SYLLABUS BOOKLET

4-YEAR B.Tech. Programme
(Computer Science and Engineering)

(Applicable to Academic Session 2014-15 and onwards)

Department Undergraduate Committee (DUGC)

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING
INDIAN INSTITUTE OF TECHNOLOGY
(BANARAS HINDU UNIVERSITY)
VARANASI-221005
INDIA

October'2015

Introduction:

The Department of Computer Science and Engineering was established in July 1983. The department offers following programmes:

1. 4-Years B.Tech. programme in Computer Sc. & Engineering
2. 5 Years Integrated Dual Degree (B.Tech. and M.Tech.) programme in Computer Sc. & Engineering and
3. Ph.D. degree in various specializations of Computer Sc. and Engineering.

Computer Sc. & Engineering is the most sought-after branch for the JEE selected students that come to the Institute. Our graduates have distinguished themselves in higher studies at the top Universities. They also occupy positions of eminence in the computer industry. Our Alumni remain in constant touch with us and are contributing in the development of the department. Placements for our graduates are the best in the Institute. The faculty members of the department have international experience and training.

The departmental research is focused in the areas of Artificial Intelligence, Neuro Computing, Parallel Processing, Software Engineering, Image Processing and Computer Vision, Medical Image Processing, Pattern Recognition, Datamining and Webmining, Biometrics, semantic web, Natural Language Processing (NLP), Machine Learning, and Information Extraction. Besides plan funding, the Department attracts financial inputs through externally funded projects.

Programme Objective:

The basic objective of the programme offered by the Dept. is to train the students in the area of Computer Science and Engineering and its streams. Apart from learning the concepts of development of skills related to the discipline, the courses are designed in such a way that have broad base of humanities and science courses as well as courses that enable the students to build their character.

Hence, overall objective is to provide education to the students with aim to build the student good human with strong character and responsive to demands of society and nature.

Curriculum Overview:

Since academic session 2014-15, the new academic curriculum has been designed and introduced keeping in mind the objectives stated as above. The programme components include courses related to Humanities, Language and Management, Exploratory projects, Science, general Engineering (related to other branches), Core courses, department core electives, Multi-department core courses, projects, dissertation, practical, Gymkhana courses etc.. The department offers the stream based education in the curriculum of B.Tech. and IDD programme. Apart from core computer Sc. and Engineering subjects, the department offers stream electives/ bouquet elective courses for following two streams:

Artificial Intelligence and Computer Vision

High Performance Computing and Data Engineering.

SEMESTER-WISE COURSE STRUCTURE OF
4-YR B.Tech. (Computer Science and Engineering) PROGRAMME
(w.e.f. 2014-15)

Semester-I				
CS. Coursecode.YY	**Course Code**	**Subject**	**Contact Hours**	**Credits**
IS.**BL 101.**14	BL 101	Biology	3-1-0	11
IS.**PHY 101.**14	PHY 101	Physics I	3-1-2	13
IS.**MA 101.**14	MA 101	Engineering Maths- I	3-1-0	11
IE.**CSO 101**.14	CSO 101	Computer Programming	3-1-2	13
EP.**ME 106**.14	ME 106	Manufacturing Practice-II	0-0-3	03
EP.ME 104.14	ME 104	Engineering Drawing	1-0-3	06
IH.**H 101**.14	H 101	Universal Human Values - I: Self and Family	1-2-0	05
		Total	**14-6-10**	**62**
LM.**HL101**.14	HL 101	Basic English	2-0-1	**07**
		Total	**15-6-8**	**63**
GY1		Physical Education/ Creative Practice #	0-0-5	05

Semester-II				
CS. Coursecode.YY	**Course Code**	**Subject**	**Contact Hours**	**Credits**
IS.MA 102.14	MA 102	Engineering Maths- II	3-1-0	11
IE.EO 101.14	EO 101	Fundamentals of Electrical Engineering	3-1-2	13
MC.CSO 102.15	CSO 102	Data Structures *	3-0-2	11
DC.CSE 101.14 (EP)	CSE 101	Information Technology Workshop-I (ITW-1)	2-0-3	09
EP.ME 105.14	ME 105	Manufacturing Practice – I	0-0-3	03
IH.H 105.14 IH.H 106.14	H 105/ H 106	(Philosophy / Education & Self) #	2-1-0	08
		Total	**13-3-10**	**55**
GY2		Physical Education/ Creative Practice #	0-0-5	**05**

*Multicore subject offered by CSE Dept. to Mathematical Sciences

Semester-III				
CS. Coursecode.YY	**Course Code**	**Subject**	**Contact Hours**	**Credits**
IS.MA202.15	MA202	Probability and Statistics	3-1-0	11
IE.CMO 101.14	CMO101	Engineering Mechanics	3-1-0	11
MC.CSO201.15	CSO201	Discrete Maths +	3-0-0	09
MC.CSO202.15	CSO202	Computer System Organization *	3-0-2	11
DC.CSE201.15	CSE201	Information Technology Workshop-II (ITW-II)	2-0-3	09
IH3.(H103/H104)/ (H105/H106).14	H103/H104/ H105/H106	(History & Civilization / Development of Societies) / (Philosophy /Education & Self)	2-1-0	08
		Total	**16-2-7**	**59**
GY3		Hobbies and Club		

Semester-IV				
CS. Coursecode.YY	**Course Code**	**Subject**	**Contact Hours**	**Credits**
IS.MA 203.14	MA 203	Mathematical Methods	3-1-0	11
DC.CSE 202.15	CSE 202	Artificial Intelligence	3-0-2	11
MC.CSO 203.15	CSO 203	Algorithms *	3-0-2	11
MC.CSO 204.14	CSO 204	Operating Systems	3-0-2	11
DP.CSE291.15	CSE 291	Exploratory Project	0-0-5	05
IH.HL201.14	HL 201	Universal Human Values - II: Self, Society and Family	1-2-0	05
		Total	**13-3-11**	**54**
GY4	GY..	Hobbies and Club		

*Multicore subject offered by CSE Dept. to Mathematical Sciences

Semester-V				
CS. Coursecode.YY	**Course Code**	**Subject**	**Contact Hours (L-T-P)**	**Credits**
IE.MO201.14	MO201	Materials Science and Engineering	3-1-0	11
OE		Open Elective-1	3-0-0/ 3-1-0	9/ 11
DC.CSE301.16	CSE301	Database Management System	3-0-2	11
MC.CSO301.16	CSO301	Computer Graphics*	3-0-2	11
BE.CSE311.16/ BE.CSE321.16/ BE.CSE411.16 DE.CSE302.16/ DE.CSE303.16	CSE311/ CSE321/ CSE411 CSE302/ CSE303	Stream Elective-I/ Non-Stream Elective-I	3-0-2 3-0-0	11/09
LM1.HL301.16	HL301	Professional Communication	2-1-0	08
		Total Credits in the Semester (Regular)	17-2-4	59-61 (Non-Stream)
DP.CSE391.16	CSE391	Stream Project (Hons.)##	0-0-10	10
		Total Credits (Stream, Hons.):	17-2-16	71/73

*Multicore Subject offered by CSE to Math Sc.

+ Multicore Subject offered by Math Sc. to CSE

OE1: Graph Theory and Applications: To be taken by students opting for HPC&DE stream. Offered by Math. Sc./ or other related course

+-: Multicore subjects for Math Sc and CSE

Extra Stream Project to be carried out by Hons. Students in V Sem.

Semester-VI				
CS. Coursecode.YY	**Course Code**	**Subject**	**Contact Hours (L-T-P)**	**Credits**
OE		Open Elective-2	3-0-0/3-1-0	9/11
DC.CSE304.16	CSE304	Software Engineering	3-0-0	09
MC.CSO302.16	CSO302	Theory of Computation+-	3-0-0	09
DC.CSE305.16	CSE305	Computer Architecture	3-0-2	11
BE.CSE312.16/ BE.CSE322.16/ DE.CSE306.16 DE.CSE307.16	CSE312/ CSE322/ CSE306/ CSE307	Stream Elective-II/ Non-Stream Elective-II	3-0-2/ 3-0-0	11/09
DP.CSE392.16	CSE392	Stream or UG Project	0-0-5	05
IH.H301.16	H301	Humanities Course – New	3-0-0	09
		Total Credits	18-0-9/ 18-1-9	61-63 (Non-Stream) 63-65 (Stream, Hons.)

Semester-VII				
CS. Coursecode.YY	**Course Code**	**Subject**	**Contact Hours**	**Credits**
OE		Open Elective-3	3-0-0/3-1-0	9/11
DC.CSE401.17	CSE401	Compiler Design	3-0-0	09
BE.CSE411.16/ BE.CSE421.17/ BE.CSE311.16 DE.CSE451.17/ DE.CSE452.17/ DE.CSE453.17/ DE.CSE454.17	CSE411/ CSE421/ CSE311 CSE451/ CSE452/ CSE453/ CSE454	Stream Elective-III/ Non-Stream Elective-III	3-0-2/ 3-0-0	11/09
DP.CSE491.17	CSE491	Stream or UG Project#	0-0-10	10
DP.**CSE393**.17	CSE393	^Industrial Training/ Summer Project Evaluation	0-0-0	05
LM.HL501.17	HL501	Academic Writing in Science & Technology	2-1-0	08
		Total Credits in Semester	11-1-12/ 11-2-12	50-52 (Non stream) 52-54 (Stream)

BE: Stream/Bouquet Electives (Any one course depending on chosen stream). These are also OE: Open Electives for other Branches.

