ZvonkoVranesic, SafwatZaky, Tata Mcgraw Hill, 5th Edition, (2011)

2. Computer Architecture : A Quantitative Approach by Hennessy, J. L, David A Patterson, and Goldberg, Pearson Education, 4th Edition, (2006)

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Computer Science & Engineering					
Code: CS	**Compiler Design**	**L**	**T**	**P**	**C**
		3	**1**	**0**	**4**

Pre-requisites: knowledge of automata theory, context free languages, computer architecture, data structures and simple graph algorithms, logic or algebra.

MODULE-I:

Introduction to compiler and Finite automata **14 lectures**

Compilers, Analysis of source programs, Tokens, patterns, lexemes, Phases of compilers, Parsing, Parse trees, Ambiguity, Associativity and precedence of operators, Top-down parsing, Bottom-up parsing, Left recursion, Syntax directed translation. Classification of grammars, NFA, DFA, Conversion of NFA to DFA, RE to NFA (Thompson's Construction), Optimization of NFA/DFA using FIRSTPOS, LASTPOS, FOLLOWPOS.

MODULE-II:

Context Free Grammar **4 lectures**

RE vs. CFG, Eliminating ambiguity and left recursion, Left factoring.

MODULE-III:

Compiler Parser **8 lectures**

Top down parsing-LL parser, LL grammars. Bottom up parsing- LR parser, SLR parser, CLR parser, LALR parser. Polishing expressions Operator precedence grammar. LR grammars. Comparison of parsing methods. Error handling.

MODULE-IV:

Run time environments **8 lectures**

Symbol tables, Language facilities for dynamic storage allocation, Dynamic storage allocation technique, Organization for non-block and block structured languages.

MODULE-V:

Intermediate code generation **4 lectures**

Intermediate languages, graphical representations, Synthesized and inherited attributes, Dependency graph, Syntax directed translation, S and L- attributed definitions, Polish notation, three address, quadruples, triples, indirect triples Flow of control statement.

MODULE-VI:

Code optimization and code generation **4 lectures**

Basic blocks and flow graphs, Optimization of basic blocks, Code optimization techniques, Issues in design of code generator, Target machine code and simple code generator.

Suggested Text Books

- Alfred V. Aho, Ravi Sethi, Jeffrey D. Ullman, Monica S. Lam, *Compilers: Principles, Techniques, and Tools*. Addison-Wesley, 2006 (optional).
- Thomas W. Parsons, *Introduction to Compiler Construction*. Computer Science Press,**1992.**

Suggested Reference books

- Compiler design in C, A.C. Holub, PHI.
- Compiler construction (Theory and Practice), A.Barret William and R.M. Bates, Galgotia Publication.
- Compiler Design, Kakde.
-

COURSE OUTCOMES

1	*Identify* the issue that arises in the design and construction of translator for programming language.
2	*Analyze* RE and CFG to specify the lexical and syntactic structure of programming language.
3	*Design* different parsers from given specification.
4	*Assess* the various program transformations.
5	*Design* a compiler for a programming language.

CO-PO MAPPING

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**P10**	**P11**	**P12**
1	-	3	2	2	-	-	-	-	-	1	-	-
2	-	3	-	2	-	-	-	-	-	-	-	-
3	-	-	2	2	-	-	-	-	-	2	-	-
4	-	2	-	2	-	-	-	-	-	-	-	-
5	-	-	2	1	-	-	-	-	-	1	-	-

**3: high, 2: moderate, 1: low*

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Computer Science & Engineering					
Code: CS	**Computer Graphics**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

Objectives of the course:

This course covers basics of computer graphics. Computer graphics are pictures and films created using computers. Usually, the term refers to computer-generated image data created with the help of specialized graphical hardware and software. It is a vast and recently developed area of computer science. Computer graphics is responsible for displaying art and image data effectively and meaningfully to the consumer. It is also used for processing image data received from the physical world. Computer graphics development has had a significant impact on many types of media and has revolutionized animation, movies, advertising, video games, and graphic design in general.

