TULSIRAMJI GAIKWAD-PATIL College of Engineering & Technology

Mohgaon, Wardha Road, Nagpur - 441 108

An Autonomous Institute Affiliated to RTM Nagpur University

UG Programme

B-Tech

in

COMPUTER SCIENCE & ENGINEERING

Structure & Curriculum

From

Academic Year 2021-22

Vision of Institute

"To emerge as a learning Center of Excellence in the National Ethos in domains of Science, Technology and Management."

Mission of Institute

- To strive for rearing standard and stature of the students by practicing high standards of professional ethics, transparency and accountability.
- To provide facilities and services to meet the challenges of Industry and Society.
- To facilitate socially responsive research, innovation and entrepreneurship.
- To ascertain holistic development of the students and staff members by inculcating knowledge and profession as work practices.

Vision of the Department

"To become a centre of excellence for nurturing the quality Computer Science & Engineering professionals to cater the needs of industry and society."

Mission of the Department

- To achieve academic excellence by imparting in-depth knowledge to the students through effective pedagogies and hands on experience on latest tools and technologies.
- Inculcating professional behavior, strong ethical values, innovative research capabilities and leadership abilities in graduates.
- To trained the graduates with the knowledge and skills required to enable them to be industry ready.
- To strengthen the industry-Institute Interaction for stakeholders to become successful entrepreneurs.

Program Education Objectives (PEO)

PEO 1 - Apply mathematical knowledge and logical programming to develop engineering solutions in the computing domain.

PEO 2 - Analyze the real-life problems and apply latest tools for developing software solutions.

PEO 3 - Apply emerging technology by communicating effectively as a team.

PEO 4 - Enhance the quality, security, privacy, cost utility, etiquette and ethics by their computing abilities.

PEO 5 - Adapt emerging technology and advance in careers for fulfilling the societal needs and protecting the environment for lifelong learning.

Program Outcomes (PO)

1. **Engineering Knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
2. **Problem Analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
3. **Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
4. **Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
5. **Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and software tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
6. **The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
7. **Environment and sustainability:** understand the impact of the professional engineering solutions in societal and environmental contexts, demonstrate the knowledge of, and need for sustainable development.
8. **Ethics:** Apply ethical principles and commit to professional ethics, responsibilities, and norms of the engineering practice.
9. **Individual and teamwork:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
10. **Communication:** Communicate effectively on complex engineering activities with the engineering community and with society, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
11. **Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
12. **Lifelong learning:** Recognize the need for, and have the preparation and ability to engage in independent and lifelong learning in the broadest context of technological change.

Program Specific Outcomes (PSO)

PSO 1- Basic Fundamental: To apply fundamental knowledge of computer science to analyze complex problem and design effective solution.

PSO 2 - Design and Implementation: Apply modern tool to solve engineering, societal problem and communicate effectively as team member in software project management.

PSO 3 – Higher Studies and Entrepreneur: The ability to use modern computer technologies to create career paths for higher studies and entrepreneurship, also inculcate moral values and ethics for lifelong learning.

Tulsiramji Gaikwad-Patil College of Engineering & Technology, Nagpur

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SCHEME OF INSTRUCTION & SYLLABI

Programme: Computer Science & Engineering

Scheme of Instructions: Third Year B. Tech. in Computer Science & Engineering

Semester – VI

Sr. No.	Course Category	CourseCode	Course Title	L	T	P	Contact Hrs./Wk	Credits	EXAM SCHEME				
									CT1	CT2	TA/CA	ESE	TOTAL
1	**PCC**	**BCS3601**	Compiler Design	4	-	-	4	4	15	15	10	60	100
2	**PCC**	**BCS3602**	Machine Learning	4	-	-	4	4	15	15	10	60	100
3	**PCC**	**BCS3603**	Compiler Design Lab	-	-	2	2	1	-	-	25	25	50
4	**PCC**	**BCS3604**	Machine Learning Lab	-	-	2	2	1	-	-	25	25	50
5	**PROJ**	**BCS3605**	Mini Project#	-	-	2	2	1+1#	-	-	50	50	100
6	**PEC**	**BCS3606-09**	Professional Elective –III	3	-	-	3	3	15	15	10	60	100
7	**PEC**	**BCS3610-13**	Professional Elective-IV	3	-	-	3	3	15	15	10	60	100
8	**OEC**	**B$$XX01-14**	Open Elective –II	3	-	-	3	3	15	15	10	60	100
9	**MCC**	**BAU3606**	Social Awareness	2	-	-	2	Audit	-	-	-	-	-
			Total	**18**	**-**	**6**	**25**	**21**	**75**	**75**	**175**	**425**	**700**

 # Every Student will undergo Industrial Training/Internship of Two weeks in summer vacation after B. Tech. VI Sem. Examinations, upon successful completion of industrial training/internship 01 credit will be awarded after submission of the report in prescribed format.