#UG Project to be carried out by every student in VII Sem

^Industrial Training/Summer Project Evaluation [To be carried out in Summer Term after VI Semester and Before VII Sem. (No Contact Hours-Only Exams)]

Semester-VIII				
CS. Coursecode.YY	**Course Code**	**Subject**	**Contact Hours**	**Credits**
OE		Open Elective-4	3-0-0/3-1-0	9/11
DC.CSE402.17	CSE402	Computer Networks	3-0-2	11
BE.CSE412.17/ BE.CSE422.17 DE.CSE461.17/ DE.CSE462.17/ DE.CSE463.17/ DE.CSE464.17/ DE.CSE465.17/	CSE412/ CSE422 CSE461/ CSE462/ CSE463/ CSE464/ CSE465	Stream Elective-IV/ Non-Stream Elective-IV	3-0-2/ 3-0-0	11/9
IH6.H401.17	H401	Humanities	3-0-0	9
DC.CSE403.17	CSE403	Seminar	0-0-3	3
		Total Credits in Semester	12-0-5/ 12-1-5	**41/43**
DP.CSE492.17	CSE492	Stream Project (Hons.)##	0-0-10	**10**
		Total Credits in Semester (Stream/Hons)	12-0-15/ 12-1-15	**51/53**

Extra Stream Project to be carried out by Stream/Hons. Students in VIII Semester

BE: Stream or Bouquet Electives (Any one course depending on chosen stream).

Note: In VIIIth Semester, students from a specific stream are required to opt for any of the subject from the list of Stream Elective-IV. However, if a student from any stream wishes to study a non-stream subject from the list of Non-stream electives-IV, he/she is allowed to opt for the same.

Total Credits (Semester I-VIII)= 448-456

= 476-484 (Hons.) Stream

(Range is varying depending on the credits of four open electives: 9/11)

List of Stream/Bouquet, Core and Open Elective Courses

I. B.Tech. (CSE) Streams/Bouquet Courses (Semester VI Onwards):

Streams
1. Artificial Intelligence and Computer Vision (AICV)
2. High performance Computing and Data Engineering (HPCDE)

Stream/Bouquet Elective (BE) Courses (Contact Hours L:T:P=0:0:0) (Credits:09)				
Stream Elective No.	**AICV Electives**		**HPCDE Electives**	
	Course Code	**Subject**	**Course Code**	**Subject**
Stream Elective-I	BE.**CSE311**.16/ BE.**CSE411**.16	Intelligent Computing (IC)/ Natural Language Processing (NLP)	BE.**CSE321**.16	Data Mining
Stream Elective-II	BE.**CSE312**.16	Computer Vision	BE.**CSE322**.16	Parallel Computing
Stream Elective-III	BE.**CSE411**.16/ BE.**CSE311**.16	Natural Language Processing (NLP)/ Intelligent Computing (IC)	BE.**CSE421**.17	Distributed Computing
Stream Elective-IV	BE.**CSE412**.17/ BE.**CSE422**.17/ BE.**CSE413**.17	Pattern Recognition/ Machine Learning/ Biometrics	BE.**CSE422**.17	Machine Learning

Note: In VIIIth Semester, students from a specific stream are required to opt for any of the subject from the list of respective Stream Elective-IV. However, if a student from any stream wishes to study a non-stream subject from the list of Non-stream electives-IV, he/she is allowed to opt for the same.

II. List of Non-stream UG Electives: (DE-Department Electives)

Non-Stream Elective-I (B.Tech. Semester-V) (Contact Hours L:T:P=0:0:0) (Credits:09)		
CSE.Coursecode.YY	**Course code**	**Subject**
DE.CSE302.16 DE.CSE303.16	CSE302 CSE303	Graph Theory and Applications Multimedia Systems

Note: In Fifth semester the non-stream students may opt above non-stream elective-I or any of the subject from the list of Stream electives –I.

Non-Stream Elective-II (B.Tech. Semester-VI) (Contact Hours L:T:P=0:0:0) (Credits:09)		
CSE.Coursecode.YY	**Course code**	**Subject**
DE.CSE306.16	CSE306	Operations Research
DE.CSE307.17	CSE307	Information Retrieval

Note: In Sixth semester the non-stream students may opt above non-stream elective-II or any of the subject from the list of Stream electives –II.

Non-Stream Elective-III (B.Tech. Semester-VII) (Contact Hours L:T:P=0:0:0) (Credits:09)		
CSE.Coursecode.YY	**Course code**	**Subject**
DE.CSE451.17	CSE451	Neural Networks
DE.CSE452.17	CSE452	Fault Tolerant Computing
DE.CSE453.17	CSE453	Real Time Systems
DE.CSE454.17	CSE454	Software Re-use and Re-engineering

Note: In Seventh semester the non-stream students may opt any of the above non-stream elective-II subject or any of the subject from the list of Stream electives –III.

Non-Stream Elective-IV (B.Tech. Semester-VIII) (Contact Hours L:T:P=0:0:0) (Credits:09)		
CSE.Coursecode.YY	**Course code**	**Subject**
DE.CSE461.17	CSE461	Advanced Databases
DE.CSE462.17	CSE462	Data Compression
DE.CSE463.17	CSE463	Cyber Security
DE.CSE464.17	CSE464	Soft Computing
DE.CSE465.17	CSE465	Cryptography

Note: 1**.** In Eighth semester the non-stream students may opt any of the above non-stream elective-IV subject or any of the subject from the list of Stream electives –IV.

2. In VIIIth Semester, students from a specific stream are required to opt for any of the subject from the list of respective Stream Elective-IV. However, if a student from any stream wishes to study a non-stream subject from the list of Non-stream electives-IV, he/she is allowed to opt for the same.

III. List of Open Electives offered from CSE Dept.

1. **Open Elective-1 (OE-1): (Semester-V) [3-0-0/3-1-0: 9/11 credits]**

   DC.CSO. 302.16/ OE.CSO. 302.16: Computer Graphics (3-0-2: 11 Credits)

   Any one of the following which is running as stream elective in current semester:
   BE.CSE311.16/ OE.CSE311.16: Intelligent Computing/
   BE.CSE411.17/ OE.CSE411.17: Natural Language Processing (NLP)
   BE.CSE321.16/OE.CSE321.16: Data Mining

2. **Open Elective-2 (OE-2): (Semester-VI) [3-0-2:11 Credits]**

BE.CSE312.16/ OE.CSE311.16: Computer Vision
BE.CSE322.16/OE.CSE321.16: Parallel Computing

3. **Open Elective-3 (OE-3): (Semester-VII) [3-0-2:11 Credits]**
   Any one of the following which is running as stream elective in current semester:

   BE.CSE411.17/ OE.CSE411.17: Natural Language Processing (NLP)/
   BE.CSE311.16/ OE.CSE311.16: Intelligent Computing/
   BE.CSE421.17/ OE.CSE421.17: Distributed Computing

4. **Open Elective-4 (OE-4): (Semester-VIII) [3-0-2:11 Credits]**
   Any one of the following which is running as stream elective in current semester:
   BE.CSE412.17/ OE.CSE412.17: Pattern Recognition/
   BE.CSE413.17/ OE.CSE413.17:: Biometrics/
   BE.CSE423.17/ OE.CSE423.17: Machine Learning

SUMMARY OF CREDIT ALLOCATION

4-YR B.Tech Programme (Computer Science and Engineering)

Category	Type of Course	No. of Courses	Prescribed Credits	Allocated Credits
IS	Institute Science	6	62-84	68
IE	Institute Engineering	4	41-60	48
DC/MC	Dept. Core/ Multicore	15 (8 core+7 multicore)	105-155	147
DE/BE	Dept. Elective/ Bouquet/Stream Elective	4	30-60	36-44 (Non-stream /Stream)
OE	Open Elective	4	35-70	36-44 (depending on credits 9/11)
DP	Department Project/Industrial Training		20-50	25- (Non-Stream) 45 (Stream)
EP	Engineering Practice	4	20-24	21
IH	Institute Humanities	6	41-60	44
LM	Language Management	3	20-24	23
GY	Gymkhana Courses			
		Total Courses: 48		**Total Credits:** 448-456 (476-484: Stream/Hons)

SUMMARY SHEET OF PROGRAMME COMPONENTS
4-YR B.Tech Programme (Computer Science and Engineering)

S.NO.	Category	Programme Components	% (Approved Credit Limits)	% (Allocated Credit Limits)
1.	HU	Humanities and Social Science*	10 (41-50)	10 (44)
2.	IS	Institute Science*	15 (62-84)	15 (68)
3.	IE	Institute Requirement Engineering*	10 (41-60)	11 (48)
4.	EP	Engineering Drawing (Manual and Computer Aided), Manufacturing Practices and Practice course of Department*	5 (20-24)	5 (21)
5.	LM	Language and Management*	5 (20-24)	5 (23)
6.	DC/MC	Department/Programme Core (Includes Stream Courses)	25-30 (105-155)	32 (147)
7.	DE/BE	Department/Programme Elective (Includes Stream Courses)	7-10 (30-60)	9 (36-44) (Non-stream /Stream)
8.	OE	Open Elective (Interdisciplinary Stream courses from Science/ Engineering/Pharmacy) (Room for Minor with some additional Credits)	8-15 (35-70)	8-10 (36-44) (depending on credits 9/11)
9.	DP	Project/ Industrial visit/ Training	5-10 (20 – 50)	7-9 (25, 45 (stream))
				Total Credits: 448-456 (476-484: Stream/Hons)

*Institute Requirements
Department Programme Core (DC) Courses also include Multi-Departmental Core Courses
Department/Programme Elective (DE) Courses also include Bouquet Elective (BE) Courses.

