2020

SYLLABUS SCHEME

B. TECH IN COMPUTER SCIENCE & ENGINEERING

VEER MADHO SINGH BHANDARI UTTARAKHAND TECHNICAL UNIVERSITY

SHIVALIK COLLEGE OF ENGINEERING

EVALUATION SCHEME & SYLLABUS

W.E.F. ACADEMIC SESSION 2020-21

Uttarakhand Technical University, Dehradun

Scheme of Examination as per AICTE Flexible Curricula

Evaluation Scheme & Syllabus

I Year (Common to All Branches)

W.E.F. Academic Session 2020-21

Uttarakhand Technical University, Dehradun
New Scheme of Examination as per AICTE Flexible Curricula
Bachelor of Technology (B. Tech.) I Year
W.E.F. Academic Session - 2020-21

I Semester - GROUP A: (Branches for Group "A" to be decided by the Institutes)

S. No.	Subject Code	Category	Subject Name	Maximum Marks Allotted					Total Marks	Contact Hours per week			Total Credits
				Theory			Practical						
				End Sem.	Mid Sem.	Quiz/ Assignment	End Sem.	Lab work & Sessional		L	T	P	
Mandatory Induction Program (First three weeks)				Physical Activity, Creative Arts, Universal Human Values, Literary, Proficiency Modules, Lectures by Eminent People, Visits to local Areas, Familiarization to Dept./Branch & Innovations									
Fourth week onwards classes will start													
1.	BAST 101 BASP 101	BSC-1	Engineering Chemistry	100	30	20	30	20	200	3	1	2	5
2.	BAST 102	BSC-2	Mathematics-I	100	30	20	-	-	150	3	1	-	4
3.	BAST 103 BASP 103	HSMC-1	English for Communications	100	30	20	30	20	200	3	-	2	4
4.	BEET 101 BEEP 101	ESC-1	Basic Electrical Engineering	100	30	20	30	20	200	3	1	2	
5.	BCST 101 BCSP 101	ESC-6	Fundamentals of Computers & Programming in C	100	30	20	30	20	200	3	1	2	5
6.	BMEP 101	ESC-3	Manufacturing Practices / Workshop	-	-	-	30	20	50	1	-	2	2
7.	BASP 102	DLC-1	Internship-I (60 Hrs Duration) at the Institute level	To be completed during or at the end of the second semester. Its evaluation/credit to be added in third semester.									
8.	BASP 105	DLC-2	Swachh Bharat Summer Internship Unnat Bharat Abhiyan (100Hrs)/ Rural Outreach				15	10	25*	-	-	4	-
			Total	**500**	**150**	**100**	**150**	**100**	**1000**	**16**	**4**	**10**	**25**

*It is non credit course. Student must clear it to be promoted in II Year; Marks will not be added to the total

Note: The Meaning of last Character of Subject Code (T – Theory and P – Practical)

1 Hr Lecture	1 Hr Tutorial	2 Hr Practical
1 Credit	**1 Credit**	**1 Credit**

Uttarakhand Technical University, Dehradun
New Scheme of Examination as per AICTE Flexible Curricula
Bachelor of Technology (B. Tech.) I Year
W.E.F. Academic Session - 2020-21

I Semester - GROUP B: (Branches for Group "B" to be decided by the Institutes)

S.No .	Subject Code	Category	Subject Name	Maximum Marks Allotted					Total Marks	Contact Hours per week			Total Credits
				Theory Slot			Practical Slot						
				End Sem.	Mid Sem Exam.	Quiz/ Assignment	End Sem.	Lab work & Sessional		L	T	P	
1.	BAST 104 BASP 104	BSC-3	Engineering Physics	100	30	20	30	20	200	3	1	2	5
2.	BAST 102	BSC-2	Mathematics-I	100	30	20	-	-	150	3	1	-	4
3.	BMET 102 BMEP 102	ESC-4	Basic Mechanical Engineering	100	30	20	30	20	200	3	1	2	5
4.	BECT 101 BECP 101	ESC-5	Basic Electronics Engineering	100	30	20	30	20	200	3	1	2	5
5.	BMEP 103	ESC-2	Engineering Graphics	-	-	-	50	25	75	1	-	2	2
6.	BASP 106	HSMC-2	Language Lab & Seminars	-	-	-	50	25	75	1	-	2	2
7.	BEST 101	BSC	Environmental Studies	70	Not Credit Course. Student must clear it to complete the degree.			30 (Field & Project Work)	100	3	-	-	-
8.	BASP 102	DLC-1	Internship-I - (60 Hrs Duration) at the Institute level	To be completed during first/second semester. Its evaluation/credit to be added in third semester.									
			Total	**470**	**120**	**80**	**190**	**140**	**1000**	**17**	**4**	**10**	**23**

Note: The Meaning of last Character of Subject Code (T – Theory and P – Practical)

1 Hr Lecture	1 Hr Tutorial	2 Hr Practical
1 Credit	**1 Credit**	**1 Credit**

Uttarakhand Technical University, Dehradun
New Scheme of Examination as per AICTE Flexible Curricula
Bachelor of Technology (B. Tech.) I Year
W.E.F. Academic Session - 2020-21

II Semester - GROUP A: (Branches for Group "A" to be decided by the Institutes)

S.No .	Subject Code	Category	Subject Name	Maximum Marks Allotted					Total Marks	Contact Hours per week			Total Credits
				Theory Slot			Practical Slot						
				End Sem.	Mid Sem Exam.	Quiz/ Assignment	End Sem.	Lab work & Sessional		L	T	P	
1.	**BAST 104 BASP 104**	BSC-3	**Engineering Physics**	100	30	20	30	20	200	3	1	2	5
2.	**BAST 105**	BSC-4	**Mathematics-II**	100	30	20	-	-	150	3	1	-	4
3.	**BMET 102 BMEP 102**	ESC-4	**Basic Mechanical Engineering**	100	30	20	30	20	200	3	1	2	5
4.	**BECT 101 BECP 101**	ESC-5	Basic Electronics Engineering	100	30	20	30	20	200	3	1	2	5
5.	**BMEP 103**	ESC-2	**Engineering Graphics**	-	-	-	50	25	75	1	-	2	2
6.	**BASP 106**	HSMC-2	**Language Lab & Seminars**	-	-	-	50	25	75	1	-	2	2
7.	**BEST 101**	**BSC**	**Environmental Studies**	70	Not Credit Course. Student must clear it to complete the degree.			30 (Field & Project Work)	100	3	-	-	-
8.	**BASP 102**	DLC-1	**Internship-I - (60 Hrs Duration) at the Institute level**	**To be completed during first/second semester. Its evaluation/credit to be added in third semester.**									
			Total	**470**	**120**	**80**	**190**	**140**	**1000**	**17**	**4**	**10**	**23**

Note: The Meaning of last Character of Subject Code (T – Theory and P – Practical)

1 Hr Lecture	1 Hr Tutorial	2 Hr Practical
1 Credit	**1 Credit**	**1 Credit**

Uttarakhand Technical University, Dehradun
New Scheme of Examination as per AICTE Flexible Curricula
Bachelor of Technology (B. Tech.) I Year
W.E.F. Academic Session - 2020-21

II Semester - GROUP B: (Branches for Group "B" to be decided by the Institutes)

S. No.	Subject Code	Category	Subject Name	Maximum Marks Allotted					Total Marks	Contact Hours per week			Total Credits
				Theory			Practical						
				End Sem.	Mid Sem.	Quiz/ Assignment	End Sem.	Lab work & Sessional		L	T	P	
Mandatory Induction Program (First three weeks)				Physical Activity, Creative Arts, Universal Human Values, Literary, Proficiency Modules, Lectures by Eminent People, Visits to local Areas, Familiarization to Dept./Branch & Innovations									
Fourth week onwards classes will start													
1.	**BAST 101 BASP 101**	BSC-1	**Engineering Chemistry**	100	30	20	30	20	200	3	1	2	5
2.	**BAST 105**	BSC-4	**Mathematics-II**	100	30	20	-	-	150	3	1	-	4
3.	**BAST 103 BASP 103**	HSMC-1	**English for Communication**	100	30	20	30	20	200	3	-	2	4
4.	**BEET 101 BEEP 101**	ESC-1	**Basic Electrical Engineering**	100	30	20	30	20	200	3	1	2	5
5.	**BCST 101 BCSP 101**	ESC-6	**Fundamentals of Computers & Programming in C**	100	30	20	30	20	200	3	1	2	5
6.	**BMEP 101**	ESC-3	**Manufacturing Practices / Workshop**	-	-	-	30	20	100	1	-	2	2
7.	**BASP 102**	DLC-1	**Internship-I (60 Hrs Duration) at the Institute level**	**To be completed during or at the end of the second semester. Its evaluation/credit to be added in third semester.**									
8.	**BASP 105**	DLC-2	Swachh Bharat Summer Internship Unnat Bharat Abhiyan (100Hrs)/ Rural Outreach				15	10	25*	-	-	4	-
			Total	**500**	**150**	**100**	**150**	**100**	**1000**	**16**	**4**	**10**	**25**

*It is non credit course. Student must clear it to be promoted in II Year; Marks will not be added to the total

Note: The Meaning of last Character of Subject Code (T – Theory and P – Practical)

1 Hr Lecture	1 Hr Tutorial	2 Hr Practical
1 Credit	**1 Credit**	**1 Credit**

BAST-101 BASP-101	Engineering Chemistry	3 1 2	05 Credits

Course Contents:

Periodic Properties (5 Lectures)

Effective Nuclear Charge, Atomic & Ionic sizes, Electron affinity, Electro negativity, Ionization Potential, Ploarizability, Oxidation States & Hydrogen Bonding.

Phase equilibrium (5 Lectures)

Gibbs Phase Rule, Phase diagram of single component system (Water & Sulphur) Phase diagram of Binary Eutectic System (Cu-Ag.)

Water Analysis - (8 Lectures)

Soft and Hard Water, Degree of Hardness, Determination of hardness by EDTA method (related numerical problems), Softening methods (Lime-Soda, Zeolite and Ion Exchange Methods), Alkalinity & It's determination.

Boiler Feed Water, Sludge & Scale, Priming & Foaming, Boiler Corrosion, Caustic Embrittlement.

Polymers (8 Lectures)

Introduction, Types of polymerization, Classification, Thermoplastic & Thermosetting polymers Elementary idea of Biodegradable polymers, Conducting Polymers & Nano Particles, Preparation, properties & uses of the following polymers - PVC, PMMA, Teflon, Nylon 6, Nylon 6:6, Polyester & Bakelite, Rubbers, Vulcanization of Rubber.

Corrosion (4 Lectures):

Introduction, Dry Corrosion, Wet Corrosion, Mechanism of Corrosion, Factors affecting corrosion and Prevention of corrosion.

Lubricants (6 Lectures)

Introduction, Mechanism of lubrication, Classification of lubricants, significance & determination of Viscosity and Viscosity Index, Flash & Fire Points, Cloud & Pour Points, Aniline & Mixed Aniline Points, Acid Number, Saponification Number.

Spectroscopic techniques and application (4 Lectures)

Principle and Applications of UV – visible, IR, Raman & NMR, Spectroscopy.

Course Outcomes

The concepts developed in this course will aid in quantification of several concepts in chemistry that have been introduced at the 10+2 levels in schools. Technology is being increasingly based on the electronic, atomic and molecular level modifications.

Quantum theory is more than 100 years old and to understand phenomena at nanometer levels, one has to base the description of all chemical processes at molecular levels. The course will enable the student to:

- Analyse microscopic chemistry in terms of atomic and molecular orbitals and intermolecular forces.
- Rationalise bulk properties and processes using thermodynamic considerations.
- Distinguish the ranges of the electromagnetic spectrum used for exciting different molecular energy levels in various spectroscopic techniques
- Rationalise periodic properties such as ionization potential, electronegativity, oxidation states and electronegativity.
- List major chemical reactions that are used in the synthesis of molecules.

Practical List

NOTE: Choice of 10-12 experiments of the following core experiments must be performed during the session.

1. Determination of hardness of water using EDTA method (Complexometric Titration).

2. Determination of alkalinity of water.
3. Determination of chloride content of water (Mohr's Method)
4. Determination of viscosity of unknown sample using Ostwald's viscometer
5. Determination of surface tension of unknown sample using stalagmometer.
6. Determination of saponification value of oil sample
7. Determination of acid value of oil sample
8. Synthesis of a polymer.
9. Determination of percentage moisture content in a coal sample.
10. Determination of percentage volatile matter in a coal sample.
11. Determination of ash content in a coal sample.
12. Separation of binary mixture by thin layer chromatography.
13. Separation of binary mixture by ascending paper chromatography.
14. Determination of adsorption isotherm of acetic acid on charcoal.
15. Determination of percentage purity of ferrous ammonium sulphate and copper sulphate.
16. Chemical analysis of salt (mixture of one acidic and one basic radical)

Reference Books :

1 Chemistry in Engineering and Technology - Vol.1 &2 Kuriacose and Rajaram , McGraw Hill Education
2 Fundamental of Molecular Spectroscopy C.N. Banwell , McGraw Hill Education
3 Engineering Chemistry – B.K. Sharma, Krishna Prakashan Media (P) Ltd., Meerut.
4 Basics of Engineering Chemistry – S.S. Dara & A.K. Singh, S. Chand &Company Ltd., Delhi.
5 Applied Chemistry – Theory and Practice, O.P. Viramani, A.K. Narula, New Age International Pvt. Ltd. Publishers, New Delhi.
6 Elementary Spectroscopy ,Y .R. Sharma , S. Chand Publishing
7 Polymer Science, Vasant R. Gowariker, N. V. Viswanathan, Jayadev Sreedhar, New Age International Pvt. Ltd
8 Advanced Inorganic Chemistry, G.R. Chatwal, Goal Publishing house
9 Engineering Chemistry (NPTEL Web-book) B.L. Tembe, Kamaluddin and M.S. Krishna
10 Advanced Physical Practical Chemistry by JB Yadav.

BAST-102	MATHEMATICS-I	3 1 0	04 Credits

OBJECTIVES: The objective of this course is to familiarize the prospective engineers with techniques in calculus, multivariate analysis and linear algebra. It aims to equip the students with standard concepts and tools at an intermediate to advanced level that will serve them well towards tackling more advanced level of mathematics and applications that they would find useful in their disciplines. More precisely, the objectives are:

To introduce the idea of applying differential and integral calculus to notions of curvature and to improper integrals. Apart from some applications it gives a basic introduction on Beta and Gamma functions.

To introduce the fallouts of Rolle's Theorem that is fundamental to application of analysis to Engineering problems.

To familiarize the student with functions of several variables that is essential in most branches of engineering.

To develop the essential tool of vector spaces, matrices and linear algebra in a comprehensive manner.

Course Contents:

Module 1: Calculus: (10 hours): Rolle's theorem, Mean Value theorems, Expansion of functions by Maclaurin's and Taylor's for one variable; Taylor's theorem for function of two variables, Partial Differentiation, Maxima & Minima (two and three variables), Method of Lagranges Multipliers.

Module 2: Calculus: (8 hours): Definite Integral as a limit of a sum and Its application in summation of series; Beta and Gamma functions and their properties; Applications of definite integrals to evaluate surface areas and volumes of revolutions. Multiple Integral, Change the order of the integration.

Module 3: Vector Calculus : (10 hours) : Differentiation of Vectors, Scalar and vector point function, Gradient, Geometrical meaning of gradient, Directional Derivative, Divergence and Curl, Line Integral, Surface Integral and Volume Integral, Gauss Divergence, Stokes and Green theorems (without proof).

Module 4: Vector Spaces (6 hours): Vector Space, Vector Sub Space, Linear Combination of Vectors,Linearly Dependent, Linearly Independent, Basis of a Vector Space,Linear Transformations.

Module 5: Matrices (6 hours): Rank of a Matrix, Solution of Simultaneous Linear Equations by Elementary Transformation, Consistency of Equation, Eigen Values and Eigen Vectors, Diagonalization of Matrices, Cayley-Hamilton theorem and its applications to find inverse.

Textbooks/References:

1. G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9th Edition,Pearson, Reprint, 2002.
2. Erwin kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
3. Veerarajan T., Engineering Mathematics for first year, Tata McGraw-Hill, New Delhi, 2008.
4. Ramana B.V., Higher Engineering Mathematics, Tata McGraw Hill New Delhi, 11thReprint, 2010.
5. D. Poole, Linear Algebra: A Modern Introduction, 2nd Edition, Brooks/Cole, 2005.
6. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2008.
7. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 36th Edition, 2010.

BAST 103 & BASP 103	English for Communication	3L-0T-2P	4 Credits

COURSE CONTENTS:

Unit-I

Identifying Common errors in writing: Articles, Subject-Verb Agreement, Prepositions, Active and Passive Voice, Reported Speech: Direct and Indirect, Sentence Structure.

Unit-II

Vocabulary building and Comprehension:

Acquaintance with prefixes and suffixes from foreign languages in English to form derivatives, synonyms, antonyms, Reading comprehension.

Unit-III

Communication:

Introduction, Meaning and Significance, Process of Communication, Oral and Written Communication, 7 c's of Communication, Barriers to Communication and Ways to overcome them, Importance of Communication for Technical students, nonverbal communication.

Unit-IV

Developing Writing Skills:

Planning, Drafting and Editing, Precise Writing, Précis, Technical definition and Technical description. Report Writing: Features of writing a good Report, Structure of a Formal Report, Report of Trouble, Laboratory Report, Progress Report.

Unit-V

Business Correspondence:

Importance of Business Letters, Parts and Layout; Application, Contents of good Resume, guidelines for writing Resume, Calling/ Sending Quotation, Order, Complaint, E-mail and Tender.

Books Recommended:

1. 'Technical Communication : Principles and practice', Meenakshi Raman and Sangeeta Sharma (Oxford)
2. 'Effective Business Communication', Krizan and merrier (Cengage learning)
3. 'Communication Skill, Sanjay Kumar and pushlata, OUP2011
4. "Practical English Usage Michael Swan OUP, 1995.
5. "Exercises in spoken English Parts I-III CIEFL, Hyderabad, Oxford University Press
6. On writing well, William Zinsser, Harper Resource Book 2001.
7. Remedial English Grammar, F.T. Wood,Macmillan2007.

Course Outcomes:

The student will acquire basic proficiency in English including reading and listening comprehension, writing and speaking skills.

Communicative Language Laboratory:

Course objective: The language laboratory focuses on the practice of English through audio-visual aids and Computer software. It intends to enable the students to speak English correctly with confidence and intends to help them to overcome their inhibitions and self –consciousness while speaking in English.

Topics to be covered in the Language laboratory sessions:

1. Listening Comprehension.
2. Pronunciation, Intonation, Rhythm
3. Practising everyday dialogues in English
4. Interviews.
5. Formal Presentation

Final Assessment should be based on assignment, assessment, presentation and interview of each candidate.

BEET 101 & BEEP 101	Basic Electrical Engineering	3L-1T-2P	5 Credits

Course outcomes:

The final outcome of the subject will result into an enhancement in understanding the basic concepts of Core Electrical Engineering subjects.

The topics covered under this subject will help to enhance the basic understanding of Electrical machines and power systems and basic electronics.

Course Contents:

UNIT 1 :

DC Circuits (8 hours)

Electrical circuit elements (R, L and C), voltage and current sources, Kirchoff current and voltage laws, analysis of simple circuits with dc excitation. Superposition, Thevenin , Norton Theorems and maximum power transfer theorem . Star to Delta conversion. Time-domain analysis of first-order RL and RC circuits.

UNIT 2:

AC Circuits (8 hours)

Representation of sinusoidal waveforms, peak and rms values, phasor representation, real power, reactive power, apparent power, power factor. Analysis of single-phase ac circuits consisting of R, L, C, RL, RC, RLC combinations (series and parallel), resonance. Three phase balanced circuits, voltage and current relations in star and delta connections and power measurement

UNIT 3:

Transformers (6 hours)

Magnetic circuits and materials, BH characteristics, Basic laws of electromagnetism, single phase transformer. ideal and practical transformer, equivalent circuit, losses in transformers, regulation and efficiency. Auto-transformer and three-phase transformer connections.

UNIT 4:

Electrical Machines (8 hours)

Generation of rotating magnetic fields, Construction and working of a three-phase induction motor, Significance of torque-slip characteristic. Loss components and efficiency, starting and speed control of induction motor. Single-phase induction motor construction and workings . Construction, working, torque-speed characteristic and speed control of separately and self excited dc machines . Construction and working of synchronous generators

Unit 5:

Electrical Installations (6 hours)

Components of LT Switchgear: Switch Fuse Unit (SFU), MCB, ELCB, MCCB, Types of Wires and Cables, Earthing methods. Types of Batteries, Important Characteristics for Batteries. Elementary calculations for energy consumption, power factor improvement and battery backup.