L- Lecture T-Tutorial P-Practical

CT1- Class Test 1 TA/CA- Teacher Assessment/Continuous Assessment

CT2- Class Test 2 ESE- End Semester Examination (For Laboratory End Semester performance)

Course Category	HSMC (Hum., Soc. Sc, Mgmt.)	BSC (Basic Sc.)	ESC (Engg. Sc.)	PCC (Programme Core courses)	PEC (Programme Elective courses)	OEC (Open Elective courses from other discipline)	Project / Seminar / Industrial Training	MCC (Mandatory Courses)
Credits	--	--	--	10	06	03	02	Yes
Cumulative Sum	06	26	18	51	12	06	04	--

PROGRESSIVE TOTAL CREDITS: 102+21 =122+1#

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SCHEME OF INSTRUCTION & SYLLABI

Program: Computer Science & Engineering

List of Electives offered by

Computer Science & Engineering

Course Code	Professional Elective- I	Course Code	Professional Elective- II
	Semester V		Semester V
BCS3506	Web Technology	BCS3510	TCP/IP
BCS3507	Design Patterns	BEC3511	Microprocessor and Microcontroller
BCS3508	Computer Graphics	BCS3512	Advance Java Programming
BCS3509	Artificial Intelligence	BCS3513	Parallel and Distributed Database

Course Code	Professional Elective- III	Course Code	Professional Elective- IV
	Semester VI		Semester VI
BCS3606	Advance Web Technology	BCS3610	Advances in Computer Networks
BCS3607	Software Testing and Quality Assurance	BCS3611	Real Time System
BCS3608	Image Processing	BCS3612	Cloud Computing
BCS3609	Neural Network and Fuzzy Logic	BCS3613	Data Mining and Data Warehousing

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Third Year B.Tech (Sixth Semester)				
BCS3601: Compiler Design				
Teaching Scheme			**Examination Scheme**	
Lectures	4 Hr / Week		**ESE**	60 Marks
Tutorial	-		**CIE**	40 Marks
Practical	-		**Total**	100 Marks
Theory Credits: 4			**Duration of Exam :** 3 Hours	

Course Objectives	
The Objectives of this course is:	
1.	Understand phases of compiler, Generate scanner for simple tokens using flex.
2.	Design parser for simple CFG, Generate parser using Bison/YACC.
3.	Generate intermediate code for basic programming constructs.
4.	Perform optimization on intermediate code for space and time.
5.	Generate machine code for small segments of Three address code and Symbol Table

Course Outcomes	
At the end of the unit, students will be able to :	
BCS3601.1	**Understand** the major phases of compilers and **use** the knowledge of the Lex tool
BCS3601.2	**Develop** the parsers and **experiment with** the knowledge of different parsers design without automated tools.
BCS3601.3	**Construct** intermediate code for basic programming constructs in C/PASCAL
BCS3601.4	**Analyze** TAC for space and time
BCS3601.5	**Develop** machine code for small segments of TAC and Symbol Table

Course Contents	
Unit I	**Introduction to Compiler** Interpreter, Assembler, Compiler, Types of compiler, Analysis of Source Program, Phases of Compiler, Grouping of phases, Compiler Construction tools, Lexical Analysis: The role of the Lexical analyzer, Input buffering, Specification of Tokens, A Language for Specifying Lexical Analyzers, Design of a Lexical Analyzer generator.
Unit II	**Syntax Analysis** The role of the Parser, Context-free grammars, Writing a Grammar, Top-Down Parsing, Bottom-Up Parsing, Operator-precedence Parsing, LR Parsers, Using Ambiguous Grammars, Parser Generators.
Unit III	**Semantic Analysis** Definitions, Construction of Syntax Trees, Bottom-Up Evaluation of S- Attributed definitions, Top-Down Translation, Intermediate Languages, Declarations, Assignment Statements, Boolean Expressions, Case Statements, Back patching, Procedure Calls.

Unit IV	**Code optimization** Sources of optimization, loop optimization, control flow analysis, data flow analysis, setting up data flow equations to compute reaching definitions, available expressions, Live variables, Induction Variable, Common sub expression elimination
Unit V	**Code Generation** problems in the Design of a Code Generator, The target Machine, Run-Time Storage Management, Basic Blocks and Flow Graphs, Next-Use information, Simple Code Generator, Register allocation and Assignment, The DAG Representation of Basic Blocks, Generating Code from DAGs, Dynamic Programming, Code- Generation Algorithm, Code-Generators.