Detailed Course Syllabus:

Biology

1. GENERAL

1.1 TITLE::Biology
1.2 *COURSE NUMBER::**IS.BL 101.14**
1.3 CREDITS:: 3-1-0: Credits 11
1.4 *SEMESTER -OFFERED:: Odd
1.5 Prerequisite: None
1.6Syllabus of Committee Member: Dr. K Sairam (Convener), Dr. A.N. Sahu (PH), Dr. Pradeep Srivastava (BC), Prof. Devendra Mohan (CE)

2. OBJECTIVE

To provide a basic understanding about human and plant systems. This will enable students to undertake advanced level courses pertaining to pharmaceutical and biomedical sciences, and other interdisciplinary engineering courses.

3. COURSE CONTENT

UNIT I:Introduction to Biology (4 Lectures)
Classification of plant and animal kingdoms; introduction to human body: Levels of body organization, basic anatomical terminology; introduction to plants with its primary and secondary uses.
UNIT II: Cell and molecular biology of animal and plant cell (13 Lectures)
Plasma membrane, cell wall, chemical and electrical properties of membrane, transport across the membrane, mechanism of cell communication, cell junctions, cell adhesion & extracellular matrix; Mitochondria, Chloroplast and photosynthesis; cytoplasm, cell organelles, nucleus, cell division, aging of cells, cellular diversity and disorders related to cells.
UNIT III: Animal and plant tissue (8 Lectures)
Elementary understanding of animal and plant tissues; aging of tissues and disorders related to it. Detail understanding of components of blood, their functions and disorders.
UNIT IV: (14 Lectures)
Basic anatomy of cardiovascular, digestive, endocrine, integumentary, nervous, respiratory, skeletal, urinary & reproductive systems; basic morphology and microscopy of plants.

4. REFERENCE BOOKS

Tortora Grabowski, Principles of anatomy and physiology, 10thedn., John Wiley & Sons, Inc.
Duta AC, Botany, 6thedn., Oxford university press.

5. OUTCOME OF THE COURSE

- Equip the students with the basic understanding cells, tissues and systems and disorders of human and plants.
- Help to acquire essential knowledge to choose specialized areas with additional requirements like Human physiology, space physiology , pharmacology, space pharmacology, biomedical devises, biocompatible devices, bio-ceramic devises, bio-sensors, herbal drug discovery, neural networks, artificial intelligence, computational biology, computational pharmacology, New drug discovery, community healthcare, Miner‘s health etc.

Physics-I (Classical, Quantum & Relativistic Mechanics)

1. GENERAL

1.1 TITLE: **Physics-I (Classical, Quantum & Relativistic Mechanics)**

1.2 COURSE NUMBER:IS.**PHY 101**.14

1.3 CREDITS: 3-1-2 - Credit 13

1.4 SEMESTER -OFFERED: Both

1.5 Prerequisite: None

1.6 Syllabus Committee Member: Dr. P. C. Pandey (Convener), Prof. O. N. Singh, Dr. S. Chatterjee, Dr. (Mrs.) S. Upadhyay

2. OBJECTIVE

This course is prepared to understand the basic principles and laws of fundamental Physics for macroscopic, microscopic and system of particles. The 1st part of the course is devoted on the understanding of mechanics of a mechanical system in different coordinate system and reference frames. The second part of the syllabus is devoted on the concept of wave-particle duality and need of other formulation to explain the finding which could not be explained by known classical mechanics. The Schrodinger‘s equation and its application in different cases are also kept in the syllabus. As the mechanics of very fast moving object could not be explained by the above laws and principles, some understanding of special theory of relativity is also provided in the syllabus.

3. COURSE CONTENT

UNIT I: Classical Mechanics (15 Lectures) Co-ordinate systems, plane polar, cylindrical and spherical polar co-ordinate systems, frame of reference, rotational frame, Coriolis forces. Motion of system of particles, Conservation laws, Constraints and degrees of freedom, Generalized co-ordinates, Lagrange‘s and Hamilton‘s formulations, Poisson‘s brackets.

UNIT II: Quantum Mechanics (15 Lectures)

Origin of Quantum Mechanics, Plank‘s black body radiation, Matter waves and concept of wave function, Heisenberg uncertainty principle, Schrodinger‘s equation, Applications of Schrodinger time independent equation; (i) Particle in a box, (ii) Potential step, (iii) Potential barrier, (iv) Harmonic oscillator (one-dimensional) & (v) Periodic potential.

UNIT III: Relativistic Mechanics (8 Lectures) Michelson – Morley experiment, postulates of special relativity, Lorentz transformation, length contraction, time dilation, Doppler effect, addition of velocities, variation of mass with velocity, equivalence of mass & energy, mass less particle.

4. READINGS

4.1 TEXTBOOK:

1. D. Kleppner and R. J. Kolenkow, An Introduction to Mechanics, Tata McGraw-Hill,
2. D T Greenwood, Classical Dynamics, Prentice Hall of India, Pvt. Ltd., New Delhi
3. A. Beiser, Perspective of Modern Physics, McGraw-Hills Co., Inc., New York.
4. Robert Resnick. Introduction to special relativity

4.2 REFERENCE BOOKS:

1. H Goldstein, Classical Mechanics, Reading Mass Adison-Wesley Press, Inc.
2. J L Powell and B Crasemann, Quantum Mechanics, Narosa Publishing House, New Delhi
3. Ghatak and Loknathan, Quantum Mechanics, Macmillan India Ltd.

5. OUTCOME OF THE COURSE:

This course is designed in such a way that the students learn the fundamental Physics, which will construct the base for the study of Engineering and Technology.

Engineering Mathematics – I

1. GENERAL

1.1 TITLE::Engineering Mathematics - I
1.2 *COURSE NUMBER::IS**.MA 101.**14
1.3 CREDITS:: 3-1-0: Credits 11
1.4 *SEMESTER -OFFERED:: Both
1.5 Prerequisite: None
1.6Syllabus of Committee Member: Prof. T. Som (Convener), Dr. V.K. Singh

2. COURSE CONTENT

UNIT I: 1 Sequences and Continuous Functions (10 Lectures)

Real number system : Completeness axiom, density of rationals (irrationals) in R, Convergence of a sequence, Sandwich theorem, Monotone sequences.

Limits and Continuity of functions, Intermediate value property, Differentiability, Necessary condition for local maxima, Rolle's theorem and Mean value theorem, Cauchy mean value theorem, L'Hospital rule, Increasing and decreasing functions, Convexity, Second derivative test for max and min, Point of inflection, curve sketching.

UNIT II: 2 Power Series Expansions (4 Lectures)

Taylor's theorem with remainder, Convergence of series, Absolute convergence, Comparison test, Ratio test, Root test, Power series, Radius of convergence, Taylor series, Maclaurin series.

UNIT III: 3 Riemann Integration, Surface Area & Volume (7 Lectures)

Introduction to Riemann integration, Elementary properties of integral, Fundamental Theorems of calculus, Improper integral of first & second kind, Comparison test, Absolute convergence, Applications of definite integral: Polar coordinates, Graphs in polar coordinates, Area between two curves when their equations are given in polar coordinates, Volumes by slicing, Length of a curve.

UNIT IV: 4 Multi-variable Calculus (6 Lectures)

Functions of several variables, Continuity, Partial derivatives, Total derivative, Increment theorem, Chain rule, Gradient, Directional derivatives, Tangent plane and Normal line, Mixed derivative theorem, Necessary and sufficient conditions for Maxima, Minima and Saddle point, The method of Lagrange multipliers.

UNIT V: Vector Calculus (4Lectures)

Review of vector algebra, Equations of lines and planes, Continuity and Differentiability of vector functions, Arc length for space curves, Unit tangent vector, Unit normal and Curvature to plane and space curves,

UNIT VI: Multiple Integrals (8 Lectures)

Double integral, Fubini's theorem, Volumes and Areas, Change of variable in a double integral, special case: Polar coordinates, Triple integral, Applications, Change of variables in a triple integral, Surface area, Surface area (contd.), Line integrals, Surface integrals, Green's Theorem, Vector fields, Divergence and Curl of a vector field, Stokes' Theorem, The divergence theorem.

3. READINGS

4.1 TEXTBOOK:

4.2 REFERENCE BOOKS: Calculus by Thomas and Finney.

Computer Programming

GENERAL

1.1 TITLE:: **Computer Programming**

1.2 *COURSE NUMBER (if known):: **IE.CSO 101.14**

1.3 CREDITS:: [3-1-2]: 13 Credits

1.4 SEMESTER-OFFERED:: First (to CSE)/Second (All Branches)

1.5 PRE-REQUISITES:: None

2. OBJECTIVE::

1. To introduce problem solving methods and algorithm development. 2. To teach programming language C. 3. To teach how to design, code, debug and document programs using techniques of good programming style.

3. **COURSE TOPICS::**

Unit 1 (10 hrs): Linux and IDE. Programming Paradigms. Programming Language C and programming: Basic Syntax and Semantics, Variables, Types, Expressions, Assignment statements, Conditional and Iterative Control Structures.

Unit 2 (10 hrs): Simple I/O, Functions and parameter passing, Strings and string processing, Structures, Recursion. File handling. Pointers and References (introduction only).