References

1. D.P. Kothari & I.J. Nagrath, Basic Electrical Engineering, Tata McGraw Hill, latest edition.
2. S.N. Singh , Basic Electrical Engineering, P.H.I.,2013
3. Rajendra Prasad, Fundamentals of Electrical Engineering, Prentice Hall,2014
4. M.S. Sukhija, T. K. Nagsarkar, Basic Electrical and electronics engineering, Oxford University press, 2012
5. C.L. Wadhwa, Basic Electrical Engineering. New Age International.
6. B.L. Theraja & A.K Theraja Textbook of Electrical Technology - Vol. 1, S. Chand Publication
7. E. Hughes & I.M. Smith Hughes Electrical Technology Pearson
8. Vincent Del Toro Electrical Engineering Fundamentals

List of experiments/demonstrations:

1. Basic safety precautions. Introduction and use of measuring instruments – voltmeter, ammeter, multi-meter, oscilloscope. Real-life resistors, capacitors and inductors.

2. Measurement of steady-state and transient response of R-L, R-C, and R-L.
3. Sinusoidal steady state response of R-L, and R-C circuits – impedance calculation and verification. Observation of phase differences between current and voltage. Resonance in R-L- C circuits.
4. Verification of Network theorems.
5. To perform Load test on single phase Transformer.
6. To study the Starting and reversal of 3 phase induction motor.
7. Study of Speed control of a DC shunt Motor by Field Control Method.
8. Study the characteristic of DC Motor.
9. Study the characteristic DC generator.

Institute can add upto two experiment of their own choice.

BMET 105	Engineering Graphics	1L-0T-2P	2 Credits

Course Objective:

All phases of manufacturing or construction require the conversion of new ideas and design concepts into the basic line language of graphics. Therefore, there are many areas (civil, mechanical, electrical, architectural and industrial) in which the skills of the CAD technicians play major roles in the design and development of new products or construction. Students prepare for actual work situations through practical training in a new state-of-the-art computer designed CAD laboratory using engineering software. This course is designed to address:

- to prepare you to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability
- to prepare you to communicate effectively
- to prepare you to use the techniques, skills, and modern engineering tools necessary for engineering practice

Goals & Outcomes:

- Introduction to engineering design and its place in society
- Exposure to the visual aspects of engineering design
- Exposure to engineering graphics standards
- Exposure to solid modeling
- Exposure to computer-aided geometric design
- Exposure to creating working drawings
- Exposure to engineering communication

Course Contents:

UNIT 1: Introduction to Engineering Drawing covering, Principles of Engineering Graphics and their significance, usage of Drawing instruments, lettering, Orthographic Projections covering, Principles of Orthographic Projections- Conventions - Projections of Points

UNIT 2: Projection of lines inclined to both planes; vertical and horizontal traces. Projections of planes - Auxiliary Planes; Projections of Regular Solids in simple position, projection of solids with base on ground and axis perpendicular to HP, Projection of solids with axis parallel to both the principal planes. Projection of solids inclined to both the Planes- Auxiliary Views; Draw simple annotation, dimensioning.

UNIT 3: Sections and Sectional Views of Right Angular Solids covering, Prism, Cylinder, Pyramid, Cone – Auxiliary Views; Frustums and truncated solids. Development of surfaces of Right Regular Solids - Prism, Pyramid, Cylinder and Cone; Draw the sectional orthographic views of geometrical solids, objects from industry and dwellings (foundation to slab only) . Isometric Projections covering, Principles of Isometric projection – Isometric Scale, Isometric Views, Isometric axes, Conventions; Isometric Views of solids, Box method, coordinate method, Simple and compound Solids; Conversion of Isometric Views to Orthographic Views and Vice-versa, Conventions;

UNIT 4: Introduction of CAD in engineering drawing. Overview of Computer Graphics covering, listing the computer technologies that impact on graphical communication, Demonstrating knowledge of the theory of CAD software [such as: The Menu System, Toolbars (Standard, Object Properties, Draw, Modify and Dimension), Drawing Area

(Background, Crosshairs, Coordinate System), Dialog boxes and windows, Shortcut menus (Button Bars), The Command Line (where applicable),

UNIT 5: Customization & CAD Drawing consisting of set up of the drawing page and the printer, including scale settings, Setting up of units and drawing limits Applying various ways of drawing circles; ; Setting up and use of Layers, layers to create drawings, Create, edit and use customized layers; Changing line lengths through modifying existing lines (extend/lengthen); Printing documents to paper using the print command; orthographic projection techniques; Drawing of lines, circles, polygons using CAD technique. Introduction of solids. Multi views.

Text/Reference Books:

1. Bhatt N.D., Panchal V.M. & Ingle P.R., (2014), Engineering Drawing, Charotar Publishing House
2. Shah, M.B. & Rana B.C. (2008), Engineering Drawing and Computer Graphics, Pearson Education
   B. & Agrawal C. M. (2012), Engineering Graphics, TMH Publication
3. Narayana, K.L. & P Kannaiah (2008), Text book on Engineering Drawing, Scitech Publishers
4. (Corresponding set of) CAD Software Theory and User Manuals

BMEP 101	Manufacturing Practices/Workshop	1L-0T-2P	2 Credits

Course Objective:

Manufacturing is fundamental to the development of any engineering product. The course on Engineering Workshop Practice is intended to expose engineering students to different types of manufacturing / fabrication processes, dealing with different materials such as metals, ceramics, plastics, wood, glass etc. While the actual practice of fabrication techniques is given more weightage, some lectures and video clips available on different methods of manufacturing are also included.

Course Outcomes:

At the end of this course, students will demonstrate the ability to

- Understanding different manufacturing techniques and their relative advantages/ disadvantages with respect to different applications.
- Selection of a suitable technique for meeting a specific fabrication need.
- Acquire a minimum practical skill with respect to the different manufacturing methods and develop the confidence to design & fabricate small components for their project work and also to participate in various national and international technical competitions.
- Introduction to different manufacturing methods in different fields of engineering.
- Practical exposure to different fabrication techniques.
- Creation of simple components using different materials.
- Exposure to some of the advanced and latest manufacturing techniques being employed in the industry.

Course Contents:

Lectures & videos: (10 hours)

1. Manufacturing Methods- casting, forming, machining, joining, Introduction to Lathe, Drilling etc. **(3 lectures)**
2. CNC machining, Additive manufacturing **(1 lecture)**
3. Fitting operations & power tools **(1 lecture)**
4. Electrical &Electronics **(1 lecture)**
5. Carpentry **(1 lecture)**
6. Plastic moulding, glass cutting **(1 lecture)**
7. Metal casting **(1 lecture)**
8. Welding (arc welding & gas welding), brazing **(1 lecture)**

(ii) Workshop Practice:(60 hours)

1. Machine shop **(10 hours)**
2. Fitting shop **(8 hours)**
3. Carpentry **(6 hours)**
4. Electrical & Electronics- Soldering, Brazing, Winding etc.**(8 hours)**
5. Welding shop **(8 hours (Arc welding 4 hrs + gas welding 4 hrs)**
6. Casting **(8 hours)**
7. Smithy **(6 hours)**
8. Plastic moulding/ Glass Cutting/ Sheet Metal Shop (6 hours)

Note: Examinations could involve the actual fabrication of simple components, utilizing one or more of the techniques covered above.

Laboratory Outcomes

- Upon completion of this laboratory course, students will be able to fabricate components with their own hands.
- They will also get practical knowledge of the dimensional accuracies and dimensional tolerances possible with different manufacturing processes.
- By assembling different components, they will be able to produce small devices of their interest.

BAST 104 & BASP 104	Engineering Physics	3L-1T-2P	5 Credits

Course Contents:

Module 1: Wave nature of particles and the Schrodinger equation (8 lectures)

Introduction to Quantum mechanics, Wave nature of Particles, Free-particle wave function and wave-packets, Group Velocity and Phase Velocity and relation, Uncertainty principle, wave function, Born interpretation of wave function, operators, Time-dependent and time-independent Schrodinger equation for wave function, Application: Particle in a One-dimensional Box.

Module 2: Wave optics (8 lectures)

Huygens' principle, superposition of waves and interference of light by wave front splitting and amplitude splitting; Young's double slit experiment, Newton's rings, Michelson interferometer, Mach- Zehnder interferometer.

Fraunhofer diffraction from a single slit and a circular aperture, the Rayleigh criterion for limit of resolution and its application to vision; Diffraction gratings and their resolving power.

Module 3: Introduction to solids (8 lectures)

Free electron theory of metals, Fermi level of Intrinsic and extrinsic, density of states, Bloch's theorem for particles in a periodic potential. V-I characteristics of PN junction, Zener diode, Solar Cell, Hall Effect, concept of zero resistivity and superconductivity, Meissner effect, Type - I and Type - II superconductors, applications of superconductivity.

Module 4: Lasers (8 lectures)

Einstein's theory of matter radiation interaction and A and B coefficients; amplification of light by population inversion, different types of lasers: gas lasers (He-Ne, CO_2), solid-state lasers (ruby, Neodymium), Properties of laser beams: mono-chromaticity, coherence, directionality and brightness, laser speckles, applications of lasers in science, engineering and medicine. Introduction to Optical fiber, acceptance angle and cone, Numerical aperture, V number, attenuation.

Module 5: Electrostatics in vacuum (8 lectures)

Gradient, Divergence and curl, Stokes' theorem, Gauss Theorem, Calculation of electric field and electrostatic potential for a charge distribution; Electric displacement, Basic Introduction to Dielectrics, Continuity equation for current densities; Maxwell's equation in vacuum and non-conducting medium; Poynting vector.

List of Experiment*

1. To determine the dispersive power of prism.
2. To determine the wave length of sodium light with the help of newton's Ring.
3. Resolving Power of Telescope.
4. YDSE (Young's double slit Experiment).
5. To determine the frequency of AC mains supply.
6. V-I Characteristics of P-N junction diode.
7. To determine the wave length of diode loses by single slit diffraction.
8. To determine the plank's constant with the help of photocell.
9. Hall's effect experiment.
10. Calibration of ammeter by using reference zener diode.

11. To study the effect of temperature on reverse saturation current in P-N junction diode and to determine the energy band gap.
12. To determine the wave length of sodium by using plane diffraction grating.
13. To determine the prominent lines of mercury source by plane diffraction grating.
14. To determine the numerical aperture of an optical fiber.
15. To determine wave length of given laser by plane diffraction grating.
16. To determine the variation of magnetic field along the axis of current carrying circular coil and the estimation the radius of coil. 1. To determine the resistivity and band gap by four probe method.
17. Use of Michelson-Morley interferometer for determining the wavelength of He-Ne laser
18. To determine the specific rotation of sugar solution using Loren's half shade polarimeter.
19. To calculate the dielectric constant of the given dielectric material.
20. To find the capacitance and permittivity of the given material.
21. Measurement of length (or diameter) using vernier calliper, screw gauge and travelling microscope
22. To determine g by bar pendulum and Kater's pendulum.
23. To determine g and velocity for a freely falling using digital timing technique.
24. To study the motion of a spring and calculate (a) spring constant (b) value of g
25. To determine the height of an object using a sextant.
26. Determination of the value of e/m of an electron by helical method/ Thomson method.

**** Minimum 15 experiment are mandatory to perform out of above list of experiments as well other than these experiments 3-4 more experiments can be considered as per their availability***

Suggested Reference Books

1. A. Ghatak, Optics.
2. O. Svelto, Principles of Lasers.
3. David Griffiths, Introduction to Electrodynamics.
4. D.J. Griffiths, Quantum Mechanics.
5. Halliday & Resnick, Physics.
6. HC Verma, Quantum Physics
7. MN Avdhanulu, PG Kshirsagar et all, Engineering Physics

BAST 105	MATHEMATICS-II	3L-1T-0P	4 Credits

OBJECTIVES: The objective of this course is to familiarize the prospective engineers with techniques in Ordinary and partial differential equations, complex variables and vector calculus. It aims to equip the students to deal with advanced level of mathematics and applications that would be essential for their disciplines. More precisely, the objectives are:

- To introduce effective mathematical tools for the solutions of ordinary and partial differential equations that model physical processes.
- To introduce the tools of differentiation and integration of functions of complex variable that are used in various techniques dealing engineering problems.
- To acquaint the student with mathematical tools available in vector calculus needed various field of science and engineering.
- To develop the tool of Series and Fourier series for learning advanced Engineering Mathematics.

Course Contents:

Module 1:Ordinary Differential Equations I :(8 hours) : Differential Equations of First Order and First Degree (Leibnitz linear, Bernoulli's, Exact), Differential Equations of First Order and Higher Degree, Higher order differential equations with constants coefficients, Homogeneous Linear Differential equations, Simultaneous Differential Equations.

Module 2:Ordinary differential Equations II:(8 hours) : Second order linear differential equations with variable coefficients, Method of variation of parameters, Power series solutions; Legendre polynomials, Bessel functions of the first kind and their properties.

Module 3: Partial Differential Equations : (8 hours) : Formulation of Partial Differential equations, Linear and Non-Linear Partial Differential Equations, Homogeneous Linear Partial Differential Equations with Constants Coefficients.

Module 4: Sequences and series: (8 hours): Convergence of sequence and series, tests for convergence; Comparison Test; Ratio Test; D'Alembert's Ratio Test, Raabe's Test, Logarithmic Test, Cauchy Root Test, Weierstrass M Test; Alternating Series, Uniform Conversions, Fourier series: Half range sine and cosine series, Parseval's theorem.

Module 5: Functions of Complex Variable :(8 hours) : Functions of Complex Variables: Analytic Functions, Harmonic Conjugate, Cauchy-Riemann Equations (without proof), Line Integral, Cauchy-Goursat theorem (without proof), Cauchy Integral formula (without proof), Singular Points, Poles & Residues, Residue Theorem, Application of Residues theorem for Evaluation of Real Integral (Unit Circle).

Textbooks/References:

1. G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9th Edition, Pearson, Reprint, 2002.
2. Erwin kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
3. W. E. Boyce and R. C. DiPrima, Elementary Differential Equations and Boundary Value Problems, 9th Edn., Wiley India, 2009.
4. S. L. Ross, Differential Equations, 3rd Ed., Wiley India, 1984.
5. E. A. Coddington, An Introduction to Ordinary Differential Equations, Prentice Hall India, 1995.
6. E. L. Ince, Ordinary Differential Equations, Dover Publications, 1958.
7. J. W. Brown and R. V. Churchill, Complex Variables and Applications, 7th Ed., McGraw Hill, 2004.
8. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2008.
9. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 36th Edition, 2010.

BMET 102 **BMEP 102**	**Basic Mechanical Engineering**	**3L-1T-2P**	**5 Credits**

Course Contents:

UNIT-1:Fundamental Concepts and Definitions

Definition of thermodynamics, System, Surrounding and universe, Phase, Concept of continuum,Macroscopic & microscopic point of view. Density, Specific volume, Pressure, temperature.Thermodynamic equilibrium, Property, State, Path, Process, Cyclic and non cyclic processes,Reversible and irreversible processes, Quasi static process, Energy and its forms, Enthalpy.

UNIT-2:

Zeroth law: Zeroth law, Different temperature scales and temperature measurement

First law: First law of thermodynamics. Processes - flow and non-flow, Control volume, Flow work and non-flow work, Steady flow energy equation, Unsteady flow systems and their analysis.

Second law: Limitations of first law of thermodynamics, Essence of second law, Thermal reservoir, Heat engines. COP of heat pump and refrigerator. Statements of second law and their equivalence,Carnot cycle, Carnot theorem, Thermodynamic temperature scale, Clausius inequality. Concept of entropy.

UNIT-3:

Properties of steam: Properties of steam, Phase transformation process and its graphical representation on P-V, T-V& T-s diagram, Mollier diagram and Steam Tables, Processes involving steam in closed and open systems.

Introduction to I.C. Engines: Two & four stoke S.I. and C.I. engines. Otto cycle, Diesel cycle, Dual cycle.

UNIT-4:Force system and Analysis

Basic concept: Review of laws of motion, transfer of force to parallel position, resultant of planer force system,Free Body Diagrams, Equilibrium. **Friction:** Introduction, Laws of Coulomb friction,Equilibriumof bodies involving dry fiction.

Structure Analysis

Beams: Introduction, Shear force and bending moment, Shear force and bending moment diagram for statically determinate and indeterminate beams.

Trusses: Introductio n, Simple Trusses, Determination of forces in simple truss members, Method of Joints and Method of section.

UNIT-5

Stress and Strain Analysis

Simple stress and strain: Introduction, Normal shear stresses, Stress-strain diagrams for ductile and brittle materials,Elastic constants, One dimensional loading of members of varying cross section, Strain energy,Thermal stresses.

Compound stress and strains: Introduction, State of plane stress, Principal stress and strain, Mohr's circle for stress and strain.

Pure Bending of Beams: Introduction, Simple bending theory, Stress in beams of different cross sections.

Torsion: Introduction, Torsion of Shafts of circular section, Torque and Twist, Shear stress due to Torque.

References:

1. Van Wylen G.J. & Sonntag R.E. : Fundamentals of classical thermodynamics, John Wiley &Sons, Inc.NY.
2. Holman, J.P. : Thermodynamics, Mc Graw Hill book Co. NY.
3. Singh Onkar, Bhavikatti S.S., Chandra Suresh : Introduction to Mechanical Engineering:
Thermodynamics, Mechanics and Strength of Materials, New Age International Publishers
4. Yadav R. : Thermodynamics and Heat Engines, Vol I & II (SI Editio n) Central Publishing
House Allahabad.
5. G. H. Ryder : Strength of Materials, Mc Millan Publishers India Ltd.
6. Timoshenko : Strength of Materials, D. Van Nostrand Company Inc.

MECHANICAL ENGINEERING LAB

List of Practical **L T P 0 0 2**

A minimum of 8 experiments from the following :

1. Study of Steam engine and steam turbine models.
2. Study of 2-stroke and 4 -stroke I.C.E. models.
3. Study of Fiat engine and/ or Diesel engine prototype.
4. Study of a vapour compression Refrigeration unit tutor/refrigerator.
5. Study of a window type air conditioner.
6. To conduct the tensile test on a UTM and determine ultimate Tensile strength, percentage elongation for a steel specimen.
7. To conduct the compression test and determine the ultimate compressive strength for a specimen.
8. To conduct the Impact test (Izod / charpy) on the Impact testing machine and to find the impact strength.
9. To determine the value of acceleration due to gravity by Atwood's Machine appratus.
10. To verify the principle of moment by Bell Crank Lever Appratus
11. To determine the moment of inertia of a flywheel apparatus about its axis of rotation.
12. To find out coefficient of friction by combined inclined plane & friction slide apparatus.

BecT 101 **BECP 101**	**Basic Electronics Engineering**	**3L-1T-2P**	**5 Credits**

Course

Contents:

Module	Basic Electronics(BECT101,BECP101)	Hr
1.	**Semiconductor Diodes** Semiconductor materials- intrinsic and extrinsic types , Ideal Diode , Terminal characteristics of diodes: p-n junction under open circuit condition p-n junction under forward bias and reverse bias conditions p-n junction in breakdown region , Diode small signal model Zener diode and applications , Rectifier Circuits, Clipping and Clamping circuits	**8**
2	**DIODE APPLICATIONS:** Rectifiers and filter circuit: Half wave rectifier, Full wave rectifier, bridge rectifier and their analysis, L,C and Pi filters, Series and shunt diode clippers, Clipping at two independent levels, Clamping operation , Clamping circuit, Practical clamping circuits, Basic regulator supply using zener diode	**7**
3	**Bipolar Junction Transistors (BJTs)** Physical structure and operation modes, Active region operation of transistor, D.C. analysis of transistor circuits, Transistor as an amplifier, Biasing the BJT: fixed bias, emitter feedback bias, collector feedback bias and voltage divider bias, Basic BJT amplifier configuration: common emitter, common base and common collector amplifiers, Transistor as a switch: cut-off and saturation modes , High frequency model of BJT amplifier	**10**
4	**Field Effect Transistor (FET**) ***Enhancement-type MOSFET***: structure and physical operation, current-voltage characteristics Depletion-type MOSFET , D.C. operation of MOSFET circuits, MOSFET as an amplifier, Biasing in MOSFET amplifiers , Basic MOSFET amplifier configuration: common source, common gate and common drain types , High frequency model of MOSFET amplifier , Junction Field-Effect Transistor (JFET)	**10**
5	**Operation Amplifier (Op-amps)** ***Ideal Op-amp Differential amplifier*****:** differential and common mode operation common mode rejection ratio (CMRR) , ***Practical op-amp circuits***: inverting amplifier, non -inverting amplifier, weighted summer, integrator, differentiator , Large signal operation of op-amps , Other ***applications of op-amps*****:** instrumentation circuits, active filters, controlled sources, logarithmic amplifiers, waveform generators, Schmitt triggers, comparators	**10**

TEXT BOOKS:

1. Integrated devices & Circuits by Millman & Halkias.
2. Electronics Devices and Circuit Theory by R. Boylestad.

REFERENCE BOOKS:

1. Electronics Devices and Circuits-II by A.P.Godre & U.A. Bakshi.
2. Electronics Devices and Circuit by G.K. Mithal.

Basic Electronics Lab

Sr.	Experiment
1	CRO-Applications
2	V-I Characteristics of Silicon & Germanium PN Junction diodes
3	V-I Characteristics of Zener Diode
4	Characteristics of BJT in Common Emitter Configuration
5	Characteristics of JFET in Common Source Configuration
6	Half Wave and Full Wave Rectifier With Filter
7	Common Emitter BJT Amplifier for audio signal amplification
8	Applications of Operational Amplifier as adder and Subtractor
9	Applications of Operational Amplifier as differentiator and integrator
10	All logic Gate's truth table validation

BCST 101 & BCSP 101	Fundamentals of Computer & Programming in C	3L-1T-2P	5 Credits

Course Objective

1. To learn basics of computers
2. To learn basics of Operating System
3. To learn basics of C Language
4. To learn basics of Programming

Course Outcomes:

1. The student will learn to formulate simple algorithms for arithmetic and logical problems.
2. To translate the algorithms to programs (in C language).
3. To test and execute the programs and correct syntax and logical errors.
4. To implement conditional branching, iteration and recursion.
5. To decompose a problem into functions and synthesize a complete program using divide and conquer approach.
6. To use arrays, pointers and structures to formulate algorithms and programs.
7. To apply programming to solve matrix addition and multiplication problems and searching and sorting problems.
8. To apply programming to solve simple numerical method problems, namely rot finding of function, differentiation of function and simple integration

Detailed Contents

Module I

Introduction to Programming - Introduction to components of a computer system (disks, memory, processor, where a program is stored and executed, operating system, compilers etc.)
Idea of Algorithm: steps to solve logical and numerical problems. Representation of Algorithm Flowchart/Pseudocode with examples.
From algorithms to programs; source code, variables (with data types) variables and memory locations, Syntax and Logical Errors in compilation, object and executable code

Module II

Arithmetic expressions and precedence, Conditional Branching and Loops, Writing and evaluation of conditionals and consequent branching, Iteration and loops,
Arrays - Arrays (1-D, 2-D), Character arrays and Strings

Module III

Basic Algorithms - Searching, Basic Sorting Algorithms (Bubble, Insertion and Selection), Finding roots of equations, notion of order of complexity through example programs (no formal definition required)
Function - Functions (including using built in libraries), Parameter passing in functions, call by value, Passing arrays to functions: idea of call by reference

Module IV –

Recursion - Recursion, as a different way of solving problems. Example programs, such as Finding Factorial, Fibonacci series, Ackerman function etc. Quick sort or Merge sort.
Structure - Structures, Defining structures and Array of Structures

Module V

Pointers - Idea of pointers, Defining pointers, Use of Pointers in self-referential structures, notion of linked list (no implementation)
File handling - (only if time is available, otherwise should be done as part of the lab)

Experiments

The laboratory should be preceded or followed by a tutorial to explain the approach or algorithm to be implemented for the problem given.