Text Books	
T.1	Compilers – Principles, Techniques and Tools; Aho, Sethi, and Ullman; Second Edition, Pearson Education, 2008
T.2	Principles of Compiler Design; Alfred V. Aho and Jeffery D. Ullman; Narosa Publishing House, 1977
T.3	Compiler Design, O. G. Kakde, Laxmi Publication
Reference Books	
R.1	Principles of Compiler Design, V. Raghavan, Tata McGraw Hill, 2009.
R.2	Compiler Design using Flex and Yacc; Vinu V. Das; PHI Publication, 2008.

Useful Links	
1	https://www.geeksforgeeks.org/last-minute-notes-compiler-design-gq/
2	https://www.tutorialspoint.com/compiler_design/compiler_design_quick_guide.htm

Course Coodinator-BCS3601 H.O.D

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Third Year B.Tech (Sixth Semester)				
BCS3602: Machine Learning				
Teaching Scheme			**Examination Scheme**	
Lectures	4 Hr / Week		**ESE**	60 Marks
Tutorial	-		**CIE**	40 Marks
Practical	-		**Total**	100 Marks
Theory Credits: 4			**Duration of Exam :** 3 Hours	

Course Objectives	
The Objectives of this course is:	
1.	To introduce students to the basic concepts and techniques of Machine Learning.
2.	To develop skills of using recent machine learning software for solving practical problems.
3.	Use Supervised classification algorithms.
4.	Use unsupervised Clustering algorithms.
5.	To gain experience of doing independent study and research.

Course Outcomes	
At the end of the unit, students will be able to :	
BCS3602.1	**Understand** the concept of Machine Learning.
BCS3602.2	**Evaluate** the results of the Supervised Learning algorithms
BCS3602.3	**Design** Unsupervised machine learning solutions to clustering problems
BCS3602.4	**Apply** the Instance-Based learning algorithms on data.
BCS3602.5	**Design** Trends and Application in Machine Learning.

Course Contents	
Unit I	**Introduction:** Machine Learning, Overview, applications, Types of machine learning (Supervised, Unsupervised and reinforcement), basic concepts in machine learning, Examples of Machine Learning ,Issues in Machine Learning, Applications ,Types of data: Numerical and categorical data .
Unit II	**Supervised Learning: Classification** Content based and collaborative techniques: Logistic regression, K-nearest neighbor (KNN), Naïve Baye's Decision trees, Support Vector machine, Data pre-processing: Dimensionally reduction, Regression: Simple Linear Regression, Multiple linear regression, Polynominal regression model**.**
Unit III	**Unsupervised Learning:** Introduction of Unsupervised Learning, Clustering, K-means clustering , Apriori algorithm and association rule , anomaly detection algorithm, Hierarchial clustering , K-Medoids
Unit IV	**Instance-Based Learning:** Nearest neighbor classification, k-nearest neighbor, nearest neighbor error probability Machine, Machine learning concepts and limitations: Learning theory,

	formal model of the learnable, sample complexity, learning in zero-bayes and realizable case, VC-dimension
Unit V	**Trends And Application in Machine Learning** Ensemble learning, Bagging, randomization, Boosting, Applications of Machine learning: Image recognition, speech recognition, Prediction recommendation: email spam and malware filtering, virtual personal assistant, online fraud detection.

Text Books	
T.1	Machine Learning – Tom M. Mitchell, - MGH
T.2	Ethem Alpaydin, "Introduction to Machine Learning", Prentice Hall of India, 2005
Reference Books	
R.1	Christopher Bishop, "Pattern Recognition and Machine Learning" Springer, 2006
R.2	Kevin P. Murphy, "Machine Learning: A Probabilistic Perspective", MIT Press, 2012
R.3	Stephen Marsland, "Machine Learning –An Algorithmic Perspective", CRC Press, 2009

Useful Links	
1	https://nptel.ac.in/courses/106/106/106106139/
2	https://nptel.ac.in/courses/106/105/106105152/

Course Coodinator-BCS3602 H.O.D

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Third Year B.Tech. (Sixth Semester)				
BCS3606: Advance Web Technology				
Teaching Scheme			**Examination Scheme**	
Lectures	3 Hr / Week		**ESE**	60 Marks
Tutorial	-		**CIE**	40 Marks
Practical	-		**Total**	100 Marks
Theory Credits : 3			**Duration of Exam :** 3 Hours	

Course Objectives	
The Objectives of this course is:	
1.	Understand the basic concept of Dot Net framework
2.	Ability to create web page using asp .net and work with .net object and components
3.	Ability to work with ado .net object and data manipulation operation also develop email sending web page

Course Outcomes	
At the end of the unit, students will be able to :	
BCS3606.1	**Understand** the working of dot net framework and it components for development
BCS3606.2	**Identify** platform for web page development.
BCS3606.3	**Adapt** knowledge of asp.net object and server components
BCS3606.4	**Make use of** ADO.net object and database operation
BCS3606.5	**Make use of** CDONTS object, CDOSYS object. -Email sending web page creation.