Unit 3 (19 hrs): OOP concepts. Basics of Data Structures and Algorithm development: Techniques of problem solving, Stepwise Refinement, Simple numerical examples, algorithms for searching and sorting, merging order lists. Case studies taken from such areas as business applications involving data manipulation.

Note: Unit 3 topics will be interleaved with Units 1 and 2.

4. READINGS

4.1 TEXTBOOK:: Let Us C by Yashwant Kanetkar

4.2 *REFERENCE BOOKS::

5. OTHER SESSIONS

5.1 *TUTORIALS:: One tutorial session in groups of maximum 30 students for clearing doubts and class assignments etc.

5.2 *LABORATORY:: One laboratory session for practice and practical assessments etc.

5.3 *PROJECT:: None

6. ASSESSMENT (indicative only)

6.1 HA:: 10% GRADE

6.2 QUIZZES-HA:: 10% GRADE

6.3 Class and Lab Assignments:: 10% GRADE

6.4 PERIODICAL EXAMS:: 30% GRADE

6.5 *PROJECT:: N.A.

6.6 FINAL EXAM:: 40% GRADE

7. OUTCOME OF THE COURSE::

1. Analyze and explain the behavior of simple programs involving the fundamental programming constructs. 2. Modify and expand short programs that use standard conditional and iterative controls structures and functions. 3. Design, implement, test and debug a program that uses each of fundamental programming constructs. 4. Apply the technique of structured decomposition to break a program into smaller pieces.

8. *EXPECTED ENROLLMENT FOR THE COURSE:: 75

9. *DEPARTMENTS OTHER THAN YOUR OWN TO WHICH THIS COURSE WOULD BE OF INTEREST:: All departments

10. *ANY OTHER REMARKS::

MANUFACTURING PRACTICE I

1. GENERAL

1.1. COURSE TITLE: Manufacturing Practice I

1.2. *COURSE CODE: **EP.ME 105.14**

1.3. CONTACT HRS: 0-0-3 1.4. CREDITS: 3 1.5. *SEMESTER OFFERED: I

1.6. SYLLABUS COMMITTEE MEMBERS: Prof. A. K. Jha (Convener), Prof. Santosh Kumar, Dr. M.Z. Khan Yusufzai, Dr. M. Vashista (ME)

2. OBJECTIVES

To make the students familiar with various manufacturing processes and to get an on hand experience on these processes. Impart practical knowledge about the capabilities of manufacturing processes and how these processes could be used to produce various types of components and products.

3. DELIVERABLES

To develop skill and confidence among the students to successfully use various manufacturing processes and to understand the difficulties faced by the personnel working on these manufacturing processes.

4. PRACTICE PLAN

1. Manufacturing Practice I(Total hours: 3 hours per week x 10 weeks=30 Hours)

i. Foundry (1 turn)

ii. Pattern Making (1 turn)

iii. Material joining and Deposition Processes (2 turns)

iv. Metal forming processes (1 turn)

v. Demonstration of Videos on Manufacturing Processes (1 turn) vi. Project work-I (4 turns)

5. SYLLABUS

1. Manufacturing Practice I EP**.ME 105.**14

a. **Foundry:** Demonstration of foundry tools, equipments and furnaces, Preparation of simple sand moulds along with the gating system and risers

b. **Pattern Making:** Importance of woodworking Demonstration of carpentry tools, equipments, carpentry processes and wood working joints. Preparation of single piece pattern.

c. **Material joining and Deposition Processes:** Classification of various welding and joining processes, types of welding joints, Demonstration of gas welding, arc welding, resistance welding. Practice of manual metal arc welding process.

Demonstration of setup for electroplating, process details and safety requirements. Practice of copper and nickel plating of mild steel samples.

d. **Metal forming processes:**

Demonstration of black smithy tools and equipments. Hot and cold working. Practice of open die forging process.Sheet metal material, tools and machines. Sheet metal joints. Practice of preparing a sheet metal component having joint.

e. **Demonstration of Videos on Manufacturing Processes**

f. **Project work-I:** Preparation of a real life job using the processes practiced in manufacturing practice I.

6. BOOKS

i. Workshop Technology in SI Units (Part - 1) Author: W. A. J. Chapman, Publisher: CBS Publications

ii. Workshop Technology in SI Units (Part - 2) Author: W. A. J. Chapman, Publisher: CBS Publications

Workshop Technology in SI Units (Part - 3) Author: W. A. J. Chapman, Publisher: CBS Publications

Universal Human Values 1: Self and Family

1. GENERAL

1.1 Title : Universal Human Values 1 : Self and Family

1.2 Course Number: **HU.H 101.14**

1.3 Credits : 1-2-0 – Credits 5

1.4 Semester offered : 1st

1.5 Pre-requisites : 4-day Harmony–1 Workshop (co-requisite)

2. OBJECTIVE

The objective of the course is four fold:

1. Sensitization of student towards issues in all dimensions of life.

2. Inculcation of self reflection.

3. Understanding (clarity) of relationships, and family.

4. Exposure to issues in society and environment.

5. Development of commitment and courage to act.

2.1. Sensitization of student towards issues in all dimensions of life

There are a whole range of issues which one faces in life towards which the young students are generally unfamiliar and therefore insensitive. Almost all the concerns - environmental, societal, familial or personal, are result of human action. Sensitization towards them therefore is an important step.

2.2. Inculcation of Self Reflection.

Human action is governed by various internal factors primarily the beliefs one holds, and therefore ‗looking-in' becomes essential, to see what beliefs one is holding, whether they are really true or not, if they are not true, then what could be the process to get the "right" belief and then further validate it.

Most of the young people are somehow trained to look only ―outside‖. The motivation and the skill to look inside are missing. Inculcation of self reflection in students will result in them becoming more responsible, honest and trustworthy. Lack of such qualities in individuals is major concern of organizations, institutions and society in general.

2.3. Understanding (Clarity) of Human Relationships and Family.

It will try to show that relationships and material prosperity are the basic desire for a human being.

Two global problems which we face today are war (including terrorism) and imbalance in nature (global warming). If we look at reasons for war, the fundamental cause is: Human Being is in opposition to other Human Being. Therefore one is willing (or gets compelled) to exploit others. This is due to lack of understanding of relationships.

2.4 Exposure to Issues in Society and nature (larger manmade systems and Nature)

- To show that the fundamental reasons for imbalance in nature are: pollution and resource depletion. Both these aspects are result of consumerist model of development.
- To show how harmony can be ensured at following levels of our living: individual, human-human relationships, larger society, Various social systems like education system, economic system, political system and others, and rest of the nature.

2.5. Development of Commitment and Courage to Act.

If the understanding is right, then the actions become right. Commitment and courage to act are considered consequences of right understanding in an individual. In the course, an attempt will be made to build right understanding in the individual, and then further plan of actions will also be discussed in order to implement the understanding in various life situations in the right manner.

3. COURSE TOPICS

Following are the topics to be covered in broadly the given sequence.

1. **Motivation and Objectives of Human Values Course.**

Introduction to the objectives of the course. Content and process of the course including mode of conduct. Daily life as lab for the course. Activities in the course.

2. **Purpose of Education** How human being has a need for Knowledge, what should be the content of knowledge, how the content should be discussed in education. Complimentarily of skills and values, how the current education system falls short.

3. **Peers Pressure, Social Pressure** In various dimensions of life, how do these things work. What is the way out? In the context of education, peer pressure etc. movie ―TaareZameen Par‖ can be used.

4. **Concept of Competition and Excellence** How competition leads to degradation of self and relationships. How excellence is the basic need of a human being. What is excellence? Movie ―Fearless‖ can be used to discuss the concept.

5. **Time Management**

How does one deal with myriads of activities in college? Focus of the mind.

6. **Concept of Preconditioning.** How preconditioning affects our thinking, behavior, work, relationships, society and nature. How do we develop pre-conditioning?

What are the various sources of preconditioning? How do we evaluate our Preconditioning? How do we come out of it?

7. **Concept of Natural Acceptance in Human Being** What is natural acceptance? How can the concept of natural acceptance be used to evaluate our preconditioning. Universal nature of natural acceptance.

Are anger, jealousy, hatred natural? How do we feel when we experience them?
Which feelings are natural for a human being and which are not?

8. **Understanding Relationships.**

a) **Are relationships important?** What is the role of relationships in our life? If relationships are important then why they are important? If they are important then why it is the case that we are not discussing them? What are the notions/conditions and factors which stop us to explore more into relationships. Relationships in family and extended family. Dealing with anger. Show film ―Right Here, Right Now‖.

b) **Basic expectations in relationships. Seven types of relations.**

c) **Gratitude as a universal value in relationships. Discuss with scenarios. Elicit examples from students' lives.**

d) **Nine universal values in human relationships. Trust as the founding value.**

e) **Concept of acceptance. Unconditional acceptance in relationships.**

f) **Our preconditioning affecting our relationships.**

Our relationships with subordinate staff, with people of opposite gender, caste, class, race. Movie ―Dharm‖ (set in Varanasi) can be used to show the conflict between preconditioning and relationships. How relationships have the power to force a person to change his preconditioning.

9. **Concept of prosperity**

Material goods and knowledge of one's physical needs is essential for feeling of prosperity.
What role others have played in making material goods available to me: Identifying from one's own life.

10. **Idea of Society.** What is a society? What constitutes a society? What systems are needed for a society to work? What is the purpose of society and various systems which are working in it?