Tutorial 1: Problem solving using computers:
Lab1: Familiarization with programming environment

Tutorial 2: Variable types and type conversions:
Lab 2: Simple computational problems using arithmetic expressions

Tutorial 3: Branching and logical expressions:
Lab 3: Problems involving if-then-else structures

Tutorial 4: Loops, while and for loops:
Lab 4: Iterative problems e.g., sum of series

Tutorial 5: 1D Arrays: searching, sorting:
Lab 5: 1D Array manipulation

Tutorial 6: 2D arrays and Strings
Lab 6: Matrix problems, String operations

Tutorial 7: Functions, call by value:
Lab 7: Simple functions

Tutorial 8 &9: Numerical methods (Root finding, numerical differentiation, numerical integration):
Lab 8 and 9: Programming for solving Numerical methods problems

Tutorial 10: Recursion, structure of recursive calls
Lab 10: Recursive functions

Tutorial 11: Pointers, structures and dynamic memory allocation
Lab 11: Pointers and structures

Tutorial 12: File handling:
Lab 12: File operations Laboratory

Suggested Text Books

1. Byron Gottfried, Schaum's Outline of Programming with C, McGraw-Hill
2. E. Balaguruswamy, Programming in ANSI C, Tata McGraw-Hill Suggested

Reference Books

1. Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, Prentice Hall of India

13. WAP to illustrate constructor & Destructor
14. WAP to illustrate Object and classes.
15. WAP to illustrate Operator overloading
16. WAP to illustrate Function overloading
17. WAP to illustrate Derived classes & Inheritance
18. WAP to insert and delete and element from the Stack
19. WAP to insert and delete and element from the Queue
20. WAP to insert and delete and element from the Linked List

Recommended Text Books:

1. Fundamentals of Computers : E Balagurusamy, TMH
2. Basic Computer Engineering: Silakari and Shukla, Wiley India
3. Fundamentals of Computers : V Rajaraman, PHI
4. Information Technology Principles and Application: Ajoy Kumar Ray & Tinku Acharya PHI.

Recommended Reference Books:

1. Introduction of Computers : Peter Norton, TMH
2. Object Oriented Programming with C++ :E.Balagurusamy, TMH
3. Object Oriented Programming in C++: Rajesh K.Shukla, Wiley India
4. Concepts in Computing: Kenneth Hoganson, Jones & Bartlett.
5. Operating Systems – Silberschatz and Galvin - Wiley India
6. Computer Networks:Andrew Tananbaum, PHI
7. Data Base Management Systems, Korth, TMH

BASP 206	Language Lab and Seminars	0L-0T-2P	1 Credits

Course objective: This course intends to impart practical training in the use of English Language for Communicative purposes and aims to develop students' personality through language Laboratory.

Topics to be covered in the Language laboratory sessions:

1. Introducing oneself, family, social roles.
2. Public Speaking and oral skills with emphasis on conversational practice, extempore speech, JAM(Just a minute sessions), describing objects and situations, giving directions, debate, telephonic etiquette.
3. Reading Comprehension: Intensive reading skills, rapid reading, and reading aloud (Reading material to be selected by the teacher).
4. To write a book review. Standard text must be selected by the teacher.
5. Role plays: preparation and delivery topic to be selected by teacher/faculty.
6. Practice of Communication Skills using Language Lab

BEST 101	Environmental Studies	L - T - P 3 0 0	0 Credits

AS Per UGC Syllabus

Total Marks - 100

The structure of the question paper and Marks Distribution:

University Examination
- Part A - Short answer pattern - 20 marks
- Part B - Essay type with inbuilt choice - 50 marks

Internal Evaluation at Institute Level
- Part C - Field & Project Work - 30 marks

AIM of Environmental Studies Subject

The aim of E.V.S. (environmental studies) is to develop a world population that is aware of and concerned about the environment and its associated problems and which has the knowledge ,Skills, attitudes ,motivations and commitment to work individually and collectively towards solutions of current problems and prevention of new ones. In view of this aim, environmental studies should form an integral part of the educational process, be centered in practical problems and be of an interdisciplinary/multidisciplinary character.

OBJECTIVES of Environmental Studies Subject

- Awareness: To help social groups and individuals acquire awareness of and sensitively to the total environment and it's allied problems.
- Knowledge: To help social groups and individuals gain a variety of experiences and acquire a basic understanding of environment and it's associated problems.
- Attitudes: To help social groups and individuals acquire a set of values and feelings of concern for environment.
- Skills: To help the individuals in acquiring skills for identifying and solving environmental problems.
- Participation: To provide social groups and individuals with an opportunity to be actively involved at all levels in working towards the resolution of environmental problems.

Detailed Content

Unit I –

Introduction: Introduction to environmental studies, Multidisciplinary nature of environmental studies; Scope and importance; the need for environmental education. Concept of sustainability and sustainable development.

Natural Resources:
Renewable and non-renewable resources: Natural resources and associated problems.
- Forest resources : Use and over-exploitation, deforestation, case studies. Timber extraction, mining, dams and their effects on forest and tribal people.
- Water resources : Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems.
- Mineral resources : Use and exploitation, environmental effects of extracting and using mineral resources, case studies.
- Food resources : World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies.
- Energy resources : Growing energy needs, renewable and non renewable energy sources, use of alternate energy sources. Case studies.

- Land resources : Land as a resource, land degradation, man induced landslides, soil erosion and desertification.
- Role of an individual in conservation of natural resources.
- Equitable use of resources for sustainable lifestyles.

Unit II : **Ecosystems**:

- Concept of an ecosystem.
- Structure and function of an ecosystem.
- Producers, consumers and decomposers.
- Energy flow in the ecosystem.
- Ecological succession.
- Food chains, food webs and ecological pyramids.
- Introduction, types, characteristic features, structure and function of the following ecosystem :-
    - Forest ecosystem
    - Grassland ecosystem
    - Desert ecosystem
    - Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)

Unit III: **Biodiversity and Conservation**

- Introduction – Definition : genetic, species and ecosystem diversity.
- Biogeographical classification of India
- Value of biodiversity : consumptive use, productive use, social, ethical, aesthetic and option values
- Biodiversity at global, National and local levels.
- Inida as a mega-diversity nation
- Hot-sports of biodiversity.
- Threats to biodiversity : habitat loss, poaching of wildlife, man-wildlife conflicts.
- Endangered and endemic species of India
- Conservation of biodiversity : In-situ and Ex-situ conservation of biodiversity.

Unit IV : **Environmental Pollution**

Definition

- Cause, effects and control measures of :-
    - Air pollution
    - Water pollution
    - Soil pollution
    - Marine pollution
    - Noise pollution
    - Thermal pollution
    - Nuclear hazards
- Solid waste Management : Causes, effects and control measures of urban and industrial wastes.
- Role of an individual in prevention of pollution.
- Pollution case studies.
- Disaster management : floods, earthquake, cyclone and landslides.

UNIT V - Social Issues and the Environment

- From Unsustainable to Sustainable development
- Urban problems related to energy
- Water conservation, rain water harvesting, watershed management
- Resettlement and rehabilitation of people; its problems and concerns. Case Studies
- Environmental ethics: Issues and possible solutions.
- Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Case Studies.

- Wasteland reclamation.
- Consumerism and waste products.
- Environment Protection Act.
- Air (Prevention and Control of Pollution) Act.
- Water (Prevention and control of Pollution) Act
- Wildlife Protection Act
- Forest Conservation Act
- Issues involved in enforcement of environmental legislation.
- Public awareness.

UNIT VI - Human Population and the Environment

- Population growth, variation among nations.
- Population explosion – Family Welfare Programme.
- Environment and human health.
- Human Rights.
- Value Education.
- HIV/AIDS.
- Women and Child Welfare.
- Role of Information Technology in Environment and human health.
- Case Studies. (6 lectures)

Note: Introduction and familiarize students with the following

Global Environmental Issues and Environmental Laws

Pollution Tragedies: Love canal, Bhopal Gas, Endosulfan, Minamata and Flint water. UN Initiatives and International agreements: Montreal and Kyoto protocols, Paris Climate Summit (2015) and Convention on Biological Diversity (CBD). Environment Laws: Environment Protection Act (1986); Air (Prevention & Control of Pollution) Act (1981); Forest Conservation Act (1980); Water (Prevention and control of Pollution) Act (1974); Wildlife Protection Act (1972).

Field work

1. Visit to a local area to document environmental assets river / forest / grassland / hill / mountain
2. Visit to a local polluted site-Urban / Rural / Industrial / Agricultural
3. Study of common plants, insects, birds.
4. Study of simple ecosystems-pond, river, hill slopes, etc.
5. Plantation at least 2 fruits tree in Surroundings. Pic is to taken.
6. Any useful daily good from waste materials.
7. Taken at least 5 pics of surrounding by mobile in relation to environmental/social issues.
8. Development of detailed list of flora and fauna of college campus.
9. Manufacturing of any technical prototype/model in relation to Climatic Change mitigation.

Note: Minimum Five activities shall be done by each class and reports shall submit to University after host institute verification.

Text Books:

1. Basu, M. and Xavier, S.,Fundamentals of Environmental Studies, Cambridge University Press, 2016.
2. Mitra, A. K and Chakraborty, R., Introduction to Environmental Studies, Book Syndicate, 2016.
3. Enger, E. and Smith, B., Environmental Science: A Study of Interrelationships, Publisher: McGraw-Hill Higher Education; 12th edition, 2010.
4. Basu, R.N, Environment, University of Calcutta, 2000.

Suggested Readings:

1. Odum, E.P., Odum, H.T. & Andrews, J. 1971. Fundamentals of Ecology. Philadelphia: Saunders.
2. Pepper, I.L., Gerba, C.P. & Brusseau, M.L. 2011. Environmental and Pollution Science. Academic Press.
3. Gleeson, B. and Low, N. (eds.) 1999. Global Ethics and Environment, London,Routledge.
4. Gleick, P. H. 1993. Water in Crisis. Pacific Institute for Studies in Dev., Environment & Security. Stockholm Env. Institute, Oxford Univ. Press.
5. Grumbine, R. Edward, and Pandit, M.K. 2013. Threats from India's Himalaya dams. Science, 339: 36-37.
6. McCully, P. 1996. Rivers no more: the environmental effects of dams (pp. 29-64). Zed Books.
7. McNeill, John R. 2000. Something New Under the Sun: An Environmental History of the Twentieth Century.
8. Ghosh Roy, MK, Sustainalble Development (Environment, Energy and Water Resources), Ane Books Pvt. Ltd., 2011.
9. Karpagam, M and GeethaJaikumar, Green Management, Theory and Applications, Ane Books Pvt. Ltd., 2010.
10. Bala Krishnamoorthy, Environmental Management, PHI learning PVT Ltd, 2012.

Uttarakhand Technical University, Dehradun

Scheme of Examination as per AICTE Flexible Curricula

Evaluation Schemes for B. Tech 2nd to 4th Year

W.E.F. Academic Session 2020-21

III to VIII SEMESTER

Bachelor of Technology (B. Tech.)

[Computer Science and Engineering]

[Computer Science and Engineering]
W.E.F. Academic Session 2020-21

III 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.	BCET301	BSC-5	Energy & Environmental Engineering	100	30	20	--	--	150	3	1	0	4
2.	BCST-302	DC-1	Discrete Structure	100	30	20	-	-	150	3	1	0	4
3.	BCST-303 BCSP 303	DC-2	Data Structure	100	30	20	30	20	200	3	1	2	5
4.	BECT 304 BECP 304	DC-3	Digital Electronics	100	30	20	30	20	200	3	1	2	5
5.	BEET 305 BEEP 305	DC-4	Object Oriented Programming & Methodology	100	30	20	30	20	200	3	1	2	5
6	BCSP-306	DLC-3	Computer Workshop (Using Python)	-	-	-	30	20	50	-	-	2	1
7	BASP 107	DLC-1	Evaluation of Internship-I completed at I year level /Seminar for Lateral Entry students				-	50	50	0	0	2	1
8	BASP 307	DLC-4	90 hrs Internship based on using various software's –Internship -II	To be completed anytime during Third/ fourth semester. Its evaluation/credit to be added in fifth semester.									
Total				500	150	100	120	130	1000	15	5	10	25
NSS/NCC													

IV 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.	BAST 401	ESC	Mathematics- III	100	30	20	-	-	150	3	1	-	4
2.	BECT 402 BECP 402	DC	Database Management Systems	100	30	20	30	20	200	3	1	2	5
3.	BECT 403 BECP 403	DC	Software Engineering	100	30	20	30	20	200	3	-	2	4
4.	BEET 404 BEEP 404	DC	Computer Org. & Architecture	100	30	20	30	20	200	3	1	2	5
5.	BEET 404 BEEP 404	DC	Theory of Automata and Formal Languages	100	30	20	-	-	150	3	1	0	4
6.	BHUT401	HV	Universal Human Values-2	50	30	20	-	-	100	2	1	0	3
	BCST 408	MC	Cyber Security and software tools										
7	BECP 407	DLC	90 hrs Internship based on using various software's –Internship -II	To be completed anytime during Third/ fourth semester. Its evaluation/credit to be added in fifth semester.									
Total				550	180	120	90	60	1000	17	5	6	25
NSS/NCC													

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.	BCST 501 BCSP- 501	DC	Operating System	100	30	20	30	20	200	3	1	2	5
2.	BCST -502 BCSP- 502	DC	Computer Networks	100	30	20	30	20	200	3	1	2	5
3.	BCST -503 BCSP-503	DC	Design and Analysis of Algorithms	100	30	20	30	20	200	3	1	2	5
4.	BCST -504	DE	Departmental Elective-I	100	30	20	-	-	150	3	1	0	4
5.	BOCS -505	OE	Open Elective-I	100	30	20	-	-	150	3	1	0	4
6.	BCST -506	D Lab	Virtual Lab (Unix/ Linux/python/JAVA etc)	-	-	-	-	50	50	0	0	2	1
8	BCST -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			Open Electives	
BCST 504 (A)	Network Architecture		BOCS -505 (A)	Principles of Programming Language
BCST 504 (B)	Pattern Recognition		BOCS -505 (B)	Modeling and Simulation
BCST 504 (C)	Internet and Web Technology		BOCS -505 (C)	Cyber Security
BCST 504 (D)	Java Programming		BOET-504(D)	Innovation and Entrepreneurship

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.	BCST-601 BCSP-601	DC	Microprocessors and Applications	100	30	20	30	20	200	3	1	2	5
2.	BCST -602 BCSP-602	DC	Compiler Design	100	30	20	30	20	200	3	1	2	5
	BCST -603 BCSP-603	DC	Data Analytics	100	30	20	30	20	200	3	1	2	5
3.	BCST -604	DE	Departmental Elective	100	30	20		-	150	3	1	0	4
4.	BOCS -605	OE	Open Elective	100	30	20	-	-	150	3	1	0	4
5.	BCSP-606	P	Open Source Lab/ Matlab Programming	-	-	-	30	20	50	0	0	2	1
6.	BCSP -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**	
BCST 604(A)	Graph Theory		BOCS -605(A)	Digital Signal Processing
BCST 604(B)	Data Mining		BOCS -605(B)	Machine Learning
BCST 604(C)	Computer Graphics and Visualisation		BOCS -605(C)	Software Testing
BCST 604 (D)	Software Quality Management		BOCS 605 (D)	Distributed Systems and Cloud Computing

VII 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.	BCST 701 BCSP 701	DC	.NET Framework and Programming	100	30	20	30	20	200	3	1	2	5
2.	BCST -702 BCSP-702	DC	Ad hoc and Wireless Networks	100	30	20	30	20	200	3	1	2	5
3.	BCST -703	DE	Departmental Elective	100	30	20	-	-	150	3	1	0	4
4.	BCST -704	OE	Open Elective	100	30	20	-	-	150	3	1	0	4
5.	BCSP -705	D Lab	Virtual Lab	-	-	-	30	20	50	0	0	2	1
6	BCSP -706	DLC-1	Evaluation of Internship-III completed at III year level	-	-	-	-	50	50			2	1
7	BCSP -707	P	Minor Project-II	-	-	-	50	50	100	0	0	4	2
Total				400	120	80	110	190	900	12	5	12	22
NSS/NCC													

Departmental Electives		**Open Electives**	
BCST 703(A)	Human Computer Interfacing	BOCS -704(A)	Big Data Processing
BCST 703(B)	Advanced Computer Architecture	BOCS -704(B)	Digital Image Processing
BCST 703(C)	Soft Computing	BOCS -704(C)	Ethical Hacking
BCST 703 (D)	Internet-of-Things Systems	BOCS 704 (D)	Subject using SWAYAM etc

VIII 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.	BCST-801 BCSP-801	DC	Advanced Operating Systems	100	30	20	30	20	200	3	1	2	5
2.	BCST -802 BCSP-802	DC	Cryptography & Network Security	100	30	20	30	20	200	3	1	2	5
3.	BCST -803	DE	Departmental Elective	100	30	20	-	-	150	3	1	0	4
4.	BOCS-804	OE	Open Elective	100	30	20	-	-	150	3	1	0	4
5	BCSP -805	P	Major Project	-	-	-	100	100	200	0	0	8	4
Total				400	120	80	120	130	900	12	4	12	22
NSS/NCC													

Departmental Electives		**Open Electives**	
BCST 803 (A)	Speech and Natural Language Processing	BOCS -804(A)	Fault Tolerant Computing
BCST 803 (B)	Embedded Systems	BOCS -804 (B)	Artificial Intelligence
BCST 803 (C)	Queuing Theory and Modeling	BOCS 804 (C)	Cognitive Radio Networks
BCST 803 (D)	Cloud Security	BOCS 804 (D)	Service Oriented Architecture
BCST 803 (E)	Blockchain	BOCS 804 (E)	Subject from SWAYAM etc

Note: 20% of subjects can be allowed to be taken online through SWAYAM or any other international Institute.

Specialisation:

- A separate list of additional credits will be released for Minor/Specialisation degree
- Additional 18 credits are to be earned for degree with specialisation.
- In final semester of degree students may be allowed for two subjects online and other subjects can be completed in 6-8 weeks.

Uttarakhand Technical University, Dehradun

New Scheme of Examination as per AICTE Flexible Curricula

Computer Science and Engineering, V-Semester

CS 501 Operating Systems

Unit-I

Introduction: Operating System and Function, Evolution of Operating System, Batch, Interactive, Time Sharing and Real Time System, System Protection. Operating System Structure: System Components, System Structure, Operating System Services.

Unit - II

Concurrent Processes: Process Concept, Principle of Concurrency, Producer / Consumer Problem, Critical Section Problem, Semaphores, Classical Problems in Concurrency, Inter Processes Communication, Process Generation, Process Scheduling, Threads. CPU Scheduling: Scheduling Concept, Performance Criteria, Scheduling Algorithm Evolution, Multiprocessor Scheduling.