Course Outcomes

After completing this course, the student will be able to:

CO1	Understand the basics of computer graphics, different graphics systems and applications of computer graphics.
CO2	Discuss various algorithms for scan conversion and filling of basic objects and their comparative analysis.
CO3	Use of geometric transformations on graphics objects and their application in composite form.
CO4	Extract scene with different clipping methods and its transformation to graphics display device.
CO5	Render projected objects to naturalize the scene in 2D view and use of illumination models for this

Module – I:
Introduction to computer graphics and graphics systems. Raster and vector graphics systems, video display devices, physical and logical input devices, simple color models.

Module – II:
Points & lines, Line drawing algorithms; DDA algorithm, Bresenham's line algorithm, Circle generation algorithm; scan line polygon, fill algorithm, boundary fill algorithm, flood fill algorithm.

Module – III:
2D Transformation : Basic transformations : translation, rotation, scaling ; Matrix representations & homogeneous coordinates, transformations between coordinate systems ; reflection shear ; Transformation of points, lines, parallel lines, intersecting lines.

Module – IV:
Viewing pipeline, Window to Viewport co-ordinate transformation, clipping operations, point clipping, line clipping, clipping circles, polygons & ellipse.

Module – V:
Hidden Surfaces: Depth comparison, Z-buffer algorithm, Back face detection, BSP tree method, the Printer's algorithm, scan-line algorithm; Hidden line elimination, wire frame methods, fractal - geometry. Rendering of a polygonal surface; Flat, Gouraud, and Phong shading; Texture mapping, bump texture, environment map; Introduction to ray tracing; Image synthesis, sampling techniques, and anti-aliasing.

Text Books

1. Donald Hearn and Pauline Baker Computer Graphics, Prentice Hall, New Delhi, 2012

2. Steven Harrington, "Computer Graphics- A programming approach", McGraw 3. Hill, 2nd Edition, 1987.

Reference Book

3. Foley J.D., Van Dam A, "Fundamentals of Interactive Computer Graphics", Addison Wesley, 1990

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Syllabus for B. Tech course in Computer Science & Engineering and Information Technology

Computer Science & Engineering					
Code: CS	**Web Technology**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

Course Objective: The focus in this course is on the World Wide Web continues to provide a foundation for the developmentofabroadrangeofincreasinglyinfluentialandstrategictechnologies,supporting a large variety of applications and services, both in the private and public sectors. There is a growing need for management and decision makers to gain a clearer understanding of the application development process, from planning through to deployment and maintenance. In this course, you will learn about the HTTP communication protocol, the markup languages HTML, XHTML and XML, the CSS standards for formatting and transforming web content, interactive graphics, multimedia content on the web, client-side programming using Java script; an understanding of approaches to more dynamic and mobile content; and demonstrate how you can analyze requirements, plan, design, implement and test arrange of webapplications.

Course Prerequisite

- Programming for Problemsolving.
- Object Oriented Programming ThroughJava.
- Basic concept ofNetworking.

Course Outcomes

After Successful completion of course, the students will be able to

CO	Description
CO 1	**Describe** various web technology and application development issues and trends.
CO 2	**Design** static and dynamic web pages using HTML, CSS and Java Script.
CO 3	**Design** and implement web services from the server and client side.
CO 4	**Build** interactive Web applications using JSP and Servlet.
CO 5	**Identify** the engineering structural design of XML and parse construction tree model.

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Computer Science & Engineering					
Code: CS	**Linux Programming**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**0**

Course objectives:

CO1: able to understand the basic commands of linux operating system and can write shell scripts.