Course Contents	
Unit I	**Introduction to Dot Net and C#:** Introduction to Dot Net Framework Architecture of Dot NET Framework, CLR-Working and Features, CTS, CLS, Assemblies-Types, Structure and Metadata, GAC C# Basics Data Types (Value Types and Reference Types), Control Structures, Operators and Expressions, Arrays.
Unit II	**Object Oriented Programming C#: Classes and Objects** - Instance Variables, Methods, Constructors, Properties, Access Specifiers, Static members and methods. **Inheritance** - Levels of Inheritance, Constructor and Inheritance, Polymorphism, Interfaces, Abstract classes, Delegates, Indexers, Sealed Classes, Exception handling. **Collections and Generics** - Bounded and Unbounded Collections, Generic Programming- Generic classes, Functions, Constraints on Generic Programming.
Unit III	**Databases and C#: File Handling** - Text Files, Binary Files, String Processing, Serialization and Deserialization.

	ADO.Net - Connected and Disconnected, Architecture of ADO.Net, Commands, Datasets, Data Readers, Data Adapters, Working with Stored Procedures **LINQ and the ADO.NET Entity –** Framework LINQ Introduction, Mapping Your Data Model to an Object Model, Introducing Query Syntax.
Unit IV	**Asp.Net Web Applications:** Life cycle of Asp.Net web pages, Role of client side scripting, postback posting and cross page posting, asp.net compilation model, asp.net HTML Controls, Server Controls (basic controls, Calendar, Ad Rotator, File Upload, Validation Controls.
Unit V	**Data and State Management in ASP.NET:** ASP.NET Websites with Themes and Master Pages, Data Source Controls, Data Bound Controls, ASP.NET State Management-Client Side and Server Side. ASP.NET and AJAX.

Text Books	
T.1	Pro C# 5.0 and the .NET 4.5 Framework – Andrew Trolsen, APress.
T.2	Programming C# 5.0: Building Windows 8, Web, and Desktop Applications for the .NET
T.3	ASP.NET: The Complete Reference Paperback by Matthew Macdonald (Author)
Reference Books	
R.1	Learn ASP.NET 4.0, C# and Visual Studio 2010 Essential Skills with The Smart Method
R.2	Professional C# 2008,Christian Nagel, Bill Evjen, Jay Glynn, Karli Watson, Morgan Skinner,ISBN: 978-1-118-64321-1 ,Wrox Publication

Useful Links	
1	https://www.youtube.com/playlist?list=PLdo4fOcmZ0oVxKLQCHpiUWun7vlJJvUiN
2	https://www.youtube.com/playlist?list=PLdo4fOcmZ0oW8nviYduHq7bmKode-p8Wy

Course Coodinator – BCS3606 H.O.D

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Third Year B.Tech (Sixth Semester)				
BCS3607: Software Testing and Quality Assurance				
Teaching Scheme			**Examination Scheme**	
Lectures	3 Hr / Week		**ESE**	60 Marks
Tutorial	-		**CIE**	40 Marks
Practical	-		**Total**	100 Marks
Theory Credits : 3			**Duration of Exam :** 3 Hours	

Course Objectives	
The Objectives of this course is:	
1.	To give students the basic knowledge of Software testing & quality assurance
2.	To enable students to the process of design of software system
3.	To classify measurement scales and models, software metrics and measures addressing Software quality and reliability.

Course Outcomes	
At the end of the unit, students will be able to :	
BCS3607.1	**Understand** testing strategy and Apply testing techniques.
BCS3607.2	**Apply** manual and automation techniques.
BCS3607.3	**Adapt** test processes to carried out testing.
BCS3607.4	**Apply** software testing cycle for making use of standards and baselines.
BCS3607.5	**Classify** measurement scales and models, software metrics and measures software quality and reliability.

Course Contents	
Unit I	**Software Testing Strategy and Environment**: Minimizing Risks, Writing a Policy for Software Testing, Economics of Testing, Testing-an organizational issue, Management Support for Software Testing, Building a Structured Approach to Software Testing, Developing a Test Strategy Building Software Testing Process: Software Testing Guidelines, workbench concept, Customizing the Software Testing Process, **Software Testing Techniques**: Dynamic Testing – Black Box testing techniques, White Box testing techniques, Static testing, Validation Activities, Regression testing
Unit II	**Software Testing Tools:** Selecting and Installing Software Testing tools –Automation and Testing Tools – Load Runner, Win runner and Rational Testing Tools, Silk test, Java Testing Tools, JMetra, JUNIT and Cactus.
Unit III	**Testing Process :** Seven Step Testing Process – I: Overview of the Software Testing Process, Organizing of Testing, Developing the Test Plan, Verification Testing, Validation Testing.