Unit - III

Deadlock: System Model, Deadlock Characterization, Prevention, Avoidance and Detection, Recovery from Deadlock, Combined Approach. Memory Management: Basic Machine, Resident Monitor, Multiprogramming with Fixed Partition, Multiprogramming with Variable Partition, Multiple Base Register, Paging, Segmentation, Paged Segmentation, Virtual' Memory Concept, Demand Paging, Performance, Paged Replaced Algorithm, Allocation of Frames, Thrashing, Cache Memory Organization, Impact on Performance.

Unit - IV

File Concept: Access Methods, Directory Structure, File System Mounting, File Sharing, Protection, File System Structure, File System Implementation, Directory Implementation, Allocation Methods, Free space Management, Kernel I/O Subsystems, Disk Structure, Disk Scheduling, Disk Management, Swap, SpaceManagement.

UNIT V

Linux overview: Kernel Architecture, Process, memory, file and I/O management, Interprocesscommunication and synchronization, Security.

Windows XP: System architecture, system management mechanisms, process, thread, memory and file management, I/O subsystem, Interprocess communication, Security.

Suggested Books and References:

1. Milenekovie , "Operating System Concept", McGraw Hill.
2. Abraham Silberschatz, Peter Baer Galvin and Greg Gagne, “Operating System Concepts”, John Wiley & Sons (ASIA) Pvt. Ltd, Seventh edition, 2005
3. Harvey M. Deitel, Paul J. Deitel, and David R. Choffnes, “Operating Systems”, Prentice Hall, Third edition, 2003
4. Petersons, "Operating Systems", Addision Wesley.
5. Tannenbaum, "Operating System Design and Implementation", PHI.
6. Stalling, Willium, "Operating System", Maxwell Macmillan
7. Gary Nutt, "Operating System, A Modern Perspective", Addision Wesley.

Uttarakhand Technical University, Dehradun

New Scheme of Examination as per AICTE Flexible Curricula

Computer Science and Engineering, V-Semester

CS 502 Computer Networks

Unit –I

Computer Network: Definitions, goals, components, Architecture, Classifications & Types.Layered Architecture: Protocol hierarchy, Design Issues, Interfaces and Services, ConnectionOriented & Connectionless Services, Service primitives, Design issues & its functionality. ISOOSI Reference Model: Principle, Model, Descriptions of various layers and its comparison with TCP/IP. Principals of physical layer: Media, Bandwidth, Data rate and Modulations

Unit-II

Data Link Layer: Need, Services Provided, Framing, Flow Control, Error control. Data Link Layer Protocol: Elementary &Sliding Window protocol: 1-bit, Go-Back-N, Selective Repeat, Hybrid ARQ. Protocol verification: Finite State Machine Models & Petri net models. ARP/RARP/GARP

Unit-III

MAC Sub layer: MAC Addressing, Binary Exponential Back-off (BEB) Algorithm, Distributed Random Access Schemes/Contention Schemes: for Data Services (ALOHA and Slotted- ALOHA), for Local-Area Networks (CSMA, CSMA/CD, CSMA/CA), CollisionFree Protocols: Basic Bit Map, BRAP, Binary Count Down, MLMA Limited Contention Protocols: Adaptive Tree Walk, Performance Measuring Metrics. IEEE Standards 802 series & their variant.

Unit-IV

Network Layer: Need, Services Provided, Design issues, Routing algorithms: Least CostRouting algorithm, Dijkstra's algorithm, Bellman-ford algorithm, Hierarchical Routing,Broadcast Routing, Multicast Routing. IP Addresses, Header format, Packet forwarding,Fragmentation and reassembly, ICMP, Comparative study of IPv4 & IPv6

Unit-V

Transport Layer: Design Issues, UDP: Header Format, Per-Segment Checksum, CarryingUnicast/Multicast Real-Time Traffic, TCP: Connection Management, Reliability of DataTransfers, TCP Flow Control, TCP Congestion Control, TCP Header Format, TCP TimerManagement. Application Layer: WWW and HTTP, FTP, SSH, Email (SMTP, MIME, IMAP), DNS, Network Management (SNMP).

References:

1. Andrew S. Tanenbaum, David J. Wetherall, “Computer Networks” Pearson Education.
2. Douglas E Comer, Internetworking WithTcp/Ip Principles, Protocols, And Architecture – Vol.1
3. Dimitri Bertsekas, Robert Gallager, “Data Networks”, PHI Publication, Second Edition.
4. Uyless Black, “Computer Networks”, PHI Publication, Second Edition.
5. Ying-Dar Lin, Ren-Hung Hwang, Fred Baker, “Computer Networks: An Open SourceApproach”, McGraw Hill.

Course Out comes:

After completion of the course students will be able to

1. Characterize and appreciate computer networks from the view point of components and from the view point of services
2. Display good understanding of the flow of a protocol in general and a network protocol

3. Model a problem or situation in terms of layering concept and map it to the TCI/IP stack
4. Select the most suitable Application Layer protocol
5. Design a Reliable Data Transfer Protocol and develop solutions of Transport Layer
6. Describe principles of Network Layers and use IP addressing to create subnets

Uttarakhand Technical University, Dehradun

New Scheme of Examination as per AICTE Flexible Curricula

Computer Science and Engineering, V-Semester

CS 503 Design and Analysis of Algorithms

Course Objectives:

Algorithm design and analysis provide the theoretical backbone of computer science and are a must in the daily work of the successful programmer. The goal of this course is to provide a solid background in the design and analysis of the major classes of algorithms. At the end of the course students will be able to develop their own versions for a given computational task and to compare and contrast their performance.

Course Learning Outcomes:

1. Ability to analyze the performance of algorithms.
2. Ability to choose appropriate algorithm design techniques for solving problems.
3. Ability to understand how the choice of data structures and the algorithm design methods impact the performance of programs.

Course Content:

Unit I: Introduction-Algorithm definition, Algorithm Specification, Performance Analysis-Space complexity, Time complexity, Randomized Algorithms. Divide and conquer- General method, applications - Binary search, Merge sort, Quick sort, Strassen's Matrix Multiplication.

Unit II: Disjoint set operations, union and find algorithms, AND/OR graphs, Connected Components and Spanning trees, Bi-connected components Backtracking-General method, applications. The 8-queen problem, sum of subsets problem, graph colouring, Hamiltonian cycles.

Unit III: Greedy method- General method, applications- Knapsack problem, Job sequencing with deadlines, Minimum cost spanning trees, Single source shortest path problem.

Unit IV: Dynamic Programming- General Method, applications- Chained matrix multiplication, All pairs shortest path problem, Optimal binary search trees, 0/1 knapsack problem, Reliability design, Travelling sales person problem.

Unit V: Branch and Bound- General Method, applications-0/1 Knapsack problem, LC Branch and Bound solution, FIFO Branch and Bound solution, Traveling sales person problem. NP-Hard and NP-Complete problems- Basic concepts, Non-deterministic algorithms, NP - Hard and NP- Complete classes, Cook's theorem.

Text Books:

1. Ellis Horowitz, Sartaj Sahni and S. Rajasekharan, Fundamentals of Computer Algorithms, 2nd Edition, Universities Press.

2. P. H. Dave, H.B.Dave, Design and Analysis of Algorithms, ,2nd edition, Pearson Education.
3. Aho, Ullman and Hopcroft, Design and Analysis of algorithms, Pearson Education.
4. T. H. Cormen, C. E. Leiserson, R. L. Rivest. Introduction to Algorithms The MIT Press, Cambridge, Massachusetts, 3rd edition.

Uttarakhand Technical University, Dehradun

New Scheme of Examination as per AICTE Flexible Curricula
Computer Science and Engineering, V-Semester
Departmental Elective CS- 504 (A) Network Architecture

Course Objectives:

Justify the need for, and describe the working of layered protocol suites such as TCP/IP. Develop client-server applications using TCP/IP. Assemble/disassemble packets and translate address as it traverses networks. Solve sample problems using popular routing protocols. Motivate the need for and summarize the details of service architectures, such as web services and micro-services. Describe the details, including payload types and synchronization of multimedia application protocols. Explain and distinguish the various service types supported by internet applications – for example, best effort, streaming. Construct the working of certain types of congestion control mechanisms.

Course Learning Outcomes:

1. Analyze a complex computing problem and to apply principles of computing and other relevant disciplines to identify solutions
2. Design, implement, and evaluate a computing-based solution to meet a given set of computing requirements in the context of the program's discipline
3. Apply computer science theory and software development fundamentals to produce computing-based solutions

Course Content:

Unit I: Layered Protocol Architectures- TCP/IP and OSI, LAN and other components, Service view, TCP vs UDP, and more, Packet formats

Unit II: Client-server Applications- Thread vs Process, Sockets, RPC, etc, Scalability, Transport and Routing- Reliable vs. unreliable transfer, Congestion control, Routing protocols.

Unit III: Service Architectures- Web services, Micro services, P2P and others, Multimedia- Real-time/streaming, VoIP, Quality of Service.

Unit IV: Wireless Communication- Wi-Fi , Cell networks, Media and Performance- Signal strength, Compression and error detection, Delay, loss, throughput.

Unit V: Emerging/Future Trends- Parallel and distributed computing, Security and others.

Text Book:

1. KUROS AND ROSS, Computer Networking: A Top-Down Approach, 2017, 7th Edition

Uttarakhand Technical University, Dehradun

New Scheme of Examination as per AICTE Flexible Curricula
Computer Science and Engineering, V-Semester
Departmental Elective CS- 504 (B) Pattern Recognition

Course Objectives:

To introduce the fundamental algorithms for pattern recognition.
To instigate the various classification and clustering techniques.

Course Learning Outcomes:

1. Design and construct a pattern recognition system
2. Know the major approaches in statistical and syntactic pattern recognition.
3. Become aware of the theoretical issues involved in pattern recognition system design such as the curse of dimensionality.

Implement pattern recognition techniques.

Unit-I

Introduction – Definitions, data sets for Pattern, Application Areas and Examples of pattern recognition, Design principles of pattern recognition system, Classificationand clustering, supervised Learning, unsupervised learning and adaptation, Patternrecognition approaches, Decision Boundaries, Decision region , Metric spaces,distances.

Unit -II

Classification: introduction, application of classification, types of classification,decision tree, naïve bayes, logistic regression , support vector machine, random forest,K Nearest Neighbour Classifier and variants, Efficient algorithms for nearestneighbour classification, Different Approaches to Prototype Selection, Combinationof Classifiers, Training set, test set, standardization and normalization.

Unit – III

Different Paradigms of Pattern Recognition, Representations of Patterns and Classes, Unsupervised Learning & Clustering: Criterion functions for clustering, Clustering Techniques: Iterative square -error partitional clustering – K means, hierarchical clustering, Cluster validation.

Unit -IV

Introduction of feature extraction and feature selection, types of feature extraction, Problem statement and Uses, Algorithms - Branch and bound algorithm, sequential forward / backward selection algorithms, (l,r) algorithm.

Unit -V

Recent advances in Pattern Recognition, Structural PR, SVMs, FCM, Soft computing and Neuro-fuzzy techniques, and real-life examples, Histograms rules, DensityEstimation, Nearest Neighbor Rule, Fuzzy classification.

REFERENCE BOOKS:

1. Richard O. Duda, Peter E. Hart and David G. Stork, “Pattern Classification”, 2nd Edition, John Wiley, 2006.
2. C. M. Bishop, “Pattern Recognition and Machine Learning”, Springer, 2009.
3. S. Theodoridis and K. Koutroumbas, “Pattern Recognition”, 4th Edition, academic Press, 2009.
4. Robert Schalkoff, “pattern Recognition: statistical, structural and neural approaches”, JohnWiley&sons ,Inc, 2007.

Uttarakhand Technical University, Dehradun

New Scheme of Examination as per AICTE Flexible Curricula
Computer Science and Engineering, V-Semester Departmental Elective
CS- 504 (C) Internet and Web Technology

UNIT 01

Introduction: Concept of WWW, Internet and WWW, HTTP Protocol: Request and Response, Web browser and Web servers, Features of Web 2.0 Web Design: Concepts of effective web design, Webdesign issues including Browser, Bandwidth and Cache, Display resolution, Look and Feel of the Web site, Page Layout and linking, User centric design, Sitemap, Planning and publishing website, Designing effective navigation.

UNIT 02

HTML: Basics of HTML, formatting and fonts, commenting code, color, hyperlink, lists, tables, images, forms, XHTML, Meta tags, Character entities, frames and frame sets, Browser architecture and Web site structure. Overview and features of HTML5

UNIT 03

Style sheets: Need for CSS, introduction to CSS, basic syntax andstructure, using CSS, background images, colors and properties, manipulating texts, using fonts, borders and boxes, margins, padding lists,positioning using CSS, CSS2, Overview and features of CSS3 JavaScript : Client side scriptingwith JavaScript, variables, functions, conditions, loops and repetition, Pop up boxes, Advance JavaScript: Javascript and objects, JavaScript own objects, the DOM and web browser environments, Manipulation using DOM, forms and validations,DHTML : Combining HTML, CSS and Javascript, Events and buttons

UNIT 04

XML: Introduction to XML, uses of XML, simple XML, XML key components, DTD and Schemas, Using XML with application. Transforming XML using XSL and XSLT PHP: Introduction and basic syntax of PHP, decision and looping with examples, PHP and HTML, Arrays, Functions, Browser control and detection, string, Form processing, Files, Advance Features: Cookies and Sessions, Object Oriented Programming with PHP

UNIT 05

PHP and MySQL:Basiccommandswith PHP examples, Connection to server, creating database, selecting a database, listing database, listing table names,creating a table, inserting data, altering tables, queries, deleting database, deleting data and tables, PHP myadmin and databasebugs

Reference Books:

1. Developing Web Applications, Ralph Moseley and M. T. Savaliya, Wiley-India
2. Web Technologies, Black Book, dreamtech Press
3. HTML 5, Black Book, dreamtech Press
4. Web Design, Joel Sklar, Cengage Learning
5. Developing Web Applications in PHP and AJAX, Harwani, McGrawHill
6. Internet and World Wide Web How to program, P.J. Deitel& H.M. Deitel , Pearson

Course Outcome

After completion of the course students will be able to

1. Describe the concepts of WWW including browser and HTTP protocol.
2. List the various HTML tags and use them to develop the user friendly web pages.
3. Define the CSS with its types and use them to provide the styles to the webpages at variouslevels.
4. Develop the modern web pages using the HTML and CSS features withdifferent layouts asper need of applications.
5. Use the JavaScript to develop the dynamic web pages.
6. Use server side scripting with PHP to generate the web pages dynamically using thedatabase connectivity.
7. Develop the modern Web applications using the client and server sidetechnologies and theweb design fundamentals.

Uttarakhand Technical University, Dehradun

New Scheme of Examination as per AICTE Flexible Curricula

Computer Science and Engineering, V-Semester

Departmental Elective CS- 504 (D) Java Programming

Course Objectives:

This course of study builds on the skills gained by students in Java Fundamentals or Java Foundations to help advance Java programming skills. Students will design object-oriented applications with Java and will create Java programs using hands-on, engaging activities.

Course Learning Outcomes:

1. Code, compile and run a Java program.
2. Master programming techniques for console input and output.
3. Apply logical constructs for branching and loops.
4. Define classes and methods.
5. Create and access arrays.
6. Develop linked data structures.
7. Employ exception-handling programming techniques.
8. Utilize file input and output procedures for sequential and random access.
9. Use the Swing library to develop programs with graphical user interfaces.

UNIT-I

The Java Environment: Java Development Kit (JDK) , Java virtual machine, Java programming environment(compiler, interpreter, applet viewer, debugger), Java Applications Programming Interface(API),Basic idea of application and applet. Java as an object oriented language: objects, classes, encapsulation, inheritance and software reuse, polymorphism, abstract classes and abstract methods,: defining an interface, implementing & applying interfaces, variables in interfaces, extending interfaces, Packages, scope and lifetime; Access specifies; Constructors; Copy constructor; this pointer; finalize() method; arrays; Memory allocation and garbage collection

UNIT- II

AWT: Containers and components, AWT classes, window fundamentals: Component, Container, Panel, Window, Frame, Canvas, AWT Controls, Layout Managers and Menus: adding and removing control, Labels, Button, Check Box, Radio Button, Choice, menu, Text area, Scroll list, Scrollbar; Frame; Layout managers flow layout, Grid layout, Border layout, Card layout. Java Event Handling Model: Java's event delegation model –Ignoring the event, Self-contained events, Delegating events; The event class hierarchy; There relationship between interface, methods called, parameters and event source; Adapter classes; Event classes action Event, Adjustment Event, Container Event, Focus Event, Item Event, Eye Event, Mouse Event, Text Event, Window Event. Applets: Applet security restrictions; the class hierarchy for applets; Life cycle of applet; HTMLTags for applet Introduction to Swing: swing library, Building application susing Swings

UNIT-III

Multithreading and Exception Handling: Overview of simple threads, Basic idea of multithreaded programming, Thread synchronization: Locks, synchronized methods, synchronized block, Thread scheduling, Producer-consumer relationship, Daemon thread,

Basic idea of exception handling, stack based execution and exception propagation, Exception types: Exception Handling: Try, Catch, Finally, Throw statement, Assertions

UNIT-IV

Input/Output:ExploringJavaI/O.,Directories,streamclassesTheBytestream:Inputstream,outputstream, file input stream, file output stream, print stream, Randomaccess file, the character streams, Buffered reader, buffered writer, print writer, serialization. JDBC: JDBC-ODBC bridge; The connectivity model; The driver manager; Navigating there sult set object contents; java.sql Package; The JDBCexception classes; Connecting to Remote database.

UNIT-V

Java Networking: exploring java. Net package Networking Basics: Socket, Client server, reserved sockets, servers, Internet addressing, TCP sockets, UDP sockets. RMI: Client/Server architecture, RMI registry services; Step sofcreating RMI Application and an example

References:

1. Naughton&Schildt" The Complete Reference Java
2. Tata McGraw Hill.2.Deitel "Java-How to Program:"Pearson Education, Asia.
3. Horstmann& Cornell "CoreJava2" (Vol I&II) , Sun Microsystems.
4. LvanBayross"Java2.0":BPBpublications.
5. Ivor Horton's"BeginningJava2,JDK5Ed.,WileyIndia.
6. Java Programming for the absolute beginners By Russell, PHIL earning

Course Outcomes

Upon successful completion of this course the student will:

-Have the knowledge of the structure and model of the Java programming language

-use the Java programming language for various programming tasks

-develop software in the Java programming language

-evaluate user requirements for software functionality required to decide whether the Java programming language can meet user requirements

-propose the use of certain technologies by implementing them in the Java programming language to solve the given problem

Uttarakhand Technical University, Dehradun

New Scheme of Examination as per AICTE Flexible Curricula
Computer Science & Engineering, V-Semester Open Elective
CS- 505 (A) Principles of Programming Language

Course Objectives:

- To understand and describe syntax and semantics of programming languages
- Understand data, data types, and basic statements and understand call-return architecture and ways of implementing them
- To understand object-orientation, concurrency, and event handling in programming languages
- Develop programs in non-procedural programming paradigms

Course Learning Outcomes:

1. Describe syntax and semantics of programming languages
2. Explain data, data types, and basic statements of programming languages
3. Design and implement subprogram constructs, Apply object-oriented, concurrency, and event handling programming constructs
4. Develop programs in Scheme, ML, and Prolog
5. Understand and adopt new programming languages

Course Contents

Unit- I

Introduction: Characteristics of programming Languages, Factors influencing the evolution of programming language, developments in programming methodologies, desirable features and design issues. Programming language processors: Structure and operations of translators, software simulated computer, syntax, semantics, structure, virtual computers, binding and binding time.

Unit -II

Elementary and Structured Data Types, Structured data type and objects, Sub Program and programmer defined data types: Evolution of data types, abstractions, encapsulations, information hiding, sub programmes, abstract data types. Sequence Control; Implicit and Explicit sequence control, sequence control with within expression and statements, recursive sub programmes, exception handling, co-routines, Scheduled sub programmes, concurrent execution.

Unit -III

Data control referencing environments, static and dynamic scope, local data local data referencing environment, shared data: Explicit common environment dynamic scope parameter passing mechanism. Storage Management: Major run time requirements, storage management phases, static storage management, stack based, heap based storage management.

Unit -IV

Syntax and translation: General syntactic criteria, syntactic element of a language, stages in translation, formal syntax and semantics. Introduction to Functional Programming, Lambda calculus, Data flow language and Object Oriented language,

Unit –V

Comparison in various general and special purpose programming languages e.g. Fortran, C, Pascal, Lisp, etc. issues related to programming languages and limitations.

References:

1. Terrance W Pratt, "Programming Languages: Design and Implementation" PHI
2. Sebesta, "Concept of Programming Language", Addison Wesley
3. E Horowitz , "Programming Languages", 2nd Edition, Addison Wesley
4. "Fundamentals of Programming Languages", Galgotia.