CO2: able to create file systems and directories and operate them

CO3: Students will be able to create processes background and fore ground etc. by fork() system calls

CO4: able to create shared memory segments, pipes, message queues and can exercise inter process communication

CO PO Mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**P10**	**P11**	**P12**
CO1	2	2	2	-	-	-		-	-	-	-	-
CO2	2	2	2	-	-	-	-	-	-	-	-	-
CO3	3	3	3	-	-	-	-	-	-	-	-	-
CO4	3	3	3	1	-	-	-	-	-	-	-	-

Module - I:Linux Utilities:

File handling utilities, Security by file permissions, Process utilities, Disk utilities, Networking commands, Filters, Text processing utilities, Backup utilities Sed - Scripts, Operations, Addresses, Commands,,awk - Execution, Fields and Records, Scripts, Operations, Actions, Assocoative Array, Strings and Mathematical functions, System commands in awk, Applications. Shell programming with Bourne Again Shell (bash): Introduction, Shell responsibilities, Pipes and redirection, here documents, Running a shell script, Shell as a programming language, Shell meta characters, File-name substitution, Shell variables, Command substitution, Shell commands, The environment, Quoting, test command, Control structures, Arithmetic in shell, Shell script examples, Interrupt processing functions, Debugging shell scripts

Module-II:Files and Directories:

File concepts, File types File system structure, file metadata - Inodes, kernel support for files, System calls for the file I/O operations- open,create,read,wrirte,close,lseek,dup2,file status information-stat family, file and record locking-fcntl function, file permissions- chmod, fchmod, file ownership-chown, lchown, fchown, links-soft links and hard links- symlink, link, unlink. Directories: Creating,,removing and changing Directories-mkdir, rmdir,chdir, obtaining current working directory-getcwd, directorycontents, scanning directories- opendir, readdir, rewin functions.

Module- III:Process:

Process concept, Layout of a C program image in main memory, Process environment – environment list, environment variables, getenv, setenv, Kernel support for process, Process identification, Process control - Process creation, replacing a process image, waiting for process, Process termination, Zombie process, Orphan process, ,system call interface for process management – fork, vfork, exit, wait, waitpid, exec family, process groups, sessions

and controlling Terminal, differences between threads and processes. Signals: Introduction to signals, Signal generation, Signal handling, Kernel support for signals, signal function, Unreliable signals, Reliable signals, and Signal functions: kill, raise, alarm, pause, abort, sleep.

Module- IV:Inter process Communication:

Introduction to IPC,IPC between processes on a single computer system, IPC between processes on different systems, Pipes-creationIPC between related processes using FIFOs(Named pipes), differences between unnamed and named pipes, popen and pclose library functions. Message Queues: Kernel support for messages, APIs for message queues, Client/Server example Semaphores: Kernel support for semaphores, APIs for semaphores, file locking with semaphores.

Module -V:Shared Memory:

Kernel support for Shared Memory, APIs for Shared Memory, Shared Memory example Sockets: Introduction to Berkley Sockets, IPC over a network, client – server model, Socket address structures (Unix domain and internet domain) , Socket system calls for connection oriented protocol and connectionless protocol, example- client/server programs- single server- client connection, multiple simultaneous clients, socket options- setsockopt and fcntl system calls, comparison of IPC mechanisms.

EXT BOOKS:-

1. Unix System Programming using C++, T. Chan, PHI,(UNIT III to UNIT VIII)
2. Unix concepts and Applications, 4th Edition, Sumitabha Das, TMH.
3. Beginning Linux Programming, 4th Edition, N.Matthew, R.Stones, Wrox, Willey India Edition.

REFERRENCE BOOKS:

1. Linux System Programming. Robert Love, O'Reilly, SPD.
2. Advanced Programming in the Unix environment, 2nd Edition, W.R.Stevens, Pearson Education.
3. Unix Network Programming, W.R.Steven, PHI.
4. UNIX for Programming and users, 3rd Edition, Graham Glass, King Ables, Pearson Edition.
5. UNIX and shell Programming, B.A.Forouzan and R.F.Koretsky, S.A.Sarawar, Pearson edition.
6. Unix The Text book, 2nd edition, S.M.Sarawar, Koretsky, S.A.Sarawar, Pearson Edition

Computer Science & Engineering					
Code: CS	**System Analysis and Design**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

COURSE OUTCOMES:

CO 1	Identify the issue that arises in the design of systems as a whole
CO 2	Ability to understand the Software Development Life Cycle
CO 3	Students will be able to understand different types of system designing and Modelling
CO 4	Students will be able to understand Maintenance, Testing and structured Design
CO 5	Ability to understand the Security and Threats

CO-PO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12
CO 1	-	3	2	2	-	-	2	-	-	1	-	-
CO 2	-	3	-	2	-	-	-	-	-	-	-	-
CO 3	-	-	2	2	-	3	-	-	-	2	-	-
CO 4	-	2	-	2	-	-	-	-	-	-	-	-
CO 5	-	-	2	1	-	-	-	-	-	1	-	-

**3: high, 2: moderate, 1: low*

MODULE- I:

INTRODUCTION

System definition and concepts: Characteristics and types of system, Manual and automated systems

Real-life Business sub-systems: Production, Marketing, Personal, Material, Finance

Systems models types of models: Systems environment and boundaries, Real-time and distributed systems, Basic principles of successful systems

MODULE- II:

SYSTEMS ANALYST

Role and need of systems analyst, Qualifications and responsibilities, Systems Analyst as and agent of change,

Introduction to systems development life cycle (SDLC):

Various phases of development: Analysis, Design, Development, Implementation, Maintenance

Systems documentation considerations: Principles of systems documentation, Typesof documentation and their importance, enforcing documentation discipline in anorganization.

System Planning

Data and fact gathering techniques: Interviews, Group communication, Presentations, Sitevisits. Feasibility study and its importance, Types of feasibility reports System Selection plan and proposal Prototyping

Cost-Benefit and analysis: Tools and techniques

MODULE- III:

SYSTEMS DESIGN AND MODELING

Process modeling, Logical and physical design, Design representation, Systems flowcharts and structured charts, Data flow diagrams, Common diagramming conventions and guidelines using DFD and ER diagrams. Data Modeling and systems analysis, designing the internals: Program and Process design, Designing Distributed Systems.

Input and Output Classification of forms: Input/output forms design, User-interface design, Graphical interfaces

MODULE- IV:

MODULAR AND STRUCTURED DESIGN

Module specifications, Module coupling and cohesion, Top-down and bottom-up design

System Implementation and Maintenance

Planning considerations, Conversion methods, producers and controls, System acceptance Criteria, System evaluation and performance, Testing and validation, Systems quality Control and assurance, Maintenance activities and issues.

MODULE- V:

SYSTEM AUDIT AND SECURITY

Computer system as an expensive resource: Data and Strong media Procedures and norms for utilization of computer equipment, Audit of computer system usage,Audit trails

Types of threats to computer system and control measures: Threat to computer system and control measures, Disaster recovery and contingency planning

Object Oriented Analysis and design

Introduction to Object Oriented Analysis and design life cycle, object modeling: Class Diagrams, Dynamic modeling: state diagram, Dynamic modeling: sequence diagramming.

TEXT BOOKS: -

1. System Analysis and Design Methods, Whitten, Bentaly and Barlow, Galgotia Publication.

2. System Analysis and Design Elias M. Award, Galgotia Publication

REFERENCES

3. Modern System Analysis and Design, Jeffrey A. Hofer Joey F. George JosephS. Valacich Addison Weseley.

Computer Science & Engineering					
Code: IT522	**Semantic Web**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

COURSE OUTCOMES:

CO1	*Understand* and *explain* the overall architecture of semantic web and to illustrate the overview of design principles and technologies in semantic web.
CO2	*Design and implement* a small ontology that is semantically descriptive of your chosen problem domain, implement applications that can access, use and manipulate the ontology, represent data from a chosen problem in XML with appropriate semantic tags obtained or derived from the ontology.
CO3	*Describe* the semantic relationships among these data elements using Resource Description Framework (RDF).
CO4	*Design and implement* a web services application that —discoversl the data and/or other web services via the semantic web (which includes the RDF, data elements in properly tagged XML, and the ontology), discover the capabilities and limitations of semantic web technology for different applications.