How understanding of Human Nature is important in order to understand the purpose of Society and various social systems? And what happens when this understanding is lacking?

11. **Idea of decentralization of politics, economics, education, justice etc. Its comparison with centralized systems. The idea of Swaraj. Various social initiatives by NGOs, social organizations and other people.** (If time permits)

12. **Balance in nature**

a) Balance which already exists in nature.

b) **How human beings are disturbing the balance. Resource depletion and pollution.**

Our own role in wastage of electricity, water and in use of plastics. Waste management. (Show episode on city waste from SatyamevaJayate 2.)
c) **Issues like global warming, animal extinction.**

Show ―Story of Stuff‖ documentary film. ―Home‖ film can also be used.

4. READINGS
4.1 Text Book
1. Human Values and Professional Ethics by R R Gaur, R Sangal, G P Bagaria, Excel Books, New Delhi, 2010.

4.2 Reference Books
1. The Story of Stuff (Book).

2. The Story of My Experiments with Truth - by Mohandas Karamchand Gandhi

3. On Education - J Krishnamurthy

4. Siddhartha - Hermann Hesse

5. Old Path White Clouds - ThichNhatHanh

6. On Education - The Mother

7. Diaries of Anne Frank - Anne Frank

8. Life and Philosophy of Swami Vivekananda

9. Swami Vivekananda on Himself

10. Small is Beautiful - E. F Schumacher.

11. Slow is Beautiful - Cecile Andrews

12. JeevanVidya: EkParichaya, ANagaraj, JeevanVidyaPrakashan, Amarkantak, 1999.

13. Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi

14. Rediscovering India - by Dharampal

15. Hind Swaraj or Indian Home Rule - by Mohandas K. Gandhi

16. India Wins Freedom - Maulana Abdul Kalam Azad

17. Ramakrishna kijeevani - Romain Rolland (English)

18. Vivekananda - Romain Rolland (English)

19. Gandhi - Romain Rolland (English)

20. Autobiography of a Yogi – by ParamhansaYogananda

21. Gandhi and Question of Science – Sahasrabudhe

5. OUTCOME OF THE COURSE

At the end of the course, students are expected to become more aware of their self and their relationships and would have better reflective and discerning ability. They would also become more sensitive to their surroundings including both people and nature, with commitment towards what they believe in (human values). It is hoped that they would be able to apply what they have learnt to their own self in different ordinary day-to-day settings in real life with higher commitment and courage.

Basic English

1. GENERAL 1.1 TITLE:: REMEDIALENGLISH

1.2 *COURSE NUMBER::LM.**HL 101.**14

1.3 CREDITS:: 2-0-1-- 7 1.4 SEMESTER-OFFERED:: Ist Sem.

2. OBJECTIVE

To improve the language skill for the students who are not skilled enough to use English as a language for their academic needs.

3. COURSE TOPICS

1. Vocabulary Building

1.1. The concept of word formation
1.2. Root words from foreign languages and their use in English
1.3. Acquaintance with prefixes and suffixes from foreign languages in English to form derivatives
1.4. Synonyms, antonyms and standard abbreviations

2.Basic Writing Skills

2.1. Sentence structures
2.2. Use of phrases and clauses in sentences
2.3. Importance of proper punctuation
2.4. Creating coherence
2.5. Organizing principles of paragraphs in documents
2.6. Techniques for writing precisely

3. Identifying Common Errors in writing

3.1. Subject-verb agreement
3.2. Noun-pronoun agreement
3.3. Misplaced modifiers
3.4. Articles
3.5. Prepositions
3.6. Redundancies
3.7. Clichés

4 Nature and style of sensible writing

4.1. Describing
4.2. Defining
4.3. Classifying
4.4. Providing examples or evidence
4.5. Writing introduction and conclusion

5 Writing practices

5.1. Comprehension
5.2. Précis writing
5.3. Essay writing

4. READINGS

1. Practical English Usage. Michael Swan. OUP. 1995.
2. Remedial English Grammar. F. T. Wood. Macmillan. 2007.
3. A course in Academic Writing. Renu Gupta. Orient Blackswan. 2010.
4. Study Writing. Liz Hamp-Lyons and Ben Heasley. Cambridge University Press. 2006.

5. OUTCOME OF THE COURSE : To make students aware about the importance of a English for communication needs. Also to equip them for the higher courses such as Academic Writing and Professional Communication in later stages.

Engineering Mathematics-II

1. GENERAL

1.1 TITLE::Engineering Mathematics - II
1.2 *COURSE NUMBER::**IS.MA 102.14**
1.3 CREDITS:: 3-1-0: Credits 11
1.4 *SEMESTER -OFFERED:: Both
1.5 Prerequisite: None
1.6Syllabus of Committee Member: Prof. O.P. Singh (Convener), Prof. S.K. Pandey

2. COURSE CONTENT

Unit 1: Vector spaces (5 Lectures)
Sets, Relations, equivalence relation, functions, partition of set, Cartesian product of Set, Binary operations, examples. Definition and examples ofGroups (stress on additive and multiplicative), Subgroups, Fields. Vector Spaces over real and complex fields. Subspaces. Some properties of subspaces. Finite linear combinations Dependent and independent vectors. Basis and Dimension of vector space. Basis and dimension (contd.), The infinite dimensional vector spaces Ck[a, b], Lp[a, b], k = 0, 1, 2,… and p >0.

Unit 2: Linear Transformations (7 Lectures)
Linear transformations, Kernel and Range of a linear transformation, nullity theorem., Matrix of a linear transformation over finite basis, Matrix of change of basis, Similar matrices, rank of a matrix. Solution of system of linear equations, Eigen values and eigen vectors, eigen space, Caley-Hamilton theorem and its implications. Inner product spaces, Matrix of inner product, norm induced by an inner product, parallelogram law.

Unit 3: Orthogonal Expansion (5 Lectures)
Orthogonal and orthonormal vectors and systems, Gram Schmidt orthogonalization process. Orthogonal expansion of function in L2[a, b]. Expansion of function in Fourier series (real and complex form), examples in $0,2\pi$, $-l,l$, $0,l$, Convergence and sum of Fourier series, Even and odd functions, half range expansions, Half range Fourier series , odd and even extensions, Gibbs phenomenon, Trigonometric approximation, Parseval‘s relation, Bessel inequality, Fourier integrals, Fourier sine and cosine transforms.

Unit 4: Holomorphic Functions (3 Lectures)
Planer sets, curves, domains and regions in the complex plane, continuous and differential functions of complex variables, Holomorphic functions, C-R equations, Laplace equation, Harmonic functions and their applications.

Unit 5: Complex Integration (8 Lectures)
Line integral, bound for the absolute value of integrals, Cauchy integral theorem, Cauchy integral formula, Derivatives of holomorphic functions, Cauchy inequality, Liouville‘s theorem (with proof), morra‘s theorem (statement), fundamental theorem of algebra, Power series, radius of convergence and Taylor‘s series. Laurent Series, Laurent series (contd.), Singularities and Zeros, behavior of f(z) at infinity, Residues, Residue theorem, residue integration method, Evaluation of real integrals.

Unit 6: Differential Equations (10 Lectures)
Basic concepts and ideas of first order differential equations, geometrical meaning of y‘=f(x, y), direction fields, Exact differential equations, Integrating factors, Linear differential equations. Bernoulli equation, Existence and Uniqueness of solutions, Wronskian, Homogeneous linear equations of second order. Second-order Homogeneous equations with constant coefficients, Cases of complex roots, complex exponential functions Euler –Cauchy equation, Non homogeneous equations, Solution by undetermined coefficients, Solution by variation of parameters, System of differential equations: introductory examples-mixing problem involving two tanks, model of an electrical network, Conversion of an nth order differential equation to a system, linear systems.

Text Books:

1. Advanced Engineering Mathematics by Erwin Kreysgic.

2. Linear Algebra by K. Hoffman and Ray Kunz

Data Structures

GENERAL

1.1 TITLE:: **Data Structures**

1.2 *COURSE NUMBER (if known):: MC.**CSO102**.15

1.3 CREDITS:: 3-0-2 (11 Credits)

1.4 SEMESTER-OFFERED:: III

1.5 PRE-REQUISITES:: Computer Programming

2. OBJECTIVE::

1. To teach efficient storage mechanisms of data for an easy access.
2. Design and implementation of various basic and advanced data structures.
3. To introduce various techniques for representation of the data in the real world.
4. To utilize the concepts of data structures in application development.

3. COURSE TOPICS::

UNIT-1

Basic structures: Arrays, Stacks and Queues. Representing stacks and queues using arrays and pointers. Recursion and their implementation.

Linked list structures: Linear, circular, double, and priority link lists. Use of link list for representation and evaluation polynomials and their operations. Implementation of link lists using arrays and pointers.

UNIT-II

Trees: definition, representation, tree traversals, Huffman Algorithm, Threaded binary trees, Applications of Trees, Heaps, binary search trees, AVL Trees, B-trees and other related topics.

Graphs: linked representation of graphs, Graph traversals.

Files, Dictionaries Sets and Sequences, Garbage collection and compaction

UNIT-III

Basic search techniques: linear and binary search.

Internal sorting techniques, Exchange sort, Selection and tree sorting, Insertion sorts, Merge sort, Radix sort, and heap sort.

Symbolic table structures and hashing techniques.

