Uttarakhand Technical University, Dehradun

Scheme of Examination as per AICTE Flexible Curricula

Evaluation Scheme & Syllabus for B. Tech Third Year

W.E.F. Academic Session 2020-21

V & VI SEMESTER

Bachelor of Technology (B. Tech.)

[Computer Science and Engineering]

Uttarakhand Technical University, Dehradun

New Scheme of Examination as per AICTE Flexible Curricula

Bachelor of Technology (B.Tech.) III Year

[Computer Science & Engineering]

W.E.F. Academic Session 2020-21

V Semester

S. No.	Subject Code	Category	Subject Name	Maximum Marks Allotted					Total Marks	Contact Hours per Week			Total Credit
				Theory			Practical						
				End Sem	Mid Sem	Quiz / Assignment	End Sem	Term Work /Lab Work & Sessional		L	T	P	
1.	CS 501	DC	Operating System	100	30	20	30	20	200	3	1	2	5
2.	CS-502	DC	Computer Networks	100	30	20	30	20	200	3	1	2	5
3.	CS-503	DC	Design and Analysis of Algorithms	100	30	20	30	20	200	3	1	2	5
4.	CS-504	DE	Departmental Elective-I	100	30	20	-	-	150	3	1	0	4
5.	CS-505	OE	Open Elective-I	100	30	20	-	-	150	3	1	0	4
6.	CS-506	D Lab	Departmental Lab (Unix/ Linux/python/JAVA etc)	-	-	-	30	20	50	0	0	2	1
8	CS-508	IN	Evaluation of Internship-II completed at II year level	-	-	-	-	50	50			2	1
9		IN	Internship -III	To be completed any time during Fifth/ Sixth semester. Its evaluation/credit to be added in Seventh semester.									
Total				500	150	100	120	130	1000	15	5	10	25
NSS/NCC													

Departmental Electives	
CS 504 (A)	Network Architecture
CS 504 (B)	Pattern Recognition
CS 504 (C)	Internet and Web Technology
CS 504 (D)	Java Programming

Open Electives	
CS-505 (A)	Principles of Programming Language
CS-505 (B)	Modeling and Simulation
CS-505 (C)	Innovation and Entrepreneurship
IT 505 (D)	Cyber Security

VI Semester

S. No.	Subject Code	Category	Subject Name	Maximum Marks Allotted					Total Marks	Contact Hours per Week			Total Credit
				Theory			Practical						
				End Sem	Mid Sem	Quiz / Assignment	End Sem	Team Work / Lab Work & Sessional		L	T	P	
1.	CS 601	DC	Microprocessors and Applications	100	30	20	30	20	200	3	1	2	5
2.	CS-602	DC	Compiler Design	100	30	20	30	20	200	3	1	2	5
	CS-603	DC	Data Analytics	100	30	20	30	20	200	3	1	2	5
3.	CS-604	DE	Departmental Elective	100	30	20		-	150	3	1	0	4
4.	CS-605	OE	Open Elective	100	30	20	-	-	150	3	1	0	4
5.	CS-606	O/E Lab	Open Elective Lab/ Matlab Programming	-	-	-	30	20	50	0	0	2	1
6.	CS-607	P	Minor Project -I					50	50		0	2	1
8		IN	Internship – III	To be completed anytime during Fifth/Sixth semester. Its evaluation/credit to be added in Seventh Semester.									
Total				500	150	100	120	130	1000	15	5	10	25

Departmental Electives			Open Electives	
CS 604(A)	Graph Theory		CS-605(A)	Digital Signal Processing
CS 604(B)	Data Mining and Warehousing		CS-605(B)	Machine Learning
CS 604(C)	Computer Graphics and Visualisation		CS-605(C)	Software Testing
CS 604 (D)	Software Quality Management		CS 605 (D)	Distributed Systems and Cloud Computing

Uttarakhand Technical University, Dehradun

New Scheme of Examination as per AICTE Flexible Curricula

Computer Science and Engineering, VI-Semester

CS- 601 Microprocessors and Applications

Course Objectives:

- To introduce students with the architecture and operation of typical microprocessors and microcontrollers.
- To familiarize the students with the programming and interfacing of microprocessors and microcontrollers.
- To provide strong foundation for designing real world applications using microprocessors and microcontrollers

Learning Outcomes:

At the end of the course students should be able to:

1. Assess and solve basic binary math operations using the microprocessor and explain the microprocessor's internal architecture and its operation within the area of manufacturing and performance.
2. Apply knowledge and demonstrate programming proficiency using the various addressing modes and data transfer instructions of the target microprocessor.
3. Compare accepted standards and guidelines to select appropriate Microprocessor (8085 & 8086) to meet specified performance requirements.
4. Analyze assembly language programs; select appropriate assemble into machine a cross assembler utility of a microprocessor.
5. Design electrical circuitry to the Microprocessor I/O ports in order to interface the processor to external devices.
6. Evaluate assembly language programs and download the machine code that will provide solutions real-world control problems.

Course Content:

UNIT I

Salient features of advanced microprocessors. Review and evolution of advanced microprocessors: 8086, 8088, 80186/286/386/486/Pentium and core i processors.
8086 processor: Register organization, Architecture, memory mapping, modes, and timings.

UNIT II

Intel 8086 microprocessor programming: 8086 Instruction Set, Addressing modes, Assembly Language Programming with Intel 8086 microprocessor

UNIT III

Introduction to the various interfacings chips, 8255, Interfacings key boards, LEDs, ADC, DAC and memory Interfacing. Programmes for various interfacing modules

UNIT IV

General purposes programmable peripheral devices: Timer (8253/8254), 8259A programmable interrupt controller, USART, serial I/O & data Communication. Interfacing Programs for chips

UNIT V

Introduction to 8bit and 16 bit microcontrollers and embedded systems, 8051 architecture, pin description , I/O configuration , interrupts, addressing modes instruction set, embedded system, use of microcontrollers in embedded systems, Display systems using microcontrollers

Reference Books:

1. Advance microprocessor and peripheral –A.K. Ray and K. M. Bhurchandi, Tata Mcgraw Hill
2. Microprocessor and Interfacing – D.V.Hall, McGraw Hill.
3. The Intel microprocessor - Barry B. Brey, Pearson
4. The 8086 & 8088 Microprocessor- LIU and Gibson, Tata McGraw Hill
5. GS Tomar, Advanced Microprocessors and Interfacing, Sun India Pub
6. The 8051 microcontroller and embedded systems-M.A. Mazidi, Janice GillispieMazidi, Pearson Prentice Hall

Course Outcome:

- Will be able to know the memory mapping stnadrads to be used for hard ware programming
- Will be able to devise assembly language programmes for various applications
- Will be able to programme devices for interfacing
- Will be able to design circuits for home automation
- Will be able to design products for societal use

Uttarakhand Technical University, Dehradun

New Scheme of Examination as per AICTE Flexible Curricula

Computer Science and Engineering, VI-Semester

CS 602 Compiler Design

Course Objectives:

1. This course is designed to provide a comprehensive knowledge of Compiler Construction.
2. To learn how to construct compiler to translate High Level Languages to Machine Language.
3. To learn different phases of compiler and how to implement them.
4. To learn efficient machine Language Code Generation using the techniques of Optimization.

Course Learning Outcomes:

1. Understands compiler and various phases in compilation.
2. Understands Lexical Analysis and implement it using LEX tool.
3. Understands LL, LR, and SLR parsing techniques.
4. Implement parsing using YACC tool.
5. Understands Syntax Directed Translation, Symbol Tables and their applications.
6. Understands Intermediate Code Generation and Code Optimization.

Unit-I Introduction to compiling & Lexical Analysis

Introduction of Compiler, Major data Structure in compiler, types of Compiler, Front-end and Back-end of compiler, Compiler structure: analysis-synthesis model of compilation, various phases of a compiler, Lexical analysis: Input buffering , Specification & Recognition of Tokens,Design of a Lexical Analyzer Generator, LEX.