CO-PO MAPPING:

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**P10**	**P11**	**P12**
CO1	3	-	-	-	-	-	-	-	-	-	-	-
CO2	-	3	3	2	-	-	-	-	-	-	2	-
CO3	3	-	-	-	-	-	-	-	-	-	-	-
CO4	-	3	3	2	-	-	-	-	-	-	2	-
Avg.	1.5	1.5	1.5	1	-	-	-	-	-	-	1	-

**3: high, 2: moderate, 1 low*

DETAIL SYLLABUS:

MODULE-I:

INTRODUCTION

Introduction to the Syntactic Web and Semantic Web – Evolution of the Web – the Visual and Syntactic Web – Levels of Semantics – Metadata for Web Information – the Semantic Web Architecture and Technologies – Contrasting Semantic with Conventional Technologies– Semantic Modeling -Potential of Semantic Web Solutions and Challenges of Adoption Design Principles.

MODULE-2:

KNOWLEDGE REPRESENTATION AND ONTOLOGIES

Knowledge Representation and Reasoning - Ontologies- Taxonomies –Topic Maps – Classifying Ontologies - Terminological Aspects: Concepts, Terms, Relations Between Them – Complex Objects -Subclasses and Sub-properties definitions –Upper Ontologies – Quality – Uses - Types of Terminological Resources for Ontology Building – Methods and Methodologies for Building Ontologies – Multilingual Ontologies -Ontology Development Process and Life Cycle – Methods for Ontology Learning – Ontology Evolution – Versioning Ontologies in Semantic Web.

MODULE-3:

STRUCTURING AND DESCRIBING WEB RESOURCES

Structured Web Documents - XML – Structuring – Namespaces – Addressing – Querying – Processing - RDF – RDF Data Model – Serialization Formats- RDF Vocabulary –Inferencing RDFS – basic Idea – Classes – Properties- Utility Properties – RDFS Modelling for Combinations and Patterns- Transitivity.

MODULE-4:

WEB ONTOLOGY LANGUAGE

OWL – Sub-Languages – Basic Notions -Classes- Defining and Using Properties – Domain and Range – Describing Properties - Data Types – Counting and Sets- Negative Property Assertions – Advanced Class Description – Equivalence – OWL Logic.

MODULE-5:

SEMANTIC WEB TOOLS AND APPLICATIONS

State - of- the- Art in Semantic Web Community-Development Tools for Semantic Web – Jena Framework – SPARL –Querying Semantic Web- Semantic Desktop – Semantic Wikis - Semantic Web Services – Application in Science – Business

TEXTBOOKS:

1. LiyangYu,lA Developer‘s Guide to the Semantic Webl, Springer, First Edition, 2011.

2. John Hebeler, Matthew Fisher, Ryan Blace and Andrew Perez-opez, —Semantic Web Programmingl, First Edition, Wiley, 2009.

3. Grigoris Antoniou, Frank van Harmelen, —A Semantic Web Primerl, Second Edition, MIT Press, 2008. 4. Robert M.Colomb, Ontology and the Semantic Webl, Frontiers in Artificial Intelligence and Applications, IOS Press, 2007.

5. Dean Allemangand James Hendler, Semantic Web for the Working Ontologist: Effective Modeling in RDFS and OWLl, Second Edition, Morgan Kaufmann, 2011.

6. Pascal Hitzler, Markus Krotzsch, Sebastian Rudolph, —Foundations of Semantic Web Technologies, CRC Press, 2009.

REFERENCES:

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1. Michael C. Daconta, Leo J.Obrst and Kevin T. Smith, —The Semantic Web: A Guide to the Future of XML, Web Services, and Knowledge Managementl, First Edition, Wiley, 2003

2. Karin Breitman, Marco Antonio Casanova and Walt Truszkowski, —Semantic Web: Concepts,TechnologiesandApplications(NASAMonographsinSystemsandSoftware Engineering) Springer, 2010.

3. Vipul Kashyap, Christoph Bussler and Matthew Moran, The Semantic Web: Semantics for Data and Services on the Web(Data-Centric Systems and Applications), Springer, 2008.