Unit IV	**Seven Step Testing Process – II:** Analyzing and Reporting Test results, Acceptance and Operational Testing, Post-Implementation Analysis Specialized Testing Responsibilities: Software Development Methodologies, Testing Client/Server Systems
Unit V	**Software Quality Assurance and Standards:** The Software Quality challenge, What is Software Quality, Software Quality factors, The components of Software Quality Assurance system, Software Quality Metrics, Costs of Software Quality, Quality Management Standards, Management and its role in Software Quality Assurance, Quality Standards: ISO 9000 and Companion ISO Standards, CMM, CMMI, PCMM, Malcom Balridge, 3 Sigma, 6 Sigma and other latest quality standard

Text Books	
T.1	Burnstein, "Practical Software Testing", Springer International Edition
T.2	William E. Perry, " Effective Methods for Software Testing", John Wiley and Sons
T.3	Daniel Galin, Software Quality Assurance: From theory to implementation, Pearson Education Limited
Reference Books	
R.1	KshirasagarNaik, PriyadarshiTripathy, Software Testing and Quality Assurance-Theory and Practice, John Wiley & Sons
R.2	Desikan, Ramesh, "Software Testing: principles and Practices", Pearson Education,
R.3	Anne Mette Jonassen Hass, Guide to Advanced Software Testing, ARTECH HOUSE, INC

Useful Links	
1	www.nptelvideos.in
2	www.coursera.com

Course Coodinator – BCS3607 H.O.D

Third Year B.Tech (Sixth Semester)				
BCS3608: Image Processing				
Teaching Scheme			**Examination Scheme**	
Lectures	3 Hr / Week		**ESE**	60 Marks
Tutorial	-		**CIE**	40 Marks
Practical	-		**Total**	100 Marks
Theory Credits: 3			**Duration of Exam :** 3 Hours	

Course Objectives	
The Objectives of this course is:	
1.	This course introduces student's detailed knowledge of Image Processing fundamental steps and components.
2.	Analyze algorithms that perform basic image processing (e.g. noise removal and image enhancement).
3.	Design and implement algorithms for advanced image analysis (e.g. image compression, image segmentation).

Course Outcomes	
At the end of the unit, students will be able to :	
BCS3608.1	**Identify** the fundamental components and steps involved in Digital Image Processing.
BCS3608.2	**Apply** the concept of filtering in different domains.
BCS3608.3	**Analyze** Image Restoration and Reconstruction process.
BCS3608.4	**Adopt** the concept of Image Compression.
BCS3608.5	**Analyze** Image Segmentation and Representation.

Course Contents	
Unit I	**Introduction:** What is Digital Image Processing, Applications of Digital Image Processing, Fundamental Steps in Digital Image Processing, Components of Image Processing System. **Digital Image Fundamentals**: Elements of Visual Perception, Image Sampling and Quantization, Basic Relationships between Pixels. **Intensity Transformations:** Basic Intensity Transformation Functions, Piecewise-Linear Transformations.
Unit II	**Spatial Filtering:** Histogram Processing – Histogram Equalization, Histogram Specification, Using Histogram Statistics for Image Enhancement, Fundamental of Spatial Filtering, Smoothing Spatial Filters, Sharpening Spatial Filters.
Unit III	**Filtering in Frequency Domain:** Preliminary Concepts, Discrete Fourier Transform of One Variable, Extensions to Functions of Two Variables, Properties of 2-D DFT, Basics of Filtering in Frequency Domain, Image Smoothing using Frequency Domain Filters, Image Sharpening using Frequency Domain Filters; Selective Filtering.

Unit IV	**Representation and Description:** Boundary Following; Chain Codes; Polygonal Approximations using MPP; Signatures; Skeletons; Shape Numbers; Topological Descriptors.
Unit V	**Image Segmentation:** Point, Line and Edge Detection – Detection of Isolated Points, Line Detection, Edge Models, Basic Edge Detection, Edge Linking and Boundary Detection, Thresholding, Region-Based Segmentation – Region Growing, Region Splitting and Merging.

Text Books	
T.1	Digital Image Processing; Rafael C. Gonzalez and Richard E. Woods; Third Edition; Pearson Education (India); 2014.
T.2	Digital Image Processing and Analysis; B. Chanda and D. Dutta Majumdar; Prentice Hall of India, 2001.
T.3	Digital Image Processing; S. Jayaraman, S. Essakkirajan and T. Veerakumar; Tata McGraw Hill; 2009.
Reference Books	
R.1	Digital Image Processing and Computer Vision; Milan Sonka, Vaclav Hlavac and Roger Boyle; Cengage Learning; 2008.
R.2	Digital Image Processing; Kenneth R. Castleman; Pearson Education (India); 1996.