Unit-II Syntax Analysis &Syntax Directed Translation

Syntax analysis: CFGs, Top down parsing, Brute force approach, recursive descent parsing, transformation on the grammars, predictive parsing, bottom up parsing, operator precedence parsing, LR parsers (SLR,LALR, LR),Parser generation. Syntax directed definitions: Construction of Syntax trees, Bottom up evaluation of S-attributed definition, L-attribute definition, Top down translation, Bottom Up evaluation of inherited attributes Recursive Evaluation, Analysis of Syntax directed definition.

Unit-III Type Checking & Run Time Environment

Type checking: type system, specification of simple type checker, equivalence of expression, types, type conversion, overloading of functions and operations, polymorphic functions. Run time Environment: storage organization, Storage allocation strategies, parameter passing, dynamic storage allocation, Symbol table, Error Detection & Recovery, Ad-Hoc and Systematic Methods.

Unit –IV Code Generation

Intermediate code generation: Declarations, Assignment statements, Boolean expressions, Case statements, Back patching, Procedure calls Code Generation: Issues in the design of code generator, Basic block and flow graphs, Register allocation and assignment, DAG representation of basic blocks, peephole optimization, generating code from DAG.

Unit –V Code Optimization

Introduction to Code optimization: sources of optimization of basic blocks, loops in flow graphs, dead code elimination, loop optimization, Introduction to global data flow analysis, Code Improving transformations ,Data flow analysis of structure flow graph Symbolic debugging of optimized code.

References:

1. A. V. Aho, R. Sethi, and J. D. Ullman. Compilers: Principles, Techniques and Tools , Pearson Education
2 Raghavan, Compiler Design, TMH Pub.
3. Louden. Compiler Construction: Principles and Practice, Cengage Learning
4. A. C. Holub. Compiler Design in C , Prentice-Hall Inc., 1993.
5. Mak, writing compiler & Interpreters, Willey Pub.

Uttarakhand Technical University, Dehradun

New Scheme of Examination as per AICTE Flexible Curricula

Computer Science and Engineering, VI-Semester

CS- 603 Data Analytics

Course Objectives:

This course will introduce students to this rapidly growing field and equip them with some of its basic principles and tools as well as its general mindset.Students will learn concepts, techniques and tools they need to deal with various facets of data Science practice, including data collection and integration, exploratory data analysis, predictivemodelling, descriptive modelling, data product creation, evaluation, and effective communication.

Learning Outcomes:

At the end of the course students should be able to:

Students will develop relevant programming abilities.
Students will demonstrate proficiency with statistical analysis of data.
Students will develop the ability to build and assess data-based models.
Students will execute statistical analyses with professional statistical software.
Students will demonstrate skill in data management.
Students will apply data science concepts and methods to solve problems in real-world contexts and will communicate these solutions effectively

Course Content:

UNIT-I:

DESCRIPTIVE STATISTICS: Probability Distributions, Inferential Statistics, Inferential Statistics through hypothesis tests Regression & ANOVA,Regression ANOVA(Analysis of Variance)

UNIT-II:

INTRODUCTION TO BIG DATA: Big Data and its Importance, Four V's of Big Data, Drivers for Big Data, Introduction to Big Data Analytics, Big Data Analytics applications. BIG DATA TECHNOLOGIES: Hadoop's Parallel World, Data discovery, Open source technology for Big Data Analytics, cloud and Big Data, Predictive Analytics, Mobile Business Intelligence and Big Data, Crowd Sourcing Analytics, Inter- and Trans-Firewall Analytics, Information Management.

UNIT-III:

PROCESSING BIG DATA: Integrating disparate data stores, Mapping data to the programming framework, Connecting and extracting data from storage, Transforming data for processing, subdividing data in preparation for Hadoop Map Reduce.