4. READINGS

4.1 TEXTBOOK:: Data Structures Using C And C++ By Tenenbaum

4.2 *REFERENCE BOOKS:: Data Structures With C by Seymour Lipschutz, Data Structures Through C by Y. Kanetkar, Data Structures by Horowitz and Sahani

5. OTHER SESSIONS

5.1 *TUTORIALS:: None

5.2 *LABORATORY:: Yes (02 Hours)

5.3 *PROJECT:: None

6. ASSESSMENT (indicative only)

6.1 HA:: [10% GRADE]

6.2 QUIZZES-HA:: [10% GRADE]

6.3 PERIODICAL EXAMS:: [40% GRADE]

6.4 *PROJECT:: [xx% GRADE]

6.5 FINAL EXAM:: [40% GRADE]

7. OUTCOME OF THE COURSE:: 1. Student will be able to choose appropriate data structure as applied to specified problem definition.

2. Student will be able to handle operations like searching, insertion, deletion, traversing mechanism etc. on various data structures.

3. Students will be able to use linear and non-linear data structures like stacks , queues , linked list etc.

8. *EXPECTED ENROLLMENT FOR THE COURSE::

9. *DEPARTMENTS OTHER THAN YOUR OWN TO WHICH THIS COURSE WOULD BE OF INTEREST:: Maths and Computing

10. *ANY OTHER REMARKS:: None

FUNDAMENTALS OF ELECTRICAL ENGINEERING

1. GENERAL

1.1 TITLE:: FUNDAMENTALS OF ELECTRICAL ENGINEERING

1.2 *COURSE NUMBER::IE**.EO 101.**14 1.3 CREDITS:: 3-1-2 – Credits 13 1.4 *SEMESTER - OFFERED:: Both

1.5 Prerequisite: None

1.6 Syllabus Committee Member: Prof. R.K. Pandey (Convener), Prof. R.K. Mishra, Dr. S.K. Singh, Ms. SobhotaMehar

2. OBJECTIVE

To provide a fundamental background to all Engineering students with minimum knowledge of Electrical Engineering so as to cope up with day to day industrial problems

3. COURSE CONTANT

UNIT I: Concepts of Electrical Circuits (15 Lectures)

Basics of work, energy and power relations, DC/AC series and parallel circuits-KVL, voltage divider rule, current divider rule, power divider rule, practical voltage sources, voltage regulation, maximum power transfer theorem, KCL, voltage sources in parallel, Duality between series and parallel circuits, Network theorems- Thevenin‘s theorem, Norton‘s theorem, Superposition theorem, Millman‘s theorem, Reciprocity theorems, Mesh analysis, Nodal analysis, DELTA-WYE and WYE-DELTA Transformations, Transient circuit analysis-RC, RL, RLC, Series and Parallel magnetic circuit calculations, concepts of self inductance, mutual inductance and coefficient of coupling, DOT convention, Phasor quantities in time domain, Variation of inductive and capacitive reactance with frequency, Active, apparent power and power factor, Concepts of resonance in electrical circuits and applications, Three-phase circuits- line and phase relationship, power measurement.

UNIT II: Basics of Electrical Machines(15 Lectures)

Transformer – principle of working, EMF equation, equivalent circuit, voltage regulation and efficiency, open circuit and short-circuit tests, autotransformer. DC machines basics, DC Generators- no load magnetization and external characteristics. D C motors – starting, speed-torque characteristics, speed control, Induction machines – principle of operation, torque-slip characteristics, starting and speed control, Synchronous Machines- Alternators and voltage regulation.

UNIT III: Basics of Electrical Power Transmission & Distribution(10 Lectures)

Lay out diagram of substation and associated equipments for 765kv/400kv/220kv/132kv/33kv/11kv. Identification of problems related to voltage fluctuations in distribution systems- house, commercial complex, industries, Knowledge of phase balancing in distribution system- practical approach, Methodology of Tariff determination for various consumers such as domestic, commercial and industrial, Electrical wiring of houses-practical approach.

UNIT IV: Electrical Measurements Fundamentals(5 Lectures)

Basic constructional features of Indicating instruments- voltmeter, ammeter, wattmeter and energy meter along with usage in circuit.

4. READINGS

4.1 TEXTBOOK

1. Circuit Analysis- Irving L. Kosow

2. Electric Machinery- A. E. Fitzgerald, Charles Kingsley, Jr. and Stephen D. Umans

3. Transmission and Distribution of Electrical Power-J. B. Gupta

4. Electrical Measurements- A. K. Sahney

4.2 *REFERENCE BOOKS:: NIL

5. OTHER SESSION

5.1 *TUTORIALS:: 25 5.2 *LABORATORY:: 10 5.3 *PROJECT:: NIL

Information Technology Workshop-I (ITW-I)

1. GENERAL

1.1 TITLE:: **Information Technology Workshop-I (ITW-I)**

1.2 *COURSE NUMBER (if known):: DC.**CS 101.**14

1.3 CREDITS:: 9 [2-0-3]

1.4 SEMESTER-OFFERED:: Second

1.5 PRE-REQUISITES:: Computer Programming

2. OBJECTIVE::

To make students familiar with some scripting languages and associated tools.

3. **COURSE TOPICS::**

Unit 1: Environment variables etc. Regular expressions and the use of grep. Detailed introduction to sed and Awk. Practice with sed. Basics of the Bash shell. Shell scripting.

Unit 2: Combining shell scripting with Linux commands, sed, Awk etc. Basics of programming with Python. Creating Python modules. HTTP, CGI and building simple interactive websites using Python.

Unit 3: Detailed introduction to Python. Common libraries for Python. Scientific computing with Python. Building websites with Python.

4. READINGS

4.1 TEXTBOOK:: There is no single textbook. Please see the list of reference books.

4.2 *REFERENCE BOOKS::

(a) Sed and Awk. Dale Dougherty, Arnold Robbins. O'Reilly Media, Inc.

(b) Mastering Unix Shell Scripting: Bash, Bourne, and Korn Shell Scripting for Programmers, System Administrators, and UNIX Gurus. Randal K. Michael. Wiley.

(c) Introduction to Computation and Programming Using Python. John V. Guttag. MIT Press.

5. OTHER SESSIONS

5.1 *TUTORIALS:: One tutorial session in groups of maximum 30 students for clearing doubts and class assignments etc.

5.2 *LABORATORY:: One laboratory session for practice and practical assessments etc.

5.3 *PROJECT:: None

6. ASSESSMENT (indicative only)

6.1 HA::

6.2 QUIZZES-HA:: 10% GRADE

6.3 Class and Lab Assignments:: 10% GRADE

6.4 PERIODICAL EXAMS:: 20% GRADE

6.5 *PROJECT:: 20% GRADE

6.6 FINAL EXAM:: 40% GRADE

7. OUTCOME OF THE COURSE::

Students should be able to use scripting languages and associated tools to solve problems that need not require full-fledged programming or software development. They should also get some practice in writing 'one-liners' to get some of their work done quickly. The course project should demonstrate their learning.

8. *EXPECTED ENROLLMENT FOR THE COURSE:: 75

9. *DEPARTMENTS OTHER THAN YOUR OWN TO WHICH THIS COURSE WOULD BE OF INTEREST:: ---

10. *ANY OTHER REMARKS:: No

MANUFACTURING PRACTICE- II

1. GENERAL

1.1. COURSE TITLE: Manufacturing Practice I

1.2. *COURSE CODE: EP**.ME 106.**14

1.3. CONTACT HRS: 0-0-3

1.4. CREDITS: 3

1.5. *SEMESTER OFFERED: II

1.6. SYLLABUS COMMITTEE MEMBERS: Prof. A. K. Jha (Convener), Prof. Santosh Kumar, Dr. M.Z. Khan Yusufzai, Dr. M. Vashista (ME)

2. OBJECTIVES

To make the students familiar with various manufacturing processes and to get an on hand experience on these processes. Impart practical knowledge about the capabilities of manufacturing processes and how these processes could be used to produce various types of components and products.

3. DELIVERABLES

To develop skill and confidence among the students to successfully use various manufacturing processes and to understand the difficulties faced by the personnel working on these manufacturing processes.

4. PRACTICE PLAN

1. Manufacturing Practice I(Total hours: 3 hours per week x 10 weeks=30 Hours)

i. Foundry (1 turn)

ii. Pattern Making (1 turn)

iii. Material joining and Deposition Processes (2 turns)

iv. Metal forming processes (1 turn)

v. Demonstration of Videos on Manufacturing Processes (1 turn)

vi. Project work-I (4 turns)

5. SYLLABUS

a. **Centre Lathe:** Classification and types of lathe, parts and components of a lathe. Demonstration of various turning operation. Practice of a few turning operations on a centre lathe. Cutting tool.

b. **Fitting:** Demonstration of various types of files, saws, marking and clamping tools. Drilling and tapping. Practice of a assembling and fitting a job.

c. **Milling:** Classification and types of milling machines, parts and components of a milling machine. Milling cutter, Indexing and gear cutting.

d. **Shaping:** Parts and components of a shaper and planer. Quick return mechanism. Practice on preparing component using shaper

e. **CNC:** Specifications of a CNC Machine, difference between a conventional machine and CNC Machines. Types of CNC Machine. Basics of CNC Programming. Writing a CNC program and executing it on a CNC Machine.

f. **Demonstration of Videos on Manufacturing Processes**

g. **Project work-II:** Preparation of a real life job using the processes practiced in manufacturing practice II.