Uttarakhand Technical University, Dehradun

New Scheme of Examination as per AICTE Flexible Curricula
Computer Science and Engineering, V-Semester Open Elective
CS- 505 (B) Modeling and Simulation

Course Objectives:

- Grasp modeling concepts with emphasis on performance analysis.
- Build simulation models and their parameterization.
- Analyze simulation output data to evaluate performance criteria.

Course Learning Outcomes:

1. Demonstrate basic programming skills – functions, arrays, loops, conditional statements, procedures.
2. Demonstrate technical communication skills
3. Explain the Role of Modeling
4. Utilize the Modeling Process to identify the key parameters of a model, estimate model outcomes, utilize a computational tool, e.g., Matlab to implement the mathematical representation of the model, convey the results of the simulation accurately, validate the model with data, and discuss the quality and sources of errors in the model.
5. Construct difference-based computer models.
6. Complete a capstone modeling project that identifies a problem, develops a mathematical representation and transforms it to a computational model. Document the development and implementation of the model and present in oral and written form.

Course Contents:

UNIT-I

Introduction: Systems, models, discrete event simulation and continuous simulation.

Discrete Event Simulation: Time-advance mechanisms, event modeling of discrete dynamic systems, single-server single queue model, event graphs, Monte Carlo simulation.

UNIT-II

GPSS: Model structure, entities and transactions, blocks in GPSS, process oriented programming, user defined functions, SNA, logic switches, save locations, user chains, tabulation of result, programming examples.

UNIT-III

Random Number Generation: Congruence generators, long period generators, uniformity and independence testing

UNIT - IV

Random Variate Generation: Location, scale and shape parameters, discrete and continuous probability distributions; Inverse transform method, composition and acceptance rejection methods

UNIT-IV

Queuing Models: Little's theorem, analytical results for M/M/1, M/M/1/N, M/M/c, M/G/1 and other queuing models.

Books:

1. Karian, Z.A. and Dudewicz, E.J., "Modern Statistical Systems and GPSS Simulation",2nd Ed., CRC Press. 1999
2. Banks, J., Carson, L.S., Nelson, B.L. and Nicol, D.M., "Discrete Event SystemSimulation", 3rd Ed., Pearson Education. 2002

Law, A.M. and Kelton, W.D., "Simulation, Modeling and Analysis", 3rd Ed., TataMcGraw-Hill. 2003

Uttarakhand Technical University, Dehradun

New Scheme of Examination as per AICTE Flexible Curricula

Computer Science & Engineering, V-Semester

Open Elective CS- 505 (C) Cyber Security

Course Objectives:

Effective information security at the enterprise level requires participation, planning, and practice. It is an ongoing effort that requires management and staff to work together from the same script. Fortunately, the information security community has developed a variety of resources, methods, and best practices to help modern enterprises address the challenge. Unfortunately, employing these tools demands a high degree of commitment, understanding, and skill—attributes that must be sustained through constant awareness and training.

Course Learning Outcomes:

1. Assess the current security landscape, including the nature of the threat, the general status of common vulnerabilities, and the likely consequences of security failures;
2. Critique and assess the strengths and weaknesses of general cyber security models, including the CIA triad;
3. Appraise the interrelationships among elements that comprise a modern security system, including hardware, software, policies, and people;
4. Assess how all domains of security interact to achieve effective system-wide security at the enterprise level.
5. Compare the interrelationships among security roles and responsibilities in a modern information-driven enterprise—to include interrelationships across security domains (IT, physical, classification, personnel, and so on);
6. Assess the role of strategy and policy in determining the success of information security;
7. Estimate the possible consequences of misaligning enterprise strategy, security policy, and security plans;
8. Evaluate the trends and patterns that will determine the future state of cyber security.

Course Content:

Unit I: The Security Environment-Threats, vulnerabilities, and consequences Advanced persistent threats, The state of security today, Why security matters to DoD? Principles of Cybersecurity-The interrelated components of the computing environment Cybersecurity models (the CIA triad, the star model, the Parkerian hexad) Variations on a theme: computer security, information security, and information assurance

Unit II: Cybersecurity Management Concepts-Security governance, Management models, roles, and functions, Enterprise Roles and Structures-Information security roles and positions Alternative enterprise structures and interfaces

Unit III: Strategy and Strategic Planning – Strategy, Strategic planning and security, strategy The information security lifecycle, Architecting the enterprise, Security Plans and Policies-Levels of planning, Planning misalignment, The System Security Plan (SSP), Policy development and implementation.

Unit IV: Laws and Regulatory Requirements- Timeline of Indian laws related to information security, The Federal Information Security Management Act (FISMA), Security Standards and Controls -Security standards and controls, Certification and accreditation (C&A).

Unit V: Risk Management-Principles of risk, Types of risk, Risk strategies, The Risk Management Framework (RMF), Security Metrics and Key Performance Indicators (KPIs)-The challenge of security metrics,What makes a good metric? Approaches to security metrics, Metrics and FISMA

Text Books:

1. Rhodes-Ousley, Mark. Information Security: The Complete Reference, Second Edition, . Information Security Management: Concepts and Practice. New York, McGraw-Hill, 2013.

Whitman, Michael E. and Herbert J. Mattord. Roadmap to Information Security for IT and Infosec Managers. Boston, MA: Course Technology, 2011.

Uttarakhand Technical University, Dehradun

New Scheme of Examination as per AICTE Flexible Curricula

Computer Science and Engineering V-Semester

Open Elective CS- 505 (D) Innovation and Entrepreneurship

Course Objectives:

- Think critically and creatively about the nature of business opportunities, resources, and industries.
- Describe the processes by which innovation is fostered, managed, and commercialized.
- Spot new business opportunities in the environment, whether by recognition, development, or creation.
- Effectively and efficiently evaluate the potential of new business opportunities.
- Assess the market potential for a new venture, including customer need, competitors, and industry attractiveness.
- Develop a business model for a new venture, including revenue, margins, operations, working capital, and investment.
- Develop pro forma financial statements that reflect business model decisions and that can be used to determine future funding requirements.
- Write a clear, concise, and compelling business plan for a new venture.
- Identify appropriate sources of financing for an entrepreneurial business plan.
- Develop a compelling sales pitch to acquire financing necessary to a new venture.
- Explain the operational implications of common terms and conditions for early-stage investment deals.
- Describe the process by which new ventures are created and launched.

Course Learning Outcomes:

1. Comprehend the role of bounded rationality, framing, causation and effectuation in entrepreneurial decision making.
2. Demonstrate an ability to design a business model canvas.
3. Evaluate the various sources of raising finance for startup ventures.
4. Understand the fundamentals of developing and presenting business pitching to potential investors.

Course Content:

Unit I: Introduction to Entrepreneurship: Entrepreneurs; entrepreneurial personality and intentions - characteristics, traits and behavioral; entrepreneurial challenges.

Unit II: Entrepreneurial Opportunities: Opportunities. Discovery/ creation, Pattern identification and recognition for venture creation: prototype and exemplar model, reverse engineering.

Unit III: Entrepreneurial Process and Decision Making: Entrepreneurial ecosystem, Ideation, development and exploitation of opportunities; Negotiation, decision making process and approaches, Effectuation and Causation.

Unit IV: Crafting business models and Lean Start-ups: Introduction to business models; Creating value propositions-conventional industry logic, value innovation logic; customer focused innovation; building and analyzing business models; Business model canvas, Introduction to lean startups, Business Pitching.

Unit V: Organizing Business and Entrepreneurial Finance: Forms of business organizations; organizational structures; Evolution of Organisation, sources and selection of venture finance options and its managerial implications. Policy Initiatives and focus; role of institutions in promoting entrepreneurship.

Text/Reference Books:

1. Ries, Eric(2011), The lean Start-up: How constant innovation creates radically successful businesses, Penguin Books Limited.
2. Blank, Steve (2013), The Startup Owner's Manual: The Step by Step Guide for Building a Great Company, K&S Ranch.
3. S. Carter and D. Jones-Evans, Enterprise and small business- Principal Practice and Policy, Pearson Education (2006)
4. T. H. Byers, R. C. Dorf, A. Nelson, Technology Ventures: From Idea to Enterprise, McGraw Hill (2013).

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 - CS604 (A) Graph Theory

Graph theoretic algorithms must be provided wherever required to solve the problems.

Unit- I

Graphs, Sub graphs, some basic properties, various example of graphs & their sub graphs, walks, trails, path & circuits, connected graphs, disconnected graphs and component, various operation on graphs, Euler graphs, Hamiltonian paths and circuits, the traveling salesman problem, directed graphs, some types of directed graphs, directed paths and connectedness, Hamiltonian and Euler digraphs.

Unit- II

Trees and fundamental circuits, distance diameters, radius and pendent vertices, rooted and binary trees, on counting trees, spanning trees, fundamental circuits, finding all spanning trees of a graph and a weighted graph, trees with directed edges, fundamental circuits in digraph, algorithms of Prim, Kruskal and Dijkstra.

Unit -III

Cuts sets and cut vertices, some properties, all cut sets in a graph, fundamental circuits and cut sets, connectivity and separability, network flows, planer graphs, Euler's formula and its corollaries, Kuratowski's theorem and its application to planarity detection of graphs, combinatorial and geometric dual, some more criterion of planarity, thickness and crossings.

Unit -IV

Incidence matrix of graph, sub matrices of A(G), circuit matrix, cut set matrix, fundamental circuit matrix and rank of B, path matrix and relationships among , , &, adjacency matrices, adjacency matrix of a digraph, matrices A, B and C of digraphs, rank- nullity theorem, coloring and covering and partitioning of a graph, chromatic number, chromatic partitioning, chromatic polynomials, matching, covering, enumeration, types of enumeration, counting of labeled and unlabeled trees.

References:

1. Deo, N: Graph theory, PHI
2. Bondy and Murthy: Graph theory and application. Addison Wesley.
3. John M. Aldous and Robin J. Wilson: Graphs and Applications-An Introductory Approach, Springer
4. Robin J, Wilson: Introduction to Graph Theory, Addison Wesley

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
Departmental Elective - CS604 (C) Computer Graphics & Visualization

Course Objectives:

This course will introduce students to all aspects of computer graphics including hardware, software and applications. Students will gain experience using a graphics application programming interface (OpenGL) by completing several programming projects.

Course Learning Outcomes:

1. Have a basic understanding of the core concepts of computer graphics.
2. Classify and describe various Computer Graphics tools and techniques.
3. Be capable of using OpenGL to create interactive computer graphics.
4. Analyze and apply various algorithms of 2D and 3D Transformations on different type of objects.
5. Understand a typical graphics pipeline.
6. Have made pictures with their computer.

Course Content:

Unit-I Introduction to Raster Scan displays, Pixels, Frame buffer, Vector & Character generation, Random Scan systems, Display devices, Scan Conversion techniques, Line Drawing algorithms: simple DDA, Bresenham's Algorithm, Circle Drawing Algorithms: Midpoint Circle drawing and Bresenham's Algorithm, Polygon fill algorithm: Boundary-fill and Flood-fill algorithms.

Unit-II 2-D Transformation: Translation, Rotation, Scaling, Shearing, Reflection. Inverse Transformation, Homogeneous coordinate system, Matrices Transformation, Composite Transformation. Windowing & Clipping: World Coordinate System, Screen Coordinate System, Viewing Transformation, Line Clipping & Polygon Clipping Algorithms

Unit-III 3-D Transformations: Translation, Rotation and Scaling. Parallel & Perspective Projection: Types of Parallel & Perspective Projection, Hidden Surface elimination: Depth comparison, Back face detection algorithm, Painter's Algorithm, Z-Buffer Algorithm. Curve generation, Bezier and B-spline methods. Basic Illumination Model: Diffuse reflection, Specular reflection, Phong Shading, Gouraud shading, Ray Tracing, Color models like RGB, YIQ, CMY, HSV.

Unit-IV Visualization: Visualization of 2D/3D scalar fields: color mapping, ISO surfaces. Direct volume data rendering: ray-casting, transfer functions, segmentation. Visualization of Vector fields and flow data, Time-varying data, High-dimensional data: dimension reduction, parallel coordinates, Non-spatial data: multi-variate, tree/graph structured, text Perceptual and cognitivefoundations, Evaluation of visualization methods, Applications of visualization, Basic Animation Techniques like traditional, key framing

Unit –V Multimedia :Basic of multimedia, application of Multimedia, Text-Types, Unicode Standard, text Compression, Text file formats, Audio Components, Digital Audio, Digital Audio processing, Sound cards, Audio file formats ,Audio Processing software ,Video-Video color spaces, Digital Video, Digital Video processing, Video file formats. Animation: Uses of Animation, Principles of Animation, Computer based animation, 3D Animation, Animation file formats, Animation software, Special Effects in animation, Storyboarding for Animation,

Compression: Lossless/Lossy Compression techniques, Image, Audio & Video Compression, MPEG Standards ,Multimedia Architecture, Multimedia databases.

Recommended Text:

1. Donald Hearn and M.P. Becker “Computer Graphics” Pearson Pub.
2. Foley, Van Dam, Feiner, Hughes, “Computer Graphics: Principles and Practice” Addison-Wesley
3. Rogers, "Procedural Elements of Computer Graphics", Tata McGraw Hill
4. Parekh “Principles of Multimedia” Tata McGraw Hill
5. Maurya, “Computer Graphics with Virtual Reality System “ , Wiley India
6. Pakhira,”Computer Graphics ,Multimedia&Animation”,PHI learning
7. Andleigh, Thakral , “Multimedia System Design “ PHI Learning
8. Khalid Sayood , “Introduction to Data Compression”, Morgan Kaufmann

Uttarakhand Technical University, Dehradun

New Scheme of Examination as per AICTE Flexible Curricula
Computer Science and Engineering, VI-Semester
Departmental Elective - CS604 (D) Software Quality Management

Course Objectives:

The course has the basic scope to provide the students with theoretical knowledge about concepts of software quality, about the quality- models, - standards and – methodologies used in the software industry. The theory is supported and supplemented by the lecturer's 10 years experience in software quality management. Understanding and usage of the theory are consolidated by the case studies and exercises.

Course Learning Outcomes:

1. List various principles Software Quality Management.
2. Describe the real world problems that may arise during software development and affects the quality.
3. Develop an appropriate plan for software quality management.
4. Explore key contributors / metrics for effective quality control.
5. Identify appropriate international standard for real life software project for controlling and managing the quality of product.
6. Demonstrate and present the learning of course on real life problems.

Course Content:

UNIT I: Introduction to Software Quality Engineering: what is software quality, who cares for software quality, benefits of software quality, phases in software development, views of quality, hierarchical models of quality, types of defects, cost of fixing defects, cost of poor quality, definitions used in software quality engineering, software quality assurance, quality control, software configuration management.

UNIT II: Software Testing: guiding principles of testing, composition of a testing team, skills of a tester, types of testing, evaluating the quality of test cases, techniques for reducing number of test cases, requirements for effective testing, test oracle, economics of software testing, handling defects, risk in software testing, requirement traceability matrix.

UNIT III: Metrics for Software Quality: categories of software metrics, metrics program, goal question metric method, types of metrics, commonly used software metrics, process metrics, product metrics, metrics for resources.

UNIT IV: Tools for Quality Improvement: basic quality control tools, check sheet, cause and effect diagram, pareto diagram, histogram, scatter plot, run chart, control chart, orthogonal defect classification.

UNIT V: Software Quality Measurement: Measuring quality, software metrics, problems with metrics, an overall measure of software quality. Developments in Measuring Quality: The work of Gilb, the COQUAMO project.

UNIT VI: The ISO9000 series of quality management standards: The purpose of standards, the ISO9000 series: a generic quality management standard, ISO9000-3: notes for guidance on the application of ISO9001 in software development, the impact of ISO9000 and TickIT. Models and standards for process improvement: The Capability Maturity Model, individual levels of CMM, the role of the CMM, SPICE modeling.

Text Book:

1. "Software Quality : Theory and Management" by Alan C Gillies, CENGAGE Learning, Second edition.
2. " Software Quality Assurance, Testing and Metrics" by Anirban Basu, PHI Publication.

References:

1. Agile and Iterative Development: A Manager's Guide, Craig Larman.
2. Practical Guide to Software Quality Management, John W. Horch.
3. Introduction to the Team Software Process(SM),Watts Humphrey.
4. Software Engineering, R.S. Pressman, McGraw Hill.

Uttarakhand Technical University, Dehradun

New Scheme of Examination as per AICTE Flexible Curricula

Computer Science and Engineering, VI-Semester

Open Elective – CS 605 (A) Digital signal Processing

Course Objectives:

- To give the students a comprehension of the concepts of discrete-time signals and systems.
- To give the students a comprehension of the Z- and the Fourier transform and their inverse.
- To give the students a comprehension of the relation between digital filters, difference equations and system functions.
- To give the students knowledge about the most important issues in sampling and reconstruction.
- To make the students able to apply digital filters according to known filter specifications.
- To provide the knowledge about the principles behind the discrete Fourier transform (DFT) and its fast computation.
- To make the students able to apply Fourier analysis of stochastic signals using the DFT

Course Learning Outcomes:

1. Determine the spectral coefficients and the Fourier series components of discrete-time signals.
2. Determine the frequency response and the z-transform of discrete-time systems.
3. Determine the discrete Fourier transform of discrete-time signals.
4. Calculate the outputs of discrete-time systems in response to inputs.
5. Design Finite Impulse Response (FIR) and Infinite Impulse Response (IIR) filters, and evaluate the performance to meet expected system specifications using MATLAB.
6. Demonstrate an understanding of contemporary issues by reviewing recent technical articles and establishing between the course material and the content of the article.

Course Content:

Unit I: discrete-time signals and systems; Discrete-time sequences, discrete-time systems, linear time-invariant systems (LTI), impulse response, convolution in time, properties of LTI systems. Difference equations and introduction to digital filters; Linear constant-coefficient equations, stability, introduction to FIR-filters, introduction to IIR-filters.

Unit II: Fourier transform and frequency response; Fourier transform of sequences, properties of the Fourier transform, frequency response of Linear Time-Invariant (LTI) systems, inverse Fourier transform, Fourier transform theorems. Sampling and reconstruction; Periodic sampling, frequency-domain representation of sampling, reconstruction of band-limited signals, changing the sampling rate of discrete signals.

Unit III: The Z-transform and its inverse; The bilateral Z-transform, properties of the Z-transform, inversion, system representation in the Z-domain, solutions to difference equations. Basic structures of IIR- and FIR filters; Filter structures (direct form I & II), signal flow graph representations, IIR systems, transposed forms, FIR systems.

Unit IV: The Discrete Fourier Transform (DFT); Discrete Fourier Series, sampling and reconstruction in the Z-domain, the DFT, properties, linear and circular convolution. Filter design techniques - IIR-filters; Analog prototypes, impulse invariance, bilinear transformation.

Unit V: Filter transformations; All-pass systems, minimum phase systems, linear phase systems, lowpass/highpass/bandpass/bandstop transformation. The Fast Fourier Transform (FFT) and FFT analysis; Block convolution, the Goertzel algorithm, decimation-in-time & -in-frequency, FFT analysis.

Text/Reference Books:

1. Oppenheim, A.V., Schafer, R.W, "Discrete-Time Signal Processing", Second Edition, Prentice-Hall, New Jersey, 1999, ISBN 0-13-083443-2.
2. Steven W. Smith, “The Scientist and Engineer's Guide to Digital Signal Processing”, California Technical Publishing, 1997, ISBN 0-9660176-3-3.
3. Kermit Sigmon, "Matlab Primer", Third Edition, Department of Mathematics, University of Florida.
4. V.K. Ingle and J.G. Proakis, "Digital Signal Processing using MATLAB", Bookware Companion Series, 2000, ISBN 0-534-37174-4.

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.

Uttarakhand Technical University, Dehradun

New Scheme of Examination as per AICTE Flexible Curricula
Computer Science and Engineering, VI-Semester Open Elective
CS- 605 (C) Software Testing

Course Objectives:

- To study fundamental concepts in software testing.
- To discuss various software testing issues and solutions in software unit test, integration and system testing.
- To expose the advanced software testing topics, such as object-oriented software testing methods

Course Learning Outcomes:

1. List a range of different software testing techniques and statergies and be able to apply specific(automated) unit testing method to the projects.
2. Distinguish characterstics of structural testing methods.
3. Demonstrate the integration testing which aims to uncover interaction and compatibility problems as early as possible.
4. Discuss about the functional and system testing methods.
5. Demonstrate various issues for object oriented testing.

Course Content:

Unit I: A Mathematical Context: A Perspective on Testing, Examples Functional Testing: Boundary Value Testing, Equivalence Class Testing, Decision TableBased Testing, Retrospective on Functional Testing.

Unit II: Structural Testing: Path Testing- DD-Paths, Test Coverage Metrics, Basis Path Testing, Dataflow Testing- Define/Use Testing, Slice-Based Testing, Retrospective on Structural Testing- Gaps and Redundancies, Metrics for Method Evaluation.

Unit III: Integration Testing: Levels of Testing, Integration Testing- A Closer Look at the SATM System, Decomposition-Based Integration, Call Graph-Based Integration, Path-Based Integration.