UNIT-IV:

HADOOP MAPREDUCE: Employing Hadoop Map Reduce, Creating the components of Hadoop Map Reduce jobs, Distributing data processing across server farms, Executing Hadoop Map Reduce jobs, monitoring the progress of job flows, The Building Blocks of Hadoop Map Reduce Distinguishing Hadoop daemons, Investigating the Hadoop Distributed File System Selecting appropriate execution modes: local, pseudo-distributed, fully distributed.

UNIT-V:

BIG DATA TOOLS AND TECHNIQUES: Installing and Running Pig, Comparison with Databases, Pig Latin, User- Define Functions, Data Processing Operators, Installing and Running Hive, Hive QL, Querying Data, User-Defined Functions, Oracle Big Data.

REFERENCES:

1. Michael Minelli, Michehe Chambers, "Big Data, Big Analytics: Emerging Business Intelligence and Analytic Trends for Today's Business", 1st Edition, AmbigaDhiraj, Wiely CIO Series, 2013.
2. ArvindSathi, "Big Data Analytics: Disruptive Technologies for Changing the Game", 1st Edition, IBM Corporation, 2012.1. Rajaraman, A., Ullman, J. D., Mining of Massive Datasets, Cambridge University Press, United Kingdom, 2012
3. Berman, J.J., Principles of Big Data: Preparing, Sharing and Analyzing Complex Information, Morgan Kaufmann, 2014
4. Barlow, M., Real-Time Big Data Analytics: Emerging Architecture, O Reilly, 2013
5. Schonberger, V.M., Kenneth Cukier, K., Big Data, John Murray Publishers, 2013
6. Bill Franks, "Taming the Big Data Tidal Wave: Finding Opportunities in Huge Data Streams with Advanced Analytics", 1st Edition, Wiley and SAS Business Series, 2012.

Uttarakhand Technical University, Dehradun

New Scheme of Examination as per AICTE Flexible Curricula

Computer Science and Engineering, VI-Semester

Departmental Elective CS 604 (B) Data Mining

Course Objectives:

1. To introduce data warehouse and its components
2. To introduce knowledge discovery process, data mining and its functionalities
3. To develop understanding of various algorithms for association rule mining and their differences
4. To introduce various classification techniques
5. To introduce various clustering algorithms.

Unit I:

Data Warehousing**:** Need for data warehousing , Basic elements of data warehousing, Data Mart, Data Warehouse Architecture, extract and load Process, Clean and Transform data, Star, Snowflake and Galaxy Schemas for Multidimensional databases, Fact and dimension data, Partitioning Strategy-Horizontal and Vertical Partitioning, Data Warehouse and OLAP technology, Multidimensional data models and different OLAP Operations, OLAP Server: ROLAP, MOLAP, Data Warehouse implementation, Efficient Computation of Data Cubes, Processing of OLAP queries, Indexing data.

Unit II:

Data Mining**:** Data Preprocessing, Data Integration and Transformation, Data Reduction, Discretizaion and Concept Hierarchy Generation, Basics of data mining, Data mining techniques, KDP (Knowledge Discovery Process), Application and Challenges of Data Mining

Unit III:

Mining Association Rules in Large Databases**:** Association Rule Mining, Single-Dimensional Boolean Association Rules, Multi-Level Association Rule, Apriori Algorithm, Fp- Growth Algorithm, Time series mining association rules, latest trends in association rules mining.

Unit IV:

Classification and Clustering: Distance Measures, Types of Clustering Algorithms, K-Means Algorithm, Decision Tree, Bayesian Classification, Other Classification Methods, Prediction, Classifier Accuracy, Categorization of methods, Outlier Analysis.

Unit V:

Introduction of Web Mining and its types, Spatial Mining, Temporal Mining, Text Mining, Security Issue, Privacy Issue, Ethical Issue.

References:-

1. Arun k Pujari “Data Mining Technique” University Press
2. Han,Kamber, “Data Mining Concepts & Techniques”,
3. M.Kaufman., P.Ponnian, “Data Warehousing Fundamentals”, John Wiley.
4, M.H.Dunham, “Data Mining Introductory & Advanced Topics”, Pearson Education.

5. Ralph Kimball, “The Data Warehouse Lifecycle Tool Kit”, John Wiley.
6. E.G. Mallach , “The Decision Support & Data Warehouse Systems”, TMH

Course Outcomes:

Upon completion of this course, students will be able to-

1. Demonstrate an understanding of the importance of data warehousing and OLAP technology
2. Organize and Prepare the data needed for data mining using pre preprocessing techniques
3. Implement the appropriate data mining methods like classification, clustering or Frequent Pattern mining on various data sets.
4. Define and apply metrics to measure the performance of various data mining algorithms.
5. Demonstrate an understanding of data mining on various types of data like web data and spatial data

Uttarakhand Technical University, Dehradun

New Scheme of Examination as per AICTE Flexible Curricula

Computer Science and Engineering, VI-Semester

Open Elective – CS 605 (B) Machine Learning

Course Objectives:

In this course we will study the basic component of an intelligence system i.e. machine learning, their functions, mechanisms, policies and techniques used in their implementation and examples.

Course Learning Outcomes:

1. List various approaches of Machine Learning.
2. Describe machine learning algorithms to solve the real world problems
3. Develop Hypothesis and machine learning models
4. Identify appropriate models for solving machine learning problems.
5. Apply learning techniques to solve real world machine learning problems.
6. Evaluate and interpret the results of the algorithms.

COURSE CONTENTS:

Unit –I

Introduction to machine learning, scope and limitations, regression, probability, statistics and linear algebra for machine learning, convex optimization, data visualization, hypothesis unction and testing, data distributions, data preprocessing, data augmentation, normalizing data sets, machine learning models, supervised and unsupervised learning.

Unit –II

Linearity vs non linearity, activation functions like sigmoid, ReLU, etc., weights and bias, loss function, gradient descent, multilayer network, backpropagation, weight initialization, training, testing, unstable gradient problem, auto encoders, batch normalization, dropout, L1 and L2 regularization, momentum, tuning hyper parameters,

Unit –III

Convolutional neural network, flattening, subsampling, padding, stride, convolution layer, pooling layer, loss layer, dance layer 1x1 convolution, inception network, input channels, transfer learning, one shot learning, dimension reductions, implementation of CNN like tensor flow, keras etc.

Unit –IV

Recurrent neural network, Long short-term memory, gated recurrent unit, translation, beam search and width, Bleu score, attention model, Reinforcement Learning, RL-framework, MDP, Bellman equations, Value Iteration and Policy Iteration, , Actor-critic model, Q learning, SARSA

Unit –V

Support Vector Machines, Bayesian learning, application of machine learning in computer vision, speech processing, natural language processing etc, Case Study: ImageNetCompetition

TEXT BOOKS RECOMMENDED:

1. Christopher M. Bishop, "Pattern Recognition and Machine Learning", Springer-Verlag
2. New York Inc., 2nd Edition, 2011.
3. Tom M. Mitchell, "Machine Learning", McGraw Hill Education, First edition, 2017.
4. Ian Goodfellow and YoshuaBengio and Aaron Courville, "Deep Learning", MIT Press,2016

REFERENCE BOOKS:

1. Aurelien Geon, "Hands-On Machine Learning with Scikit-Learn and Tensorflow:Concepts, Tools, and Techniques to Build Intelligent Systems", Shroff/O'Reilly; Firstedition (2017).
2. Francois Chollet, "Deep Learning with Python", Manning Publications, 1st Ed. 2018.
3. Andreas Muller, "Introduction to Machine Learning with Python: A Guide for DataScientists", Shroff/O'Reilly; First edition (2016).
4. Russell, S. and Norvig, N. "Artificial Intelligence: A Modern Approach", Prentice HallSeries in Artificial Intelligence. 2003.

PRACTICAL:

Different problems to be framed to enable students to understand the concept learnt andget hands-on on various tools and software related to the subject. Such assignments are tobe framed for ten to twelve lab sessions.