Useful Links	
1	https://nptel.ac.in/courses/106/105/106105032/
2	https://nptel.ac.in/courses/117/105/117105135/

Course Coodinator-BCS3608 H.O.D

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and Technology, Nagpur

Third Year B.Tech (Sixth Semester)				
BCS3609: Neural Network and Fuzzy Logic				
Teaching Scheme			**Examination Scheme**	
Lectures	3 Hr / Week		**ESE**	60 Marks
Tutorial	-		**CIE**	40 Marks
Practical	-		**Total**	100 Marks
Theory Credits: 3			**Duration of Exam :** 3 Hours	

Course Objectives	
The Objectives of this course is:	
1.	Understand Biological Neural network and Artificial Neural Network, MP Model
2.	Understand Supervise Learning
3.	Understand un-supervise Learning
4.	Know Fuzzy set and operations on fuzzy set.
5.	Understand the concept of Genetic Algorithm.

Course Outcomes	
At the end of the unit, students will be able to :	
BCS3609.1	**Understand** the basic fundamental of Neural network.
BCS3609.2	**Make Use of** Neural Network techniques
BCS3609.3	**Apply & Analyze** Competitive of network
BCS3609.4	**Analyze** Fuzzy set and operations on fuzzy set.
BCS3609.5	**Understanding** the Concept of Genetic Algorithms.

Course Contents	
Unit I	**BASIC NEURAL NETWORK TECHNIQUES:** Introduction and how brain works, Neuron as a simple computing element, The perceptron, Backpropagation networks: architecture, multilayer perceptron, backpropagation learning-input layer, accelerated learning in multilayer perceptron, The Hopfield network.
Unit II	**ARCHITECTURE OF NEURAL NETWORKS:** Biological neuron – Artificial neuron – Neuron modeling – Learning rules – Single layer – Multi layer feed forward network Learning factors. McCulloach – Pits model, Perceptron, Adaline, Madaline.
Unit III	**COMPETITIVE NEURAL NETWORKS:** Neural network based on competition: fixed weight competitive nets- Kohonenself organizing maps and applications-learning vector quantization-counter propagation nets and applications **SPECIAL NEURAL NETWORKS**: Cognitron and Neocognitron - Architecture, training algorithm and application-fuzzy associate memories, fuzzy system architecture-comparison of fuzzy and neural systems..
Unit IV	**FUNDAMENTALS OF FUZZY LOGIC:** Classical and fuzzy sets: Introduction, Operations and Properties, Fuzzy Relations: Cardinality, Operations and Properties, Fuzzification: Membership value assignment- Inference, rank ordering, angular fuzzy sets. Defuzzification methods, Fuzzy measures, Fuzzy integrals, Fuzziness and fuzzy

	resolution; possibility theory and Fuzzy arithmetic; composition and inference; Use open-source tool **Fuzzy Lite** for modelling
Unit V	**GENETICS ALGORITHMS:** basic concepts, encoding, fitness function, Genetic modeling: Cross over, Inversion & Deletion, Mutation Operator, Bit wise Operators, Convergence of Genetic Algorithm. reproduction-Roulette wheel, Boltzmann, tournament, rank, and steady state selections, Convergence of GA, Applications of GA case studies. Introduction to genetic programming- basic concepts

Text Books	
T.1	Jacek M. Zurada, 'Introduction to Artificial Neural Systems', Jaico Publishing home, 2002.
T.2	Timothy J. Ross, 'Fuzzy Logic with Engineering Applications', Tata McGraw Hill, 1997.
T.3	R. Rajasekaran and G. A and Vijayalakshmi Pa, *Neural Networks, Fuzzy Logic, and Genetic Algorithms: Synthesis and Applications*, Prentice Hall of India
Reference Books	
R.1	Laurance Fausett, Englewood cliffs, N.J., 'Fundamentals of Neural Networks', Pearson Education, 1992.
R.2	John Yen & Reza Langari, 'Fuzzy Logic – Intelligence Control & Information', Pearson Education, New Delhi, 2003.

Useful Links	
1	https://www.fuzzylite.com
2	https://nptel.ac.in/courses/117/105/117105084/, https://onlinecourses.nptel.ac.in/noc20_ge09/
3	https://nptel.ac.in/courses/127/105/127105006/,

Course Coodinator – BCS3609 H.O.D

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Mohagaon, Wardha Road, Nagpur

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College Of Engineering
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Third Year B.Tech. (Sixth Semester)				
BCS3610: Advanced in Computer Network				
Teaching Scheme			**Examination Scheme**	
Lectures	3 Hr / Week		**ESE**	60 Marks
Tutorial	-		**CIE**	40 Marks
Practical	-		**Total**	100 Marks
Theory Credits: 3			**Duration of Exam:** 3 Hours	

Course Objectives	
The Objectives of this course is:	
1.	This course introduces student ‘s detailed knowledge of Advance Computer Networks, various protocols used in Communication.
2.	Various Network Management protocols with their services.
3.	To understand Security aspects.