Unit IV: System TestingThreads, Basic Concepts for Requirements Specification, Finding Threads, Structural Strategies for Thread Testing, Functional Strategies for Thread Testing SATM Test Threads, System Testing Guidelines

Unit V: Object-Oriented Testing: Issues in Object-Oriented Testing, Class Testing, Object-Oriented Integration Testing, GUI Testing, Object-Oriented System Testing.

Text/Reference Books:

1. Paul C. Jorgensen, Software Testing: A Craftsman‟s Approach, 3rd Edition, CRC Press, 2007.
2. Boris Beizer, Software Testing Techniques, Dreamtech, 2009

Uttarakhand Technical University, Dehradun

New Scheme of Examination as per AICTE Flexible Curricula
Computer Science and Engineering, VI-Semester Open Elective
CS- 605 (D) Distributed Systems and Cloud Computing

Course Objectives:

- To explain the evolving computer model called cloud computing.
- To introduce the various levels of services that can be achieved by cloud.
- To describe the security aspects in cloud.

Learning Outcomes:

1. use public and private cloud solutions for computational science and engineering applications
2. discuss key concepts of cloud computing services, such as Infrastructure as a Service (IaaS), Platform as a Service (PaaS) and Software as a Service (SaaS);
3. asses the suitability of cloud computing infrastructures for different scientific applications;
4. implement software for cloud-based distributed computing using the technology presented in the course;
5. Critically analyze and present solutions and implementations in writing and orally.

Course Content:

UNIT- I : Systems Modeling, Clustering and Virtualization: Distributed System Models and Enabling Technologies, Computer Clusters for Scalable Parallel Computing, Virtual Machines and Virtualization of Clusters and Data centers.

UNIT- II : Foundations: Introduction to Cloud Computing, Migrating into a Cloud, Enriching the 'Integration as a Service' Paradigm for the Cloud Era, The Enterprise Cloud Computing Paradigm.

UNIT- III : Infrastructure as a Service (IAAS) & Platform and Software as a Service (PAAS / SAAS): Virtual machines provisioning and Migration services, On the Management of Virtual machines for Cloud Infrastructures, Enhancing Cloud Computing Environments using a cluster as a Service, Secure Distributed Data Storage in Cloud Computing. Aneka, Comet Cloud, T-Systems', Workflow Engine for Clouds, Understanding Scientific Applications for Cloud Environments.

UNIT- IV : Monitoring, Management and Applications: An Architecture for Federated Cloud Computing, SLA Management in Cloud Computing, Performance Prediction for HPC on Clouds, Best Practices in Architecting Cloud Applications in the AWS cloud, Building Content Delivery networks using Clouds, Resource Cloud Mashups.

UNIT – V : Governance and Case Studies: Organizational Readiness and Change management in the Cloud age, Data Security in the Cloud, Legal Issues in Cloud computing, Achieving Production Readiness for Cloud Services.

Text Book

1. K. Hwang, G. Fox and J. Dongarra, "Distributed and Cloud Computing", Morgan Kaufmann Publishers, 2012.
2. Rajkumar Buyya, James Broberg and Andrzej M. Goscinski, "Cloud Computing: Principles and Paradigms", Wiley, 2011.

Uttarakhand Technical University, Dehradun

New Scheme of Examination as per AICTE Flexible Curricula

Computer Science and Engineering, VII-Semester

CS 701 .Net Framework and C# Programming

UNIT I

Introduction to C#, CLR, Visual studio console app, Simple windows forms, C# language fundamentals, Enumerations, structures, Namespaces

UNIT II

C# Object oriented programming: OOPs, Encapsulation, Inheritance, Polymorphism, Object Lifetime, Components, Modules, Windows Forms, Interface, Cloneable objects, Comparable objects, Collections Namepaces

Advanced Class Construction: Custom Indexer, Overloading operators, Delegates, Events

UNIT III

Assemblies, Thread, and AppDomains: C# assemblies, GAC, threads, contexts, Appdomains, Processes concepts, Concurrency and synchronization- Locks, Monitors, ReaderWriterLock, Mutexes, Thread pooling,

UNIT IV

IO, Object serialization and remoting: System.IO, Streams, TextWriter, TextReader, BinaryWirter, BinaryReader, Serialized Object Persistence and formatters, Remoting ADO.Net, C# windows forms for data control: Grid, Datasource and databinding controls, Connected and disconnected scenarios, ADO.Net system, Data, Dataset, connections, Adapters, commands, datareaders,

UNIT V

ASP.net: Introduction, Architecture, Web forms,Web servers, Server controls, Data connectivity using ASP.net, Introduction of XML, Using XML with ASP.nat

Text Books

1. A Guide to the Project Management Body of Knowledge (PMBOK), Project Management Institute, PA,
2. Harold Kerzner, Frank P. Saladis, Project Management Workbook and PMP/CAPM Exam Study Guide , Wiley Publishers
3. Addison Wesley –C# Developers Guide to ASP.Net 4. Wiley," Beginning Visual C# 2008", Wrox

Reference Books

1. Claudia M. Baca, Patti, PMP: Project Management Professional Workbook, Sybex, Workbook.
2. C#.Net Developers Guide- Greg Hack, Jason Werry, Saurabh Nandu. (SyngRess)
3. Wrox Press Professional C# 3rd Edition – Simon Robinson, Jay Glynn

a.WAP to implement SET, Get Properties?
b. WAP to implement String Using array's?
c. WAP to print the ARMSTRONG Number?
d. Create a console application to calculate area of circle. Accept radius from user Calculate circle area and print it Create a console application to build simple calculator Calculator will have following functions Accept 2 numbers Perform Add/Sub/Div/Mult Print Result.
e. WAP to Use a Exception (Predefined and User defined).
f. WAP to implement the concept of Abstract and Sealed Classes.
g. WAP to implement ADO.Net Database connectivity.
h. WAP to implement the concept of Data Streams.
i. WAP to implement the Events and Delegates.
j. Design the WEB base Database connectivity Form by using ASP.NET.
k. WAP to implement Indexers.

Uttarakhand Technical University, Dehradun

New Scheme of Examination as per AICTE Flexible Curricula

Computer Science and Engineering, VII-Semester

CS 702 Ad Hoc and Wireless Networks

Course Objectives:

This course covers major aspects of ad hoc networks, from design through performance issues to application requirements. It starts with characteristics features, applications of ad hoc networks, Modulation techniques and voice coding. It also covers the IEEE 802.11 Wireless LAN and Bluetooth standards.

Learning Outcomes:

1. Have gained an understanding of the current topics in MANETs and WSNs, both from an industry and research point of views.
2. Have an understanding of the principles of mobile ad hoc networks (MANETs) and what distinguishes them from infrastructure-based networks.
3. Understand how proactive routing protocols function and their implications on data transmission delay and bandwidth consumption Development of software to solve computationally intensive problems.

Course Content:

Unit I: Introduction: Introduction to Ad Hoc networks – definition, characteristics features, applications. Characteristics of Wireless channel, Modulation techniques, multiple access techniques, voice coding, error control, computer networks, computer networks software, computer network architecture, IEEE 802 Networking standard, fundamentals of WLANs, Bluetooth.

Unit II: Wireless WANs: The cellular concept, cellular architecture, the first generation cellular systems, the second generation cellular systems, the third generation cellular systems, wireless in local loop, IEEE 802.11standard, IEEE 802.16 standard. Wireless Internet: What is wireless internet? Mobile IP. Ad Hoc Wireless Networks: Introduction, Issues in Ad Hoc Wireless Networks, Ad Hoc Wireless Internet.

UnitIII: MAC Protocols: design issues, goals and classification. Contention based protocols, Contention based protocols with reservation mechanisms, and Contention based MAC protocols with Scheduling mechanisms, MAC protocols that use directional antennas, protocols using directional antennas, Other MAC protocols.

UnitIV: Routing Protocols: Design issues, goals and classification. Table driven routing protocols, on-demand routing protocols, Hybrid routing protocols, Hierarchical routing protocols, power-aware routing protocols. Multicast routing in Ad HOC wireless networks: Issues in designing a multicast routing protocols, operation of multicast routing protocols, classification, Tree based multicast routing protocols.

UnitV: Transport layer and security protocols for Ad Hoc wireless networks: Issues in designing- Transport layer, classification of Transport Layer solutions, TCP over Ad Hoc wireless networks, other transport layer protocols for Ad Hoc wireless networks,

Security in ad hoc wireless networks: issues and challenges in security provisioning, network security attacks, Key management, secure routing in Ad Hoc wireless networks. QoS in Ad Hoc Wireless networks: Classifications of QoS soluteons, MAC layer solutions, Network layer solutions.

Topics for Programs:-

1. Drawing a wireless coverage map and measurements (cross validation through various measurement techniques, GPS, encounters, etc.).
2. Encounter based networks (discovering devices, building ad hoc net, increasing the coverage of the wireless net, using static or mobile nodes, etc.).
3. The 'socializer' experiments: establishing friendship and interest group links in mobile societies (through analysis of traces, mobile device experiments, surveys, etc.).
4. Simulation of disaster scenarios and establishment of networks for the relief and search/rescue missions.

Text Books:

1. C.Siva Ram Murthy and B.S.Manoj, "Ad hoc Wireless Networks Architectures and protocols", 2nd edition, Pearson Education. 2007.
2. Stefano Basagni, Marco Conti, Silvia Giordano and Ivan stojmenovic, "Mobile ad hoc networking", Wiley-IEEE press, 2004.
3. Mohammad Ilyas, "The handbook of adhoc wireless networks", CRC press, 2002.

Uttarakhand Technical University, Dehradun

New Scheme of Examination as per AICTE Flexible Curricula

Computer Science and Engineering, VII-Semester

Dept Elective CS 703 (A) Human Computer Interfacing

Course Objectives:

- Learn the foundations of Human Computer Interaction
- Be familiar with the design technologies for individuals and persons with disabilities
- Be aware of mobile HCI
- Learn the guidelines for user interface.

Learning Outcomes:

1. Explain the capabilities of both humans and computers from the viewpoint of human information processing.
2. Describe typical human–computer interaction (HCI) models and styles, as well as various historic HCI paradigms.
3. Apply an interactive design process and universal design principles to designing HCI systems.
4. Describe and use HCI design principles, standards and guidelines.
5. Analyze and identify user models, user support, socio-organizational issues, and stakeholder requirements of HCI systems.
6. Discuss tasks and dialogs of relevant HCI systems based on task analysis and dialog design.
7. Analyze and discuss HCI issues in groupware, ubiquitous computing, virtual reality, multimedia, and Word Wide Web-related environments.

Course Content:

Unit 1: Foundations of Human–Computer Interaction; Human Capabilities, The Computer, The Interaction, Paradigms

Unit 2: The Design Process; Interaction Design Basics, HCI in the Software Process, Design Rules, Universal Design

Unit 3: Implementation Support; Implementation Tools, Evaluation and User Support, Evaluation, User Support

Unit 4: Users Models; Cognitive Models, Socio-organizational Issues and Stakeholder Requirements, Task Models and Dialogs, Analyzing Tasks,Dialog Notations and Design

Unit 5: Groupware, Ubiquitous Computing, Virtual and Augmented Reality, Hypertext and Multimedia; Groupware and Computer-supported Collaborative Work, Ubiquitous Computing, Virtual Reality and Augmented Reality, Hypertext, Multimedia and the World Wide Web.

Text Book

1. Alan Dix, Janet Finlay, Gregory Abowd, Russell Beale, "Human Computer Interaction", 3rd Edition, Pearson Education, 2004.
2. Brian Fling, "Mobile Design and Development", First Edition , O"Reilly Media Inc., 2009.
3. Bill Scott and Theresa Neil, "Designing Web Interfaces", First Edition, O"Reilly, 2009.

Uttarakhand Technical University, Dehradun

New Scheme of Examination as per AICTE Flexible Curricula

Computer Science and Engineering, VII-Semester

Dept Elective CS 703 (B) Advanced Computer Architecture

Course Objectives:

- To make students know about the Parallelism concepts in Programming.
- To give the students an elaborate idea about the different memory systems and buses.
- To introduce the advanced processor architectures to the students.
- To make the students know about the importance of multiprocessor and multicomputers.
- To study about data flow computer architectures

Learning Outcomes:

1. Demonstrate concepts of parallelism in hardware/software.
2. Discuss memory organization and mapping techniques.
3. Describe architectural features of advanced processors.
4. Interpret performance of different pipelined processors.
5. Explain data flow in arithmetic algorithms.
6. Development of software to solve computationally intensive problems.

Course Content:

Unit I: Instruction execution fundamentals, Von-Neumann architecture, concept of memory and addressing. Performance measurement of computer hardware-MIPS, IPC, CPI, benchmarks. Speed-up & Amdahl's Law, Instruction set principles, classification of instructions, addressing modes, instruction set encoding, MIPS instruction set, RISC vs CISC architectures. Concept of instruction pipelining, RISC instruction set, RISC 5 stage pipeline, pipeline hazards, operand forwarding, branch prediction techniques, basic MIPS pipeline.

Unit II: MIPS pipeline for handling multi-cycle operations, Design issues with multi-cycle pipeline. Case Study: MIPS R4000 pipeline. Introduction to gem5 simulator. Compiler techniques to exploit ILP, pipeline scheduling, loop unrolling, advanced branch prediction schemes, dynamic scheduling, Tomasulo's approach, hardware base speculation, VLIW approach for multi-issue.

UnitIII: Multi threading - fined grained and coarse grained, super scalar and super pipelining, hyper threading. Vector architectures, organizations and performance tuning. GPU architecture and internal organization, Elementary concepts in CUDA programming.

UnitIV: Introduction to memory hierarchy, locality of reference, cache memory fundamentals, cache performance parameters. Block level issues -mapping, identification, cache replacement techniques, write strategy, types of misses-compulsory, capacity, conflict misses.

UnitV: Basic cache optimizations by adjusting cache size, block size, associativity. Advanced cache optimizations-way prediction, pipelined and non-blocking caches, multi-banked caches, critical word first, early restart approaches, compiler optimizations, hardware pre-fetching, write buffer merging.

UnitVI: Introduction to TCMP, NoC, topology, routing, flow control, virtual channels, input buffered router micro-architecture. Input and output selection strategies, allocators and arbiter algorithms for crossbar switch.

Topics for Programs:-

1. Introduction, Instruction Set Architecture, and Pipelines
2. Control Hazards
3. Base Cache Memory, Dynamic Execution and Superscalar Model
4. VLIW, EPIC, and ILP Compiler Optimizations for Architectures
5. Multicore Architectures and Vector/Multimedia Instruction Sets
6. Graphics Processing Unit (GPU) Architecture
7. Runtime Optimization and Compilation

Text Books:

1. Hennessy and Patterson, Computer Architecture- A Quantitative Approach, 4th or later Edition (ISBN-13: 978-0123704900 ISBN-10: 0123704901 Edition: 4th)
2. David Culler, Jaswinder Pal Singh and Anoop Gupta, Parallel Computer Architecture: A Hardware/Software Approach.
3. Jose Duato, Sudhakar Yalamanchili and Lionel Ni, Interconnection Networks: An Engineering Approach.

Uttarakhand Technical University, Dehradun

New Scheme of Examination as per AICTE Flexible Curricula

Computer Science and Engineering, VII-Semester

Dept Elective CS 703 (C) Soft Computing

Course Objectives:

This course aims to develop students' abilities in using some contemporary approaches in solving problems in automation.

Learning Outcomes:

1. Appreciate the advantages and limitations of fuzzy systems and their potential impacts and applications in intelligent control and automation;
2. Appreciate the advantages and limitations of neural networks and their potential impacts and applications in intelligent automation; and
3. Develop an understanding of generic algorithms and their potential applications.

Course Content:

Unit-1: Basics of Soft Computing - Introduction, Fuzzy Computing, Neural Computing, Genetic Algorithms, Associative Memory, Adaptive Resonance Theory, Applications. Fundamental of Neural Networks- Introduction, Model of Artificial Neuron, Architectures, Learning Methods, Taxonomy of NN Systems, Single-Layer NN System, Applications.

Unit-2: Back-propagation Networks - Background, Back-Propagation Learning, Back-Propagation Algorithm. Associative Memory - Description, Auto-associative Memory, Bi-directional Hetero-associative Memory.

Unit-3: Adaptive Resonance Theory -Recap supervised, unsupervised, backprop algorithms; Competitive Learning; Stability-Plasticity Dilemma (SPD), ART Networks, Iterative Clustering, Unsupervised ART Clustering. Fuzzy Set Theory – Introduction, Fuzzy set : Membership, Operations, Properties; Fuzzy Relations.

Unit-4: Fuzzy Systems– Introduction, Fuzzy Logic, Fuzzification, Fuzzy Inference, Fuzzy Rule Based System, Defuzzification. Genetic algorithms & Modeling- Introduction, Encoding, Operators of Genetic Algorithm, Basic Genetic Algorithm.

Unit-5: Integration of Neural Networks, Fuzzy Logic and Genetic Algorithms - GA Based Back Propagation Networks, Fuzzy Back Propagation Networks, Fuzzy Associative Memories, Simplified Fuzzy ARTMAP.

Text Book

1. Rajasekaran, G.A. Vijayalakshmi Pai , Neural Networks, Fuzzy Logic, and Genetic Algorithms, Prentice-Hall of India Private Ltd.
2. J. S. R. Jang, C. T. Sun, E. Mizutani, Neuro-Fuzzy And Soft Computing, Pearson Education.
3. Horia-Nicolai Teodorescu, Abraham Kandel, Lakhmi C. Jain , Soft Computing in Human-Related Science, CRC Press.
4. David E. Goldberg, Genetic Algorithms, Pearson Education.

Uttarakhand Technical University, Dehradun

New Scheme of Examination as per AICTE Flexible Curricula

Computer Science and Engineering, VII-Semester

Dept Elective CS 703 (D) Internet-of-Things Systems

Course Objectives:

Students will understand the concepts of Internet of Things and can able to build IoT applications.

Learning Outcomes:

1. Understand the concepts of Internet of Things.
2. Analyze basic protocols in wireless sensor network.
3. Design IoT applications in different domain and be able to analyze their performance.
4. Implement basic IoT applications on embedded platform

Course Content:

Unit-1: Overview and Introduction: Internet of Things (IoT) and Web of Things (WoT): What's WoT?, The Internet of Things Today, Time for Convergence, Towards the IoT Universe, Internet, of Things Vision, IoT Strategic Research and Innovation Directions, IoT Applications, Future Internet Technologies, Infrastructure, Networks and Communication, Processes, Data Management, Security, Privacy & Trust, Device Level Energy Issues, IoT Related Standardization, Recommendations on Research Topics

Unit-2: M2M to IoT A Basic Perspective: Introduction, Some Definitions, M2M Value Chains, IoT Value Chains, An emerging industrial structure for IoT, The international driven, global value chain and global information monopolies. M2M to IoT-An Architectural Overview: Building architecture, Main design, principles and needed capabilities, An IoT architecture outline, standards considerations.

Unit-3: IoT Architecture -State of the Art: Introduction, State of the art, Architecture Reference Model- Introduction, Reference Model and architecture, IoT reference Model, IoT Reference Architecture- Introduction, Functional View, Information View, Deployment and Operational View, Other Relevant architectural views.

Unit-4: IoT Applications for Value Creations: Introduction, IoT applications for industry: Future Factory Concepts, Brownfield IoT, Smart Objects, Smart Applications, Four Aspects in your Business to Master IoT, Value, Creation from Big Data and Serialization, IoT for Retailing Industry, IoT For Oil and Gas, Industry, Opinions on IoT Application and Value for Industry, Home Management, eHealth.

Unit-5: Internet of Things Privacy, Security and Governance: Introduction, Overview of Governance, Privacy and Security Issues, Contribution from FP7 Projects, Security, Privacy and Trust in IoTData-Platforms for Smart Cities, First Steps Towards a Secure Platform, Smartie Approach.

Text Book

1. Jan Holler, Vlasios Tsiatsis, et.al., Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence, 1st Edition, Academic Press, 2014.
2. ijay Madisetti and Arshdeep Bahga, Internet of Things (A Hands-on-Approach), 1st Edition, VPT, 2014.
3. Francis daCosta, Rethinking the Internet of Things: A Scalable Approach to Connecting Everything, 1st Edition, Apress Publications, 2013.

Uttarakhand Technical University, Dehradun

New Scheme of Examination as per AICTE Flexible Curricula

Computer Science and Engineering, VII-Semester

Open Elective CS 704 (A) Big Data Processing

Course Objectives:

- Understand the Big Data Platform and its use cases.
- Provide an overview of Apache Hadoop.
- Provide HDFS Concepts and Interfacing with HDFS.
- Understand Map Reduce Jobs.
- Provide hands on Hodoop Eco System.
- Apply analytics on Structured, Unstructured Data.
- Exposure to Data Analytics with R.

Learning Outcomes:

1. Identify Big Data and its Business Implications.
2. List the components of Hadoop and Hadoop Eco-System.
3. Access and Process Data on Distributed File System.
4. Manage Job Execution in Hadoop Environment.
5. Develop Big Data Solutions using Hadoop Eco System.
6. Analyze Infosphere BigInsights Big Data Recommendations.
7. Apply Machine Learning Techniques using R.