6. BOOKS

i. Workshop Technology in SI Units (Part - 1) Author: W. A. J. Chapman, Publisher: CBS Publications

ii. Workshop Technology in SI Units (Part - 2) Author: W. A. J. Chapman, Publisher: CBS Publications

Workshop Technology in SI Units (Part - 3) Author: W. A. J. Chapman, Publisher: CBS Publications.

Engineering Drawing (Manual and Computer Aided)

1. GENERAL

1.1 TITLE::Engineering Drawing (Manual and Computer Aided)
1.2 *COURSE NUMBER::EP**.ME 104.**14
1.3 CREDITS:: 1-0-3 Credits 6
1.4 *SEMESTER -OFFERED:: Both
1.5 Prerequisite: None
1.6 Syllabus Committee Member:**Dr. S. K. Shah(Convener)**, Dr. Amit Tyagi,Dr. D. Khan,
Dr. U. S. Rao (ME)

1. OBJECTIVE : :

Technical drawing is the language of engineering. The objective of this course is to learn initially the basic principles involved in the projection of points, lines, lamina and solids. As well this course is focused towards the interpenetration of solids, development of surfaces, isometric drawings and some basics of computer aided drafting software. It is expected that a student should learn this subject in a very systematic way to develop the skill to express effectively his/her idea about an object to others through drawings.

2. COURSE CONTENT : :

UNIT I: 12 Contact Hours

Instruments used, Lettering, Types of Lines used, Types of Projections in use,
Dimensioning of Figures, etc.; Orthographic Projections of Points, Lines & Lamina

UNIT II: 16 Contact Hours

Projection of Solids; Section of Solids & its Projections; Interpenetration of Solids & Curve of Interpenetration; Development of Surfaces.

UNIT III: 12 Contact Hours

Isometric Drawing & Isometric Projection; Free-Hand sketching of Engineering Components

UNIT IV: 12 Contact Hours

Introduction to Drafting Software (AutoCAD) & its Basic Commands,
Solving Problems using AutoCAD.

3. READINGS : :
3.1 TEXT BOOKS : :
1. Title: Engineering Drawing Author: N. D. Bhatt
2. Title: Engineering Graphics With Autocad Author: James D. Bethune
3.2 REFERENCE BOOKS : :

1. Title: Engineering Drawing & Graphics Author: K. Venugopal
2. Title: Engineering Drawing Author R. K. Dhawan
3. Title: Engineering Drawing Author: M. B. Shah & B. C. Rana

7. OUTCOME OF THE COURSE : :

It is anticipated that after completion of the course, a student would be in a position to study/guide basic engineering drawings required in workshop for the fabrication purposes. Also this basic course will help the students to handle effectively the course on machine drawing.

History and Civilization

1. GENERAL

1.1 TITLE:: **History and Civilization** 1.2 *COURSE NUMBER :: IH.**H 104.**14 1.3 CREDITS:: 2-1-0-Credit 8 1.4 SEMESTER-OFFERED:: Both 1.5 PRE-REQUISITES:: None

2. OBJECTIVE:: This course is one of the foundation courses of Humanities (in Foundation Area 1). Objective of this course is to make students aware of rich legacy of India and introduce history in the context of survival, political and cultural development. The course is to emphasize the role of history in understanding the concepts of civilization and its connection towards the evolution of future societies. It also gives an opportunity to explore the world civilization and understand the contemporary development.

3. COURSE TOPICS::

Unit I: Overview of Indian History (19 hours)

Two threads will be running while covering the topics

a) Study of history as a way to understand contemporary society

b) Study of history as development of ideas of humankind to understand future societies

1. Prehistoric Period (Earliest times to the formation of States) - Origin of technologies (Stone, Bronze & Iron), subsistence (food collection to food production) in context of survival, Development from Rural to Urban societies.

2. Empires of Ancient India – (Maurya, Kushan & Gupta): study of Governance, Culture achievements (epigraphs, Icons and Architecture).

3. Medieval Period – (Early Medieval dynasties: Pala, Chandela, Rshtrakuta, Chola) & The Mughals: Governance, Sculptures, Paintings, Architecture.

4. British Raj & Contemporary India as a study of decentralized society and industrial societies (comparative study), colonialism.

Unit II: Sources of History & History Writing: (3 hours)

These topics will be taught interspersed with unit I

1. Sources of History – Literary (Texts) & Archaeological (material remains): Nature, limitations.

2. Discoveries & Data retrieval – Methods and techniques of Archaeology (exploration, excavation, recording, dating); Scrutiny of textual narrations (contexts, linguistic, dating).

3. Interpretations & Historical Reconstructions – Identification of cultures, Analysis of data, Interpretative models, Ideological bias.

Unit III: Survey of World Civilizations (4 hours)

(Beginning to 1500 CE): Mesopotamia, Egypt, China.

4. READINGS 4.1 TEXTBOOK::

1. India: A History by John Keay

2. Discovery of India : by Pt. J. L. Nehru

4.2 *REFERENCE BOOKS::

1. An Advanced History of India. By R.C. Majumdar, H.C. Raychaudhuri, and Kalikinkar Datta. 1946. London: Macmillan.

2. Bharat Mein Angreji Raj - Pundit Sunderlal

5.3 *PROJECT:: Thematic projects to create larger picture of times and society. The following can be some of the projects:

- Choose one monument -- do in-depth research
- Choose one festival -- connect with communities and mythology
- Choose one inscription -- connect with historical times
- Choose one personality -- study the times, and how the individual copedwith difficulties. Example: Social leaders, scientists, authors, freedom fighters, and visionaries such as Mahamana Madan Mohan Malviya.
- Choose one city -- what makes the city alive
- Choose family histories
- Choose local oral history (e.g. legends, ballads)

OUTCOME OF THE COURSE:: It is expected that after taking this course, students will be aware of the different facet of the evolution of societies in the past. It will also give them an opportunity to envisage the future societies and encourage an exploration of the role of technology in social developments.

Development of Societies

1. GENERAL

1.1 TITLE:: Development of Societies

1.2 *COURSE NUMBER (if known):: IH.**H 103**.14 1.3 CREDITS:: 2-1-0- Credits 8 1.4 SEMESTER-OFFERED:: Both 1.5 PRE-REQUISITES:: None

2. OBJECTIVE:: This is one of the foundation courses of Humanities (in Foundation Area 1). It is envisaged that this course will provide a natural link between engineering and humanities with an emphasis that Development is not just materialistic, larger view of all round human development should also be considered. Importance of sustainable development, inter-dependence and co-existence in nature should be realised through this course. It is to gain an understanding of alternative models of development.

3. COURSE TOPICS::

Unit I: Social Development (5 hours)

1. Concepts behind the origin of Family, Clan and Society
2. Different Social Systems
3. Relation between Human being and Society
4. Comparative studies on different models of Social Structures and their evolution

Unit II: Political Development (3 hours)

1. Ideas of Political Systems as learnt from History
2. Different models of Governing system and their comparative study

Unit III: Economic Development (18 hours)

1. Birth of Capitalism, Socialism, Marxism
2. Concept of development in pre-British, British and post British period- Barter, Jajmani
3. Idea of development in current context.
4. E. F. Schumacher's idea of development, Buddhist economics.
5. Gandhian idea of development. Swaraj and Decentralization.

***PROJECT:: Possible projects in this course could be**

a) Interact with local communities and understand their issues.

b) Study local cottage industry and agricultural practices. Role of engineering and specialized knowledge.

c) Evaluation of technology in the context of its application. Social impact of technology. Enviromental impact of technology. Evaluation from a holistic perspective.

Philosophy

1. **GENERAL**

1.1 Title ::Philosophy

1.2 Course Number (if known) ::HU-105

1.3 Credits :: 2-1-0-8

1.4 Semester offered :: Both

1.5 Prerequisite:: None

2. OBJECTIVE::

Even though developments are taking place with greater production of physical facilities, conflict and strife are increasing in the individual and society. Environmental crisis in the form of climate change is putting life itself in danger.

In spite of achieving ones goals, the individual remains dissatisfied with jobs and positions that are intellectually and mentally unfulfilling, and wealth that breeds problems in family, chaos in society, and imbalance in nature. In fact, the nations and civilizations are increasingly at war.

It is believed that ideas in Humanities and Social Sciences can provide a new understanding, based on which one can move to overcome the current problems, both at the individual level as well as at the societal level.

This course is expected to relate philosophy to literature, culture, society and lived experience can be considered. This is in addition to training students in already available philosophical systems. Instead of only theory or only practical courses attempt can be made to combine both theory and practice.

This course is expected to bridge the gap between theory and practice by making the courses interactive. Along with projects, this course will have more illustrations that would invite students into the subject.

3. COURSE TOPICS::

Unit 1:The difference between knowledge (Vidya) and Ignorance (Avidya):

a. Upanishads;

b. Six systems orthodox and Heterodox Schools of Indian Philosophy.

c. Greek Philosophy:

Unit 2:Origin of the Universe:

Nasidiya Sukta: "Who really knows?‖

Brhadaranyaka Upanishad; *Chandogya Upanishad*: Non-self, Self, real and unreal.

Taittiriya Upanishad: Siksha Valli.

Plato‘s *Symposium*: Lack as the source of desire and knowledge.

Socratic method of knowledge as discovery.

Language: Word as root of knowledge (Bhartrahari‘s Vakyapadiyam)

Fourteen Knowledge basis as a sources of Vidya: Four Vedas; Six auxiliary sciences (Vedangas); Purana, Nyaya, Mimamsa and Dharma Sastras.