Course Outcomes	
At the end of the unit, students will be able to:	
BCS3610.1	**Understand** the advanced computer network knowledge.
BCS3610.2	**Analyze and implement** routing algorithms
BCS3610.3	**Evaluate** the performances of computer networks
BCS3610.4	**Design** the network protocols using network simulators
BCS3610.5	**Discover** the knowledge in the field of Software Defined Network

Course Contents	
Unit I	**Introduction:** Brief history of Computer Networks, Network Layer, Transport Layer, and Applications Layer: HTTP and other protocols, Layering abstraction. Network architecture and protocols, Packet switching, Internetworking protocols
Unit II	Addressing, IP versions, routing, Routing in the Internet: Intra and inter domain routing; **Unicast Routing Protocols:** RIP, OSPF, BGP, Socket programming.
Unit III	**Network Management and Services :** SNMP : Concept, Management components, Multi-media over Internet : RTP, RSVP, IP Multicasting, VOIP
Unit IV	Cryptography, Enterprise Network Security : DMZ, NAT, Proxy
Unit V	Storage and Networking, Software Defined Networks, Open Stack Networking, Neutron.

Text Books	
T.1	B. A. Forouzan , “TCP/IP Protocol Suite”, Tata McGraw Hill edition, Third Edition
T.2	N. Olifer V. Olifer, “Computer Networks: Principles, Technologies and Protocols for Network design”, Wiley India Edition (1st Edition)
T.3	S. Tanenbaum , “Computer Networks”, Pearson Education, Fourth Edition

Reference Books	
R.1	Marc Farley, Building Storage Networks , Tata McGraw Hill
R.2	Thomas D N Adeau and Ken Grey, Software Defined Networking, O'Reilly, 2013
R.3	SDN and NFV Simplified SDN and NFV Simplified Jim Doherty Copyright © 2016 Pearson Education, Inc. ISBN-13: 978-0-13-430640-7

Useful Links	
1	https://onlinecourses.nptel.ac.in/noc23_cs35/preview

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Third Year B.Tech (Sixth Semester)				
BCS3611: Real Time System				
Teaching Scheme			**Examination Scheme**	
Lectures	3 Hr / Week		**ESE**	60 Marks
Tutorial	-		**CIE**	40 Marks
Practical	-		**Total**	100 Marks
Theory Credits: 3			**Duration of Exam :** 3 Hours	

Course Objectives	
The Objectives of this course is:	
1.	To develop the understanding of fundamentals and technological aspects of real time operating systems.
2.	To understand the architectures and building blocks of RTOS.
3.	To understand process management of real time operating system.
4.	To gain knowledge of how to manage memory in a real time environment.

Course Outcomes	
At the end of the unit, students will be able to :	
BCS3611.1	**Understand** the concept of a Real time system.
BCS3611.2	**Analyze** Scheduling used in real time OS.
BCS3611.3	**Analyze** Real-Time System Design Approach.
BCS3611.4	**Apply** Programming Language and tools for Real Time System.
BCS3611.5	**Analyze** Fault Tolerance Techniques in Real Time System.

Course Contents	
Unit I	**Introduction to Real Time Systems:** Real time systems, soft vs. hard real time systems, Concept of computer control, sequence, loop and supervisor control, centralized, hierarchical and distributed systems, applications of real time systems, hardware requirement for real time applications, specialized processors, interfaces, communications.
Unit II	**Real Time Scheduling:** Clock Driven approach, Weighted Round robin approach, Priority Driven approach, Concept of effective release time and deadline, Optimality and non-optimality of EDF & LST. **Real Time operating System:** Task management, Real Time Clock Handler, Code sharing, Resource Control, Inter task Communication and control.
Unit III	**Design of Real Time System:** Specification, Preliminary Design, multitasking Approach, monitors, Rendezvous. **Design Analysis:** Introduction, Petri nets, Analysis of Petri Nets, Scheduling problem, Real Time Database, Real Time Vs General Purpose Databases, Transaction priorities and Aborts, Concurrency Control, Disk Scheduling Algorithms, Maintaining Serialization Consistency.
Unit IV	**Programming Language and Tools:** Desired language characteristics, Data typing,

	Control structures, Facilitating hierarchical decomposition, packages, Run time error handling, Overloading and generics, Multitasking, Low level programming, Task scheduling, Timing specifications, Programming environments, Run time support.
Unit V	**Fault Tolerance Techniques:** Introduction, Faults, Errors and Failures, Fault types, Detection and Containment, Redundancy, Integrated Failure Handling. **Commercial Real Time Systems:** General concepts, Unix and Windows as RTOS.