Course Content:

UNIT I : INTRODUCTION TO BIG DATA AND HADOOP Types of Digital Data, Introduction to Big Data, Big Data Analytics, History of Hadoop, Apache Hadoop, Analysing Data with Unix tools, Analysing Data with Hadoop, Hadoop Streaming, Hadoop Echo System, IBM Big Data Strategy, Introduction to Infosphere BigInsights and Big Sheets.

UNIT II : HDFS(Hadoop Distributed File System) The Design of HDFS, HDFS Concepts, Command Line Interface, Hadoop file system interfaces, Data flow, Data Ingest with Flume and Scoop and Hadoop archives, Hadoop I/O: Compression, Serialization, Avro and File-Based Data structures.

UNIT III : Map Reduce Anatomy of a Map Reduce Job Run, Failures, Job Scheduling, Shuffle and Sort, Task Execution, Map Reduce Types and Formats, Map Reduce Features.

Unit IV : Hadoop Eco System Pig : Introduction to PIG, Execution Modes of Pig, Comparison of Pig with Databases, Grunt, Pig Latin, User Defined Functions, Data Processing operators. Hive : Hive Shell, Hive Services, Hive Metastore, Comparison with Traditional Databases, HiveQL, Tables, Querying Data and User Defined Functions. Hbase : HBasics, Concepts, Clients, Example, Hbase Versus RDBMS. Big SQL : Introduction

UNIT V : Data Analytics with R Machine Learning : Introduction, Supervised Learning, Unsupervised Learning, Collaborative Filtering. Big Data Analytics with BigR.

Text Book

1. Tom White, “Hadoop: The Definitive Guide”, Third Edit on, O’reily Media, 2012.
2. Seema Acharya, Subhasini Chellappan; “Big Data Analytics”, Wiley 2015.
3. Michael Berthold, David J. Hand, "Intelligent Data Analysis”, Springer, 2007.
4. Jay Liebowitz, “Big Data and Business Analytics” Auerbach Publications, CRC press (2013)
5. Tom Plunkett, Mark Hornick, “Using R to Unlock the Value of Big Data: Big Data Analytics with Oracle R Enterprise and Oracle R Connector for Hadoop”, McGraw-Hill/Osborne Media (2013), Oracle press.
6. Anand Rajaraman and Jef rey David Ulman, “Mining of Massive Datasets”, Cambridge University Press, 2012.
7. Bill Franks, “Taming the Big Data Tidal Wave: Finding Opportunities in Huge Data Streams with Advanced Analytics”, John Wiley & sons, 2012.
8. Glen J. Myat, “Making Sense of Data”, John Wiley & Sons, 2007.
9. Pete Warden, “Big Data Glossary”, O’Reily, 2011.

Uttarakhand Technical University, Dehradun

New Scheme of Examination as per AICTE Flexible Curricula

Computer Science and Engineering, VII-Semester

Open Elective CS 704 (B) Digital Image Processing

Course Objectives:

- Develop a theoretical foundation of fundamental Digital Image Processing concepts.
- Provide mathematical foundations for digital manipulation of images; image acquisition; preprocessing; segmentation; Fourier domain processing; and compression.
- Gain experience and practical techniques to write programs using MATLAB language for digital manipulation of images; image acquisition; preprocessing; segmentation; Fourier domain processing; and compression.

Learning Outcomes:

1. Have a good understanding of the mathematical foundations for digital manipulation of images.
2. Be able to write programs for digital manipulation of images.
3. Learn and understand the Image Enhancement in the Spatial Domain.
4. Be able to use different digital image processing algorithms.
5. Be able to design, code and test digital image processing applications.
6. Analyze a wide range of problems and provide solutions related to the design of image processing systems through suitable algorithms, structures, diagrams, and other appropriate methods.

Course Content:

UNIT I : Digital Image Fundamentals: What is Digital Image Processing?, Origins of Digital Image Processing, Examples of fields that use DIP, Fundamental Steps in Digital Image Processing, Components of an Image Processing System, Elements of Visual Perception, Image Sensing and Acquisition, Image Sampling and Quantization, Some Basic Relationships Between Pixels, Linear and Nonlinear Operations.

UNIT II: Spatial Domain: Some Basic Intensity Transformation Functions, Histogram Processing, Fundamentals of Spatial Filtering, Smoothing Spatial Filters, Sharpening Spatial Filters.

UNIT III : Frequency Domain: Preliminary Concepts, The Discrete Fourier Transform (DFT) of Two Variables, Properties of the 2-D DFT, Filtering in the Frequency Domain, Image Smoothing and Image Sharpening Using Frequency Domain Filters, Selective Filtering.

Unit IV : Restoration: Noise models, Restoration in the Presence of Noise Only using Spatial Filtering and Frequency Domain Filtering, Linear, Position-Invariant Degradations, Estimating the Degradation Function, Inverse Filtering, Minimum Mean Square Error (Wiener) Filtering, Constrained Least Squares Filtering.

UNIT V : Color Image Processing: Color Fundamentals, Color Models, Pseudocolor Image Processing. **Wavelets:** Background, Multiresolution Expansions. Morphological Image

Processing: Preliminaries, Erosion and Dilation, Opening and Closing, The Hit-or-Miss Transforms, Some Basic Morphological Algorithms.

UNIT V : Segmentation: Point, Line, and Edge Detection, Thresholding, Region-Based Segmentation, Segmentation Using Morphological Watersheds. **Representation and Description:** Representation, Boundary descriptors.

Text Book

1. R. C. Gonzalez and R. E. Woods, "Digital Image Processing", Third Edit on, Pearson-Prentice-Hall, 2008.
2. R. C. Gonzalez, R. E. Woods, S. L. Eddins, "Digital Image Processing using Matlab", Second Edit on, Pearson-Prentice-Hall, 2004.
3. Al Bovik (ed.), "Handbook of Image and Video Processing", Academic Press, 2000.
4. A.K. Jain, "Fundamentals of Digital Image Processing", Prentice-Hall, Addison-Wesley, 1989.
5. M. Petrou, P. Bosdogianni, "Image Processing, The Fundamentals", Wiley, 1999.
6. P.Ramesh Babu, Digital Image Processing. Scitech Publications., 2003.
7. Bernd Jähne, Digital Image Processing, Springer-Verlag Berlin Heidelberg 2005.
8. B. Jähne, "Practical Handbook on Image Processing for Scientific Applications", CRC Press, 1997.

Uttarakhand Technical University, Dehradun

New Scheme of Examination as per AICTE Flexible Curricula

Computer Science and Engineering, VII-Semester

Open Elective CS 704 (C) Ethical Hacking

Course Objectives:

- The aim of the course is to introduce the methodologies and framework of ethical hacking for enhancing the security. The course includes-Impacts of Hacking; Types of Hackers; Information Security.
- Models; Information Security Program; Business Perspective; Planning a Controlled Attack; Framework of Steps (Reconnaissance, Enumeration, Vulnerability Analysis, Exploitation, Deliverable and Integration)

Course Learning Outcomes:

1. Gain the knowledge of the use and availability of tools to support an ethical hack.
2. Gain the knowledge of interpreting the results of a controlled attack.
3. Understand the role of politics, inherent and imposed limitations and metrics for planning of a test.
4. Comprehend the dangers associated with penetration testing.

Course Content:

UNIT- I Introduction: Hacking Impacts, The Hacker Framework: Planning the test, Sound Operations, Reconnaissance, Enumeration, Vulnerability Analysis, Exploitation, Final Analysis, Deliverable, Integration Information Security Models: Computer Security, Network Security, Service Security, Application Security, Security Architecture Information Security Program: The Process of Information Security, Component Parts of Information Security Program, Risk Analysis and Ethical Hacking

UNIT - II The Business Perspective: Business Objectives, Security Policy, Previous Test Results, Business Challenges Planning for a Controlled Attack: Inherent Limitations, Imposed Limitations, Timing is Everything, Attack Type, Source Point, Required Knowledge, Multi-Phased Attacks, Teaming and Attack Structure, Engagement Planner, The Right Security Consultant, The Tester, Logistics, Intermediates, Law Enforcement

UNIT - III Preparing for a Hack: Technical Preparation, Managing the Engagement Reconnaissance: Social Engineering, Physical Security, Internet Reconnaissance

UNIT - IV Enumeration: Enumeration Techniques, Soft Objective, Looking Around or Attack, Elements of Enumeration, Preparing for the Next Phase Exploitation: Intutive Testing, Evasion, Threads and Groups, Operating Systems, Password Crackers, RootKits, applications, Wardialing, Network, Services and Areas of Concern

UNIT - V Deliverable: The Deliverable, The Document, Overal Structure, Aligning Findings, Presentation Integration: Integrating the Results, Integration Summary, Mitigation, Defense Planning, Incident Management, Security Policy.

Text/Reference Books:

1. James S. Tiller, “The Ethical Hack: A Framework for Business Value Penetration Testing”, Auerbach Publications, CRC Press.
2. EC-Council, “Ethical Hacking and Countermeasures Attack Phases”, Cengage Learning.

Michael Simpson, Kent Backman, James Corley, “Hands-On Ethical Hacking and Network Defense”, Cengage Learning

Uttarakhand Technical University, Dehradun

New Scheme of Examination as per AICTE Flexible Curricula

Computer Science and Engineering, VIII-Semester

CS 801 Advanced Operating Systems

Course Objectives:

- Have an understanding of high-level OS kernel structure.
- Gained insight into hardware-software interactions for compute and I/O.
- Have practical skills in system tracing and performance analysis.
- Have been exposed to research ideas in system structure and behaviour.
- Have learned how to write systems-style performance evaluations.

- **Learning Outcomes:**
  1. Outline the potential benefits of distributed systems.
  2. Summarize the major security issues associated with distributed systems along with the range of techniques available for increasing system security.
  3. Apply standard design principles in the construction of these systems.
  4. Select appropriate approaches for building a range of distributed systems, including some that employ middleware

Course Content:

UNIT I:

Overview of UNIX system calls. The anatomy of a system call and x86 mechanisms for system call implementation. How the MMU/memory translation, segmentation, and hardware traps interact to create kernel–user context separation. What makes virtualization work? The kernel execution and programming context. Live debugging and tracing. Hardware and software support for debugging.

UNIT II:

DTrace: programming, implementation/design, internals. Kprobes and SysTrace: Linux catching up. Linking and loading. Executable and Linkable Format (ELF). Internals of linking and dynamic linking. Internals of effective spinlock implementations on x86. OpenSolaris adaptive mutexes: rationale and implementation optimization. Pre-emptive kernels. Effects of modern memory hierarchies and related optimizations.

UNIT III:

Process and thread kernel data structures, process table traversal, lookup, allocation and management of new structures, /proc internals, optimizations. Virtual File System and the layering of a file system call from API to driver. Object-orientation patterns in kernel code; a review of OO implementation generics (C++ vtables, etc).

UNIT IV:

OpenSolaris and Linux virtual memory and address space structures. Tying top-down and bottom-up object and memory page lookups with the actual x86 page translation and segmentation. How file operations, I/O buffering, and swapping all converged to using the same mechanism. Kmem and Vmem allocators. OO approach to memory allocation. Challenges of multiple CPUs and memory hierarchy. Security: integrity, isolation, mediation, auditing. From MULTICS and MLS to modern UNIX. SELinux type enforcement: design,

implementation, and pragmatics. Kernel hook systems and policies they enable. Trap systems and policies they enable. Tagged architectures and multi-level UNIX.

UNIT V:

ZFS overview. OpenSolaris boot environments and snapshots. OpenSolaris and UNIX System V system administration pragmatics: service startup, dependencies, management, system updates. Overview of the kernel network stack implementation. Path of a packet through a kernel. Berkeley Packet Filter architecture. Linux Netfilter architecture.

Topics for Programs:

1. Getting Started with Kernel Tracing - I/O
2. Kernel Implications of IPC
3. Micro-Architectural Implications of IPC
4. The TCP State Machine
5. TCP Latency and Bandwidth

Text Books:

1. Jean Bacon, Concurrent Systems, Addison – Wesley, 1998.
2. William Stallings, Operating Systems, Prentice Hall, 1995.
3. Andrew S. Tanenbaum and Maarten van Steen. “Distributed Systems: Principles and Paradigms”, Prentice Hall, 2nd Edition, 2007.
4. Silberschatz, Galvin, and Gagne, Operating System Concepts Essentials, 9th Edition.

Uttarakhand Technical University, Dehradun

New Scheme of Examination as per AICTE Flexible Curricula

Computer Science and Engineering, VIII-Semester

CS 802 Cryptography & Network Security

Course Objectives:

The objective of the course is to provide a basic understanding of the various issues related to information systems security (esecurity). The course will present an overview of the risks encountered in information systems security, and the tools used for resolving these risks.

Course Learning Outcomes:

1. Provide security of the data over the network.
2. Do research in the emerging areas of cryptography and network security.
3. Implement various networking protocols.
4. Protect any network from the threats in the world.

Course Content:

UNIT I: INTRODUCTION & NUMBER THEORY

Services, Mechanisms and attacks-the OSI security architecture-Network security model-Classical Encryption techniques (Symmetric cipher model, substitution techniques, transposition techniques, steganography).FINITE FIELDS AND NUMBER THEORY: Groups, Rings, Fields-Modular arithmetic-Euclid‟s algorithm-Finite fields- Polynomial Arithmetic –Prime numbers-Fermat‟s and Euler‟s theorem-Testing for primality -The Chinese remainder theorem- Discrete logarithms.

UNIT II: BLOCK CIPHERS & PUBLIC KEY CRYPTOGRAPHY

Data Encryption Standard-Block cipher principles-block cipher modes of operation-Advanced Encryption Standard (AES)-Triple DES-Blowfish-RC5 algorithm. Public key cryptography: Principles of public key cryptosystems-The RSA algorithm-Key management – Diffie Hellman Key exchange-Elliptic curve arithmetic-Elliptic curve cryptography.

UNIT III: HASH FUNCTIONS AND DIGITAL SIGNATURES

Authentication requirement – Authentication function – MAC – Hash function – Security of hash function and MAC –MD5 – SHA – HMAC – CMAC – Digital signature and authentication protocols – DSS – EI Gamal – Schnorr.

UNIT IV: SECURITY PRACTICE & SYSTEM SECURITY

Authentication applications – Kerberos – X.509 Authentication services – Internet Firewalls for Trusted System: Roles of Firewalls – Firewall related terminology- Types of Firewalls – Firewall designs – SET for E-Commerce Transactions. Intruder – Intrusion detection system – Virus and related threats – Countermeasures – Firewalls design principles – Trusted systems – Practical implementation of cryptography and security.

UNIT V: E-MAIL, IP & WEB SECURITY

E-mail Security: Security Services for E-mail-attacks possible through E-mail – establishing keys privacy-authentication of the source-Message Integrity-Non-repudiation-Pretty Good Privacy-S/MIME. IPSecurity: Overview of IPSec – IP and IPv6-Authentication Header-Encapsulation Security Payload (ESP)-Internet Key Exchange (Phases of IKE, ISAKMP/IKE Encoding). Web Security: SSL/TLS Basic Protocol-computing the keys- client authentication-PKI as deployed by SSLAttacks fixed in v3- Exportability-Encoding-Secure Electronic Transaction (SET)

List of Programs:-

1. Implement the following SUBSTITUTION & TRANSPOSITION TECHNIQUES concepts:
    - Caesar Cipher
    - Playfair Cipher
    - Hill Cipher
    - Vigenere Cipher
    - Rail fence – row & Column Transformation
2. Implement the following algorithms
    - DES
    - RSA Algorithm
    - Diffiee-Hellman
    - MD5
    - SHA-1
3. Implement the Signature Scheme - Digital Signature Standard.
4. Demonstrate how to provide secure data storage, secure data transmission and for creating digital signatures (GnuPG).
5. Setup a honey pot and monitor the honeypot on network (KF Sensor).
6. Installation of rootkits and study about the variety of options.
7. Perform wireless audit on an access point or a router and decrypt WEP and WPA. (Net Stumbler).
8. Demonstrate intrusion detection system (ids) using any tool (snort or any other s/w).

Books:

1. William Stallings, Cryptography and network security, Pearson Education.
2. Alfred J. Menezes, Paul C. van Oorschot and Scott A. Vanstone , Handbook of Applied Cryptography, CRC Press.
3. Margaret Cozzens, Steven J Miller, The mathematics of encryption, American Mathematical Society

Uttarakhand Technical University, Dehradun

New Scheme of Examination as per AICTE Flexible Curricula

Computer Science and Engineering, VIII-Semester

Dept Elective CS 803(A) Speech and Natural Language Processing

Course Objectives:

This course provides an introduction to the theory of natural language processing (NLP). The creations of computer programs that can understand, generate, and learn natural language. We will use natural language understanding as a vehicle to introduce the three major subfields of NLP: syntax (which concerns itself with determining the structure of a sentence), semantics (which concerns itself with determining the explicit meaning of a single sentence), and pragmatics (which concerns itself with deriving the implicit meaning of a sentence when it is used in a specific discourse context). The course will introduce both knowledge-based and statistical approaches to NLP, illustrate the use of NLP techniques and tools in a variety of application areas, and provide insight into many open research problems.

Course Learning Outcomes:

1. Explain different syntax and semantics approaches in NLP
2. Understand the fundamental mathematics applied in the field of NLP
3. Apply different models like Hidden Markov Model, SVM, CRF, RNN, LSTM in parts of speech tagging.
4. Apply different probabilistic parsing techniques in NLP
5. Apply different supervised and unsupervised techniques for document classification.
6. Analyse and apply appropriate Machine Learning techniques to solve the real world problem in NLP

Course Content:

Unit-1: Natural Language Processing: applications and key issues, The lexicon and morphology.

Unit-2: Phrase structure grammars and English syntax, Part of speech tagging,

Unit-3: Syntactic parsing, top-down and bottom-up parsing strategies.

Unit-4: Semantics, Word Sense Disambiguation, Semantic parsing, Subjectivity and sentiment analysis.

Unit-5: Information extraction, Automatic summarization.

Unit-6: Information retrieval and Question answering, Machine translation.

Text Book:

1. Speech and Language Processing, by D. Jurafsky and R. Martin, 2nd Edition.

An Introduction to Natural Language Processing, Computational Linguistics, and Speech Recognition (second edition), D. Jurafsky and J. Martin.

Uttarakhand Technical University, Dehradun

New Scheme of Examination as per AICTE Flexible Curricula

Computer Science and Engineering, VIII-Semester

Dept Elective CS 803(B) Embedded Systems

Course Objectives:

To understand the concepts of Hardware of various microcontrollers to enable Programming and Interfacing of microcontroller.

Course Learning Outcomes:

1. Maintain microcontroller based system.
2. Select appropriate family of microcontroller for different application.
3. Interface relevant hardware for given application.
4. Develop programme for given application.
5. Integrate hardware and software for embedded system for given application.

Course Content:

Unit - I Introduction: Embedded Systems and general purpose computer systems, history, classifications, applications and purpose of embedded systems. Core of Embedded Systems : Microprocessors and microcontrollers, RISC and CISC controllers, Big endian and Little endian processors, Application specific ICs, Programmable logic devices, COTS, sensors and actuators, communication interface, embedded firmware, other system components, PCB and passive components.

Unit - II Characteristics and quality attributes of embedded systems: Characteristics, Operational and nonoperational quality attributes, application specific embedded system - washing machine, domain specific - automotive.

Unit - III Programming Embedded Systems: Structure of embedded program, infinite loop, compiling, linking and locating, downloading and debugging.

Unit - IV Embedded hardware : Memory map, i/o map, interrupt map, processor family, external peripherals, memory - RAM, ROM, types of RAM and ROM, memory testing, CRC, Flash memory.

Unit - V Peripherals: Control and Status Registers, Device Driver, Timer Driver-Watchdog Timers, Embedded Operating System, Real-Time Characteristics, Selection Process.

Unit - VI Design and Development: Embedded System development environment - IDE, Types of file generated on cross compilation, disassembler / decompiler, simulator, emulator and debugging, embedded product development life-cycle, trends in embedded industry.

Text Books:

1. S. R. Ball, "Embedded Microprocessor Systems: Real World Design", 2nd edition, Newton, Mass. USA, 2002.
2. S. Ball, Analog Interfacing to Embedded Microprocessor Systems, Newness, 2003.
3. Berger, Embedded Systems Design, CMP Books, 2002.
4. J. Ganssle, The Art of Designing Embedded Systems, Butterworth, 2002.
5. S. Heath, Embedded Systems Design, Elsevier, 2003.
6. R. Kamal, "Embedded Systems: Architecture, Programming & Design", 1st edition, 2007, McGraw Hill, USA 2007.
7. P. Laplante, Real-Time Systems Design and Analysis, IEEE Press, 2004.
8. D.W. Lewis, Fundamentals of Embedded Software, Prentice hall, 2002.

Uttarakhand Technical University, Dehradun

New Scheme of Examination as per AICTE Flexible Curricula

Computer Science and Engineering, VIII-Semester

Dept Elective CS 803(C) Queuing Theory and Modeling

Course Objectives:

- To provide necessary basic concepts in probability and random processes for applications such as random signals, linear systems in communication engineering.
- To understand the basic concepts of probability, one and two dimensional random variables and to introduce some standard distributions applicable to engineering which can describe real life phenomenon.
- To understand the basic concepts of random processes which are widely used in IT fields.
- To understand the concept of queueing models and apply in engineering.
- To understand the significance of advanced queueing models.
- To provide the required mathematical support in real life problems and develop probabilistic models which can be used in several areas of science and engineering.