Unit 3:

Knowledge as Power: Francis Bacon. Knowledge as both power and self-realization in Bagavad Gita.

Unit 4:

Knowledge as oppression: M. Foucault. Discrimination between *Rtam* and *Satyam* in Indian Philosophy.

Unit 5:

Knowledge as invention: Modern definition of creativity; scientific activity in the claim that science invents new things at least through technology.

Unit 6:

Knowledge about the self, transcendental self; knowledge about society, polity and nature.

Unit 7:

Knowledge about moral and ethics codes.

Unit 8:

Tools of acquiring knowledge: *Tantrayuktis*, an system of inquiry (Caraka, Sushruta, Kautilya, Vyasa)

4. READINGS

1. Copleston, Frederick, *History of Philosophy, Vol. 1.*Great Britain: Continuum.

2 Hiriyanna, M. *Outlines of Indian Philosophy,* Motilal Banarsidass Publishers; Fifth Reprint edition (2009)

3 Sathaye, Avinash, *Translation of Nasadiya Sukta*

4. Ralph T. H. Griffith. *The Hymns of the Ṛgveda*. Motilal Banarsidass: Delhi: 1973.

5. Raju, P. T. *Structural Depths ofIndian Thought*, Albany: State University of New York Press.

6. Plato, *Symposium*, Hamilton Press.

7. Kautilya *Artha Sastra*. Penguin Books, New Delhi.

8. Bacon, *Nova Orgum*

9. Arnold, Edwin. *The Song Celestial*.

10. Foucault, *Knowledge/Power.*

11. Wildon, Anthony, *System of Structure*.

12. Lele, W.K. *The Doctrine of Tantrayukti.* Varanasi: Chowkamba Series.

13. Dasgupta, S. N. *History of Indian Philosophy*, Motilal Banasidas, Delhi.

14. Passmore, John, *Hundred Years of Philosophy*, Penguin.

5. Other Sessions

5.1 Mode of Conduct

6. **ASSESSMENT (indicative only)** : Ask students to do term papers, for example, writing biographical details of founders, sustainers, transmitters, modifiers, rewriters; translating monographs of less known philosophers such as K. C. Bhattacharys, Daya Krishna, Gopinath Bhattacharya; comparative study of philosophical system such as Madhyastha Darshan.

7**. OUTCOME OF THE COURSE::** - Students will develop strong natural familiarity with humanities along with right understanding enabling them to eliminate conflict and strife in the individual and society.

Students shall be able to relate philosophy to literature, culture, society and lived experience can be considered.

Education and Self

1. GENERAL

1.1 TITLE :: **Education and Self**

1.2 *COURSE NUMBER:: IH.**H106**.14 1.3 CREDITS:: **2-1-0-8**

1.4 SEMESTER-OFFERED:: Both Semester

1.5 PRE-REQUISITES:: None

2. OBJECTIVE:: In this course it is emphasized that understanding self is a crucial aspect of education. and this course aims to explicitly highlight concern for relationship between education and society. Assumption is that any concern with the social issues without understanding the self is likely to cause complications that we witness amongst the well meaning activists today. An understanding of one‘s psycho-physical makeup, underlying motivations and aspirations helps not only an understanding of one self but also creates an understanding of social interactions. On the other hand, sole occupation with self is likely to alienate the social aspects. Thus it is considered necessary to view concerns of education in relation to social environment as well.

Education or _shiksha‘ is not so much a matter of pedagogy as of a _way of life‘. The fabric of interpersonal relations, values, aspirations, language and many other factors mould the nature of knowledge, learning and teaching.

3. **COURSE TOPICS::** Following are the topics to be covered in broadly the given sequence.

Unit-I: Understanding Education.

1. Dialogues on education.
- To reflect over meaning and significance of education.
2. History and philosophy of education.
- Search for truth and understanding of cosmos and society.
- Pre industrialization and post industrialization.
3. Modern education, a process of alienation from self and society.
- Critique of education from the Western and Indian perspectives

Unit - II: Indian Perspectives of Education.

1. Notions of Vidya, Shiksha, Talim and Education.
2. Upanishads and Raj-Yoga for understanding and educating the Self.
- Spirit of enquiry of the Upanishads and the path of Ashtanga Yoga.
3. Role of education in transforming social consciousness.
- Alternatives in education in 19th-20th century India.

Unit - III: Present efforts to integrate education, self, and society.

1. Drawing upon traditions of Gurukuls, Monanstries, and Yogic practices.
2. Shiksha and Samaj
- The process of learning and teaching as an integral part of a society.
- Shiksha/education in relation to socio-environmental concerns.

4. READINGS

- Education and the Significance of Life. J. Krishnamurti, Gollancz, London,1955.
- Glimpses of Raja Yoga, Vimala Thakar, Vimal Prakashan Trust, Ahmedabad,India,!998.

- Hind Swaraj or Indian Home Rule, Mohandas K. Gandhi. Navjeevan Trust, Ahmedabad,India 1938 (Complete book online.)
- Kathopanishad: An alchemy of life, Vimala Thakar. Vimal Prakashan Trust, Panchgani, Maharashtra. 2006.
- Shiksha Evam Parampara, Part I, Samdhong Rinpoche, Bir Conference on Indian Perspectives of Education. Audio- Video Recording, SIDH, Mussoorie.Uttranchal, India.
- Shiksha Evam Parampara, Part II, Samdhong Rinpoche, Panchgani Seminar on Indian Perspectives of Education. Audio- Video recording, Vidyadan Foundation for Education, Panchgani, India.
- Patanjala Yoga Sutras,P.V Karambelkar, Kaivalyadham, Lonavala, Maharashtra, India
- Communal Life in India, Rabindranath Tagore, The Modern Review for June 1913
- The Beautiful Tree, Dhrampal. Collected Writings Vol III, Other India Press, SIDH, Mussoorie, Uttranchal, India, 2007.
- The Complete Works of Swami Vivekananda, Eleventh Edition,Vols 4,6,8, Advait Ashram,Mayavati, Pithoragarh, Himalayas.
- Vidya evam samaj, Ravindra Shrama. Panchgani Seminar, Indian Perspectives of Education, Audio-Video recordings, September 2012
- Vidya evam samaj, Ravindra Shrama. Panchgani Seminar, Indian Perspectives of Education, Audio-Video recordings, September 2012.
- Yoga beyond Meditation, Vimala thakar. VImal Prakashan Trust, Ahmedabad,India.
- Vidya evam samaj, Ravindra Shrama. Panchgani Seminar, Indian Perspectives of Education, Audio-Video recordings, September 2012

Websites
- History of Education. https://www.Wikipedia, the free encyclopedia.
- The people‘s institute for Rethinking Education. https://www.swaraj.org/shikshantar
- Finding Purpose in Education. https://www.Sidh.
- Indian Perspectives of Education. https://www.Vidyadan.com.

6. ASSESSMENT (indicative only): Projects and Term Papers might be there. One possible mode of project is as follows.

a. Projects: Along with the faculty, the students will interview thinkers, educationists, and activists to connect with topics of the above stated three units. The reports would be analyzed and presented by the students.

7. OUTCOME OF THE COURSE:: As noted in the course objective/description, the mainstream education tends to alienate us from ourselves and the society. With the help of the above mentioned topics and interactions, we expect the students to become aware of the limitations of our existing education system and become part of exploring alternatives.

Probability and Statistics

1. GENERAL

1.1 TITLE::Probability and Statistics
1.2 *COURSE NUMBER::IS**.MA 202.**14
1.3 CREDITS:: 3-1-0: Credits 11
1.4 *SEMESTER -OFFERED:: Odd
1.5 Prerequisite: Mathematics I
1.6Syllabus of Committee Member: Dr. Subir Das (Convener), Dr. Anuradha Banerjee

2. COURSE CONTENT

UNIT I: Probability (4 Lectures)

Classical, Relative Frequency and Axiomatic definitions, Properties of Probability Function, Conditional Probability, Independence of Events, Theorem of Total Probability, Bayes' Theorem.

UNIT II: Random Variable and Its Distribution (4 Lectures)

Definition of Random Variable, Distribution Function and Its Properties, Types of Probability Distributions (Discrete, Continuous, Absolutely Continuous and Mixed Type), Probability Mass Function, Probability Density Function, Mathematical Expectation, Moments, Probability and Moment Generating Functions and Their Properties, Characteristics of Probability Distributions (Measures of Central Tendency, Measures of Skewness and Kurtosis), Markov and Chebychev Inequality.

UNIT III: Special Discrete Distributions (2 Lectures)

Bernoulli and Binomial Distribution, Geometric and Negative Binomial Distribution, Hyper-Geometric Distribution, Poisson Distribution, Discrete Uniform Distribution.

UNIT IV: Special Absolutely Continuous Distributions (3 Lectures)

Uniform Distribution, Exponential and Gamma Distributions, Beta Distribution, Cauchy Distribution and Its Moments, Normal Distribution and Its Properties.

UNIT V: Function of Random Variables and Its Distribution (3 Lectures)

Function of Random Variable, Methods to Find Distribution of Function of a random Variable (Distribution Function, Jacobian and M.G.F Methods) and Their Expectations.

UNIT VI: Random Vector and Its Joint Distribution (4 Lectures)

Definition of Random Vector, Distribution Function of a Random Vector and Its Properties, Joint, Marginal and Conditional Distributions, Product Moments, Covariance and Correlation, Joint Moment Generating Function and Its Properties, Multinomial