Text Books	
T.1	J. J Labrosse, "MicroC/OS-II: The Real –Time Kernel", Newnes, 2002.
T.2	Real-Time Systems, Jane W. Liu, Pearson Education, 2001.
Reference Books	
R.1	Real-Time Systems: Theory and Practice, Rajib Mall, Pearson, 2008.
R.2	Real-Time Systems, Krishna and Shin, Tata McGraw Hill. 1999.

Useful Links	
1	https://nptel.ac.in/courses/106/105/106105172/

Course Coodinator -BCS3611 H.O.D

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Third Year B.Tech. (Sixth Semester)				
BCS3612: Cloud Computing				
Teaching Scheme			**Examination Scheme**	
Lectures	3 Hr / Week		**ESE**	60 Marks
Tutorial	-		**CIE**	40 Marks
Practical	-		**Total**	100 Marks
Theory Credits: 3			**Duration of Exam:** 3 Hours	

Course Objectives	
The Objectives of this course is:	
1.	To develop the understanding of fundamentals and technological aspects of Cloud Computing
2.	To understand the architectures of Cloud Computing and cloud service models along with deployment models
3.	To understand virtualization and how abstraction is provided in cloud computing.
4.	To gain knowledge of how to create cloud using windows azure
5.	To gain knowledge of how to create cloud using amazon web services

Course Outcomes	
At the end of the unit, students will be able to :	
BCS3606.1	**Understand** the concept of cloud computing.
BCS3606.2	**Analyze** need, types and tools of Virtualization for cloud.
BCS3606.3	**Apply** Services Oriented Architecture and various types of cloud services.
BCS3606.4	Explain Inter cloud resources management cloud storage services and their providers Assess security services and standards for cloud computing.
BCS3606.5	**Analyze** advanced cloud technologies.

Course Contents	
Unit I	**Introduction To Cloud Computing:** Definition of Cloud – Evolution of Cloud Computing – Underlying Principles of Parallel and Distributed Computing – Cloud Characteristics – Elasticity in Cloud – On-demand Provisioning.
Unit II	**Cloud Enabling Technologies Service Oriented Architecture:** REST and Systems of Systems – Web Services – Publish, Subscribe Model – Basics of Virtualization – Types of Virtualization – Implementation Levels of Virtualization – Virtualization Structures – Tools and Mechanisms – Virtualization of CPU – Memory – I/O Devices –Virtualization Support and Disaster Recovery.
Unit III	**Cloud Architecture, Services and Storage:** Layered Cloud Architecture Design – NIST Cloud Computing Reference Architecture – Public, Private and Hybrid Clouds – laaS – PaaS – SaaS – Architectural Design Challenges – Cloud Storage – Storage-as-a-Service – Advantages of Cloud Storage – Cloud Storage Providers – S3.

Unit IV	**Resource Management and Security in Cloud:** Inter Cloud Resource Management – Resource Provisioning and Resource Provisioning Methods – Global Exchange of Cloud Resources – Security Overview – Cloud Security Challenges – Software-as-a-Service Security – Security Governance – Virtual Machine Security – IAM – Security Standards.
Unit V	**Cloud Technologies and Advancements Hadoop:** MapReduce – Virtual Box — Google App Engine – Programming Environment for Google App Engine — Open Stack – Federation in the Cloud – Four Levels of Federation – Federated Services and Applications – Future of Federation.
Text Books	
T.1	Ritting house, John W., and James F. Ransome, ―Cloud Computing: Implementation, Management and Security, CRC Press, 2017.
T.2	Kai Hwang, Geoffrey C. Fox, Jack G. Dongarra, "Distributed and Cloud Computing, From Parallel Processing to the Internet of Things", Morgan Kaufmann Publishers, 2012.
Reference Books	
R.1	Rajkumar Buyya, Christian Vecchiola, S. ThamaraiSelvi, ―Mastering Cloud Computing, Tata Mcgraw Hill, 2013.
R.2	Toby Velte, Anthony Velte, Robert Elsenpeter, "Cloud Computing – A Practical Approach, Tata Mcgraw Hill, 2009.
R.3	George Reese, "Cloud Application Architectures: Building Applications and Infrastructure in the Cloud: Transactional Systems for EC2 and Beyond (Theory in Practice), O'Reilly, 2009.

Useful Links	
1	https://nptel.ac.in/courses/106/105/106105223/
2	https://nptel.ac.in/courses/106/105/106105167/
3	https://nptel.ac.in/courses/106/105/106105081/

Course Coodinator – BCS3612 H.O.D

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