Course Learning Outcomes:

1. Understand the fundamental knowledge of the concepts of probability and have knowledge of standard distributions which can describe real life phenomenon.
2. Understand the basic concepts of one and two dimensional random variables and apply in engineering applications.
3. Apply the concept of random processes in engineering disciplines.
4. Acquire skills in analyzing queueing models.
5. Understand and characterize phenomenon which evolve with respect to time in a probabilistic manner.

Course Content:

UNIT I: PROBABILITY AND RANDOM VARIABLES

Probability – Axioms of probability – Conditional probability – Baye‘s theorem - Discrete and continuous random variables – Moments – Moment generating functions – Binomial, Poisson, Geometric, Uniform, Exponential and Normal distributions.

UNIT II: TWO – DIMENSIONAL RANDOM VARIABLES

Joint distributions – Marginal and conditional distributions – Covariance – Correlation and linear regression – Transformation of random variables – Central limit theorem (for independent and identically distributed random variables).

UNIT III: RANDOM PROCESSES

Classification – Stationary process – Markov process - Poisson process – Discrete parameter Markov chain – Chapman Kolmogorov equations – Limiting distributions.

UNIT IV: QUEUEING MODELS

Markovian queues – Birth and death processes – Single and multiple server queueing models – Little‘s formula - Queues with finite waiting rooms – Queues with impatient customers : Balking and reneging.

UNIT V: ADVANCED QUEUEING MODELS

Finite source models - M/G/1 queue – Pollaczek Khinchin formula - M/D/1 and M/EK/1 as special cases – Series queues – Open Jackson networks.

Text Books:

1. Gross, D., Shortle, J.F, Thompson, J.M and Harris. C.M., Fundamentals of Queueing Theory", Wiley Student 4th Edition, 2014.
2. Ibe, O.C., Fundamentals of Applied Probability and Random Processes", Elsevier, 1st Indian Reprint, 2007.
3. Hwei Hsu, "Schaum‘s Outline of Theory and Problems of Probability, Random Variables and Random Processes", Tata McGraw Hill Edition, New Delhi, 2004.

Taha, H.A., "Operations Research", 9th Edition, Pearson India Education Services, Delhi, 2016.

Uttarakhand Technical University, Dehradun

New Scheme of Examination as per AICTE Flexible Curricula

Computer Science and Engineering, VIII-Semester

Dept Elective CS 803(D) Cloud Security

Course Objectives:

- To provide introduction to the fundamental principles of cloud computing.
- Students should able to identify the architecture and infrastructure of cloud computing, including SaaS, PaaS, IaaS, public cloud, private cloud, hybrid cloud.
- Students should learn and investigate the hardware and software architecture of Cloud Computing and understand how virtualization is key to a successful Cloud Computing solution.

Course Learning Outcomes:

1. Understand Cloud Computing Architectural Framework with Service Models.
2. Demonstrate with different levels of Virtualization by creating Virtual Machine for different applications.
3. Analyze cloud computing security challenges to design the security model.
4. Appraise the cloud management with migration techniques.
5. Develop the applications on Microsoft Azure, Google App Engine, Web 2.0 platforms.

Course Content:

Unit-1

Fundamentals of Cloud Computing: Fundamental concepts of Distributed Systems, IT Challenges, Technology Foundations of Cloud Computing, What is Cloud Computing? NIST Definition and Overview of Cloud Computing, Journey of the Cloud, Essential Characteristics of Cloud Computing, Cloud Components, Cloud Challenges, Economics of the Cloud

Understanding Cloud Architecture and Services: Cloud Architecture, Service Model and Deployment Model, Stack, Management Layers, Standards, Interoperability, Cloud Maturity, Introducing SOA, Relating SOA and Cloud Computing, Architectural Influences, Services: Storage-as-a-Service, Database-as-a-Service, Information-as-a-Service, Identity-as-a-Service, Process-as-a-Service, Integration-as-a-Service, Compliance-as-a-Service, Security-as-a-Service, Management/Governance-as-a-Service, Testing-as-a-Service

Unit-2

Infrastructure-As-A-Service (Iaas): Virtualization Overview, Virtualized Data Center (VDC) – Compute: Why Virtualize, How to Virtualize, Types of Virtualization, Understanding Hypervisors, Virtual Machine and its Components, Resource Management, Share, Limit and Reservation, Optimizing Memory Resource, Memory Ballooning, Virtual Machine Affinity, Physical to Virtual Conversion: Hot and Cold Conversion Process , Virtualized Data Center (VDC) – Storage: Benefits, Storage Virtualization at different Layers, Virtual Machine Storage Options and Considerations, Virtual Provisioning, Storage Tiering, Virtualized Data Center (VDC) – Networking: BenefitsComponents of VDC network infrastructure, Virtual Network Components, Virtual LAN, VLAN, Trunking, VLAN Tagging, Network Traffic Management, Virtualized Data Center (VDC) - Desktop and Application, VMware vSphere.

Unit-3

Platform-As-A-Service (Paas): PaaS: Overview, Web Application Frameworks, Web Hosting Services- 1: Google App Engine, Web Hosting Services- 2: Microsoft Azure Service.

Software-As-A-Service (Saas): SaaS: Overview, Web Services 2.0, REST API, SOAP API, User Authentication, Case Study: Healthcare or Banking

Unit-4

Cloud Security: Cloud Security: Information Security, Basic Terminology, Security Domains, Security Concerns and Threats, Access Control and Identity Management in Cloud, Governance, Risk and Compliance, Virtualization Security Management, Cloud Security Risk, Incident Response, Retirement, Cloud Computing Security Architecture, Architectural Consideration, Trusted Cloud Computing, Data Privacy, Testing from SOA to the Clouds.
Business Continuity In Cloud: Business Continuity in Cloud: Fault Tolerance Mechanisms in VDC, Backup in VDC, Replication and Migration in VDC, Capacity Planning, Vertical Scaling, Private Cloud Planning, Business Continuity Plan, Availability.
Cloud Infrastructure, Management and Migration: Cloud Infrastructure and Service Creation, Cloud Service Management, Cloud Administration, Cloud Monitoring, Cloud Migration Consideration: Migration Considerations, Phases to Adopt the Cloud

Unit-5

Hadoop in Cloud Computing: Overview of Big Data Analytics, Overview of Hadoop and Map Reduce, Example of Map Reduce, Hadoop as a Service in Public Cloud, Hadoop in Private Cloud, HDInsight.

Text Books:

1. RajkumarBuyya (Editor), James Broberg, Andrzej M. Goscinski, Cloud Computing: Principles and Paradigms, Wiley India Pvt Ltd, 2013.
2. RajkumarBuyya, Christian Vecchiola , TamaraiSelvi, Mastering Cloud Computing, First edition, McGraw Hill Education, 2013.
3. John Rhoton, Cloud Computing Explained, 2nd Edition , Recursive Press, , 2010.
4. Barrie Sosinsky, Cloud Computing: Bible, Wiley India, 2011
5. John W. Rittinghouse and James F. Ransome, Cloud Computing, Implementation, Management and Security, CRC Press, 2010
6. David S. Linthicum, Cloud Computing and SOA Convergence in Your Enterprise: A Step-by-Step Guide, Addison Wesley, 2009
7. Andrew S. Tanenbaum, Modern Operating Systems, 3rd Edition, Prentice Hall, 2007
8. George Reese, Cloud Application Architectures, O'Reilly, 2009
9. Mark C. Chu-Carroll, Code in the Cloud: Programming Google App Engine, Pragmatic Programmers, LLC, 2011
10. Roger Jennings, Cloud Computing with the Windows Azure Platform, Wrox, Wiley India, 2010

Uttarakhand Technical University, Dehradun

New Scheme of Examination as per AICTE Flexible Curricula

Computer Science and Engineering, VIII-Semester

Dept Elective CS 803(E) Block Chain

COURSE OBJECTIVES

By the end of the course, students will be able to • Understand how blockchain systems (mainly Bitcoin and Ethereum) work, • To securely interact with them, • Design, build, and deploy smart contracts and distributed applications, • Integrate ideas from blockchain technology into their own projects.

COURSE OUTCOMES 1. Explain design principles of Bitcoin and Ethereum. 2. Explain Nakamoto consensus. 3. Explain the Simplified Payment Verification protocol. 4. List and describe differences between proof-of-work and proof-of-stake consensus. 5. Interact with a blockchain system by sending and reading transactions. 6. Design, build, and deploy a distributed application. 7. Evaluate security, privacy, and efficiency of a given blockchain system.

SYLLABUS

Unit I: Basics: Distributed Database, Two General Problem, Byzantine General problem and Fault Tolerance, Hadoop Distributed File System, Distributed Hash Table, ASIC resistance, Turing Complete. • Cryptography: Hash function, Digital Signature - ECDSA, Memory Hard Algorithm, Zero Knowledge Proof. Digital Cash

Unit II: Blockchain: Introduction, Advantage over conventional distributed database, Blockchain Network, Mining Mechanism, Distributed Consensus, Merkle Patricia Tree, Gas Limit, Transactions and Fee, Anonymity, Reward, Chain Policy, Life of Blockchain application, Soft & Hard Fork, Private and Public blockchain.

Unit III: Distributed Consensus: Nakamoto consensus, Proof of Work, Proof of Stake, Proof of Burn, Difficulty Level, Sybil Attack, Energy utilization and alternate.

Unit IV: Cryptocurrency: History, Distributed Ledger, Bitcoin protocols - Mining strategy and rewards, Ethereum - Construction, DAO, Smart Contract, GHOST, Vulnerability, Attacks, Sidechain, Namecoin

Unit V: Cryptocurrency Regulation: Stakeholders, Roots of Bit coin, Legal Aspects-Crypto currency Exchange, Black Market and Global Economy. Applications: Internet of Things, Medical Record Management System, Domain Name Service and future of Blockchain.

Text Book 1. Arvind Narayanan, Joseph Bonneau, Edward Felten, Andrew Miller and Steven Goldfeder, Bitcoin and Cryptocurrency Technologies: A Comprehensive Introduction, Princeton University Press (July 19, 2016).

Reference Books

1. Antonopoulos, Mastering Bitcoin: Unlocking Digital Cryptocurrencies
2. Satoshi Nakamoto, Bitcoin: A Peer-to-Peer Electronic Cash System
3. DR. Gavin Wood, “ETHEREUM: A Secure Decentralized Transaction Ledger,”Yellow paper.2014.
4. Nicola Atzei, Massimo Bartoletti, and Tiziana Cimoli, A survey of attacks on Ethereum smart contracts

Uttarakhand Technical University, Dehradun

New Scheme of Examination as per AICTE Flexible Curricula

Computer Science and Engineering, VIII-Semester

Open Elective CS 804(A) Fault Tolerant Computing

Course Objectives:

Dependability is now a major requirement for all computing systems and applications. Computer hardware, software, data, networks and systems are always subject to faults. The faults cannot be eliminated, however their impact can be limited and a suitably designed fault-tolerant system can function even in the presence of faults. This course introduces the widely applicable concepts in reliable and fault-tolerant computing. Topics to be covered include basic testing concepts, hardware and software faults, reliability evaluation, design and evaluation of redundant systems, relationship between testing and reliability, software reliability growth, security vulnerabilities and emerging issues.

Course Learning Outcomes:

1. Understand techniques to model faults and know how to generate tests and evaluate effectiveness.
2. Evaluate reliability of systems with permanent and temporary faults.
3. Determine applicability of these forms of redundancy to enhance reliability: spatial, temporal, procedural.
4. Assess the relation between software testing and residual defects and security vulnerabilities devise and analyse potential solutions for emerging issues.

Course Content:

Unit-I: System model -error, failure, faults, software fault tolerance

Unit-II: Byzantine agreement, fail-stop processors,

Unit-III: Stable storage, reliable and atomic broadcasting

Unit-IV: Process resiliency, data resiliency & recovery, commit protocols

Unit-V: Reliability modeling & performance evaluation, crash recovery in databases, and voting methods.

Text/Reference Books:

1. Parag Lala: "Fault tolerant and Fault Testable Digital Design"; Prentice Hall International.
2. Israel Koren & C. Mani Krishna: "Fault-Tolerant Systems", Morgan Kaufmann.
3. P. Jalote, “Fault Tolerance in Distributed Systems”, Prentice Hall Inc., 1994.

Uttarakhand Technical University, Dehradun

New Scheme of Examination as per AICTE Flexible Curricula

Computer Science and Engineering, VIII-Semester

Open Elective CS 804(B) Artificial Intelligence

Course Objectives:

- The adoption of Artificial Intelligence (AI) technologies is widely expanding in our society. Applications of AI include: self-driving cars, personal assistants, surveillance systems, robotic manufacturing, machine translation, financial services, cyber security, web search, video games, and code analysis and product recommendations. Such applications use AI techniques to interpret information from a wide variety of sources and use it to enable intelligent, goal-directed behaviour.

Course Learning Outcomes:

1. Acquire advanced Data Analysis skills.
2. Stay Industry relevant and grow in your career.
3. Create AI/ML solutions for various business problems. Ÿ Build and deploy production grade AI/ML applications.
4. Apply AI/ML methods, techniques and tools immediately

Course Content:

Unit-1 (Introduction to AI): Definitions, Goals of AI, AI Approaches, AI Techniques, Branches of AI, Applications of AI. Introduction of Intelligent Systems: Agents and Environments, Good Behavior: the concept of Rationality, The Nature of Environments, The structure of Agents, How the components of agent programs work.

Unit-2 (Problems Solving, Search and Control Strategies)

Solving Problems by Searching, Study and analysis of various searching algorithms. Implementation of Depth-first search, Problem-Solving Agents, Searching for Solutions, Uninformed Search Strategies: Breadth-first search, Uniform-cost search, Depth-first search, Depth-limited search, Iterative deepening depth-first search, Bi-directional search Informed (Heuristic) Search Strategies: Greedy best-first search A* search: Minimizing the total estimated solution cost, Conditions for optimality: Admissibility and consistency, Optimality of A*, Memory-bounded heuristic search, Heuristic Functions, Generating admissible heuristics from sub problems: Pattern databases, Learning heuristics from experience.

Beyond Classical Search: Local Search Algorithms and Optimization Problems: Hill-climbing search Simulated annealing, Local beam search, Genetic algorithms, Local Search in Continuous Spaces, Searching with Non-deterministic Actions: AND-OR search trees, Searching with Partial Observations.

Unit- 3 (Knowledge Representations Issues, Predicate Logic, Rules)

Knowledge representation, KR using predicate logic, KR using rules. Reasoning System - Symbolic, Statistical: Reasoning, Symbolic reasoning, Statistical reasoning.

Unit-4 (Quantifying Uncertainty, Learning Systems)

Acting under Uncertainty, Basic Probability Notation, Inference Using Full Joint Distributions, Bayes' Rule and Its Use, Representing Knowledge in an Uncertain Domain, Other Approaches to Uncertain Reasoning, Rule-based methods for uncertain reasoning, Representing vagueness: Fuzzy

sets and fuzzy logic, Study of fuzzy logic and Decision trees, Implementation aspects of Decision trees.
Learning from Examples: Forms of Learning, Supervised Learning, Learning Decision Trees, The decision tree representation, Expressiveness of decision trees, inducing decision trees from examples.

Unit-5 (Expert Systems)

Introduction, Knowledge acquisition, Knowledge base, Working memory, Inference engine, Expert system shells, Explanation, Application of expert systems.
Fundamentals of Neural Networks: Introduction and research history, Model of artificial neuron, Characteristics of neural networks, learning methods in neural networks, Single-layer neural network system, Applications of neural networks.
Fundamentals of Genetic Algorithms: Introduction, Encoding, Operators of genetic algorithm, Basic genetic algorithm.

Text/Reference Books:

1. Rich, Elaine Knight, Kevin, Artificial Intelligence, Tata McGraw Hill.
2. Luger, George F, Artificial Intelligence: Structures and Strategies for Complex Problem Solving, Pearson Education.
3. Nilsson, Nils J, Artificial Intelligence, Morgan Kaufmann
4. Russell, Stuart J. Norvig, Peter, AI: A Modern Approach, Pearson Education

Uttarakhand Technical University, Dehradun

New Scheme of Examination as per AICTE Flexible Curricula

Computer Science and Engineering, VIII-Semester

Open Elective CS 804(C) Cognitive Radio Networks

UNIT – I :

Reconfigurable Wireless communication Systems, Digital Radio Processing. Concept of Cognitive Radio: Cognitive Radio Bands, Spectrum policy, Application of Cognitive radio, Cognitive radio network design, spectrum coexistence in Cognitive radio network

UNIT – II :

Multiple Access Communications and ALOHA,, Splitting Algorithms, Carrier Sensing, Routing, Flow Control. Cooperative Communications and Networks: Information Theory for Cooperative Communications, Cooperative Communications, Cooperative Wireless Networks. Cognitive Radio Communications: Cognitive Radios and Dynamic Spectrum Access, Analytical Approach and Algorithms for Dynamic Spectrum Access, Fundamental Limits of Cognitive Radios, Mathematical Models toward Networking Cognitive Radios.

UNIT – III:

Network Coding for Cognitive Radio Relay Networks, Cognitive Radio Networks Architecture, Terminal Architecture of CRN, QoS Provisional Diversity Radio Access Networks, Scaling Laws of Ad Hoc and Cognitive Radio Networks. Spectrum Sensing: Spectrum Sensing to Detect Specific Primary System, Spectrum Sensing for Cognitive OFDMA Systems, Spectrum Sensing for Cognitive Multi-Radio Networks

UNIT – IV :

Network Layer Design: Routing in Mobile Ad Hoc Networks, Routing in Cognitive Radio Networks, Control of CRN, Network tomography, Self-Organization in Mobile Communication Networks.

UNIT – V :

Spectrum Management of Cognitive Radio Networks: Spectrum Sharing, Spectrum Pricing, Mobility Management of Heterogeneous Wireless Networks, Regulatory Issues and International Standards.

TEXT BOOKS:

- Kwang-Cheng Chen, Ramjee Prasad, “Cognitive Radio Networks”, Wiley , 2009
- Ezio Biglieri, Andrea J. Goldsmith, Larry J. Greenstein, Narayan B. Mandayam, H. Vincent Poor, “Principles of Cognitive Radio”, Cambridge, 2012
- GS Tomar and A. Bagwari, Introduction to Cognitive Radio Networks, CRC Press 2016

REFERENCES:

- Ekram Hossain, Dusit Niyato, Zhu Han, “Dynamic Spectrum Access and Management in Cognitive Radio Networks”, Cambridge, 2009
- Linda E. Doyle,” Essentials of Cognitive Radio”, Cambridge, 2009

Uttarakhand Technical University, Dehradun

New Scheme of Examination as per AICTE Flexible Curricula

Computer Science and Engineering, VIII-Semester

Open Elective CS 804(D) Service Oriented Architecture

Course Objectives:

- To build an understanding of the fundamental concepts of service oriented architecture.
- To familiarize the basics of service oriented analysis and design.
- To familiarize the various WS-specification standards

Course Learning Outcomes:

1. Understand the basic concepts of service oriented architecture.
2. Explain the business activities related to Service oriented analysis and design.
3. Describe various web service specification standards.

Course Content:

Unit I: Roots of SOA – Characteristics of SOA - Comparing SOA to client-server and distributed internet architectures – Anatomy of SOA- How components in an SOA interrelate - Principles of service orientation.

Unit II: Web services – Service descriptions – Messaging with SOAP –Message exchange Patterns – Coordination –Atomic Transactions.

Unit III: Business activities – Orchestration – Choreography - Service layer abstraction – Application Service Layer – Business Service Layer – Orchestration Service Layer Service oriented analysis – Business-centric SOA – Deriving business services- service modeling.

Unit IV: Service Oriented Design – WSDL basics – SOAP basics – SOA composition guidelines – Entity-centric business service design – Application service design – Task- centric business service design.

Unit V: SOA platform basics – SOA support in J2EE – Java API for XML-based web services (JAX-WS) - Java architecture for XML binding (JAXB) – Java API for XML Registries (JAXR) - Java API for XML based RPC (JAX-RPC)- Web Services Interoperability Technologies (WSIT) - SOA support in .NET – Common Language Runtime - ASP.NET web forms – ASP.NET web services – Web Services Enhancements (WSE).

Unit VI: WS-BPEL basics – WS-Coordination overview - WS-Choreography, WSPolicy, WS-Security.

Text/Reference Books:

1. Dan Woods, Thomas Mattern , “Enterprise SOA: Designing IT for Business Innovation” , O’Reilly 1e, 2006.
2. Newcomer,Lomow, “ Understanding SOA with Web Services”, Pearson Education, 2005.
3. Sandeep Chatterjee, James Webber, “Developing Enterprise Web Services: An Architect’s Guide”, Pearson Education, 2005.
4. Thomas Erl, “Service-Oriented Architecture: Concepts, Technology, and Design”, Pearson Education, 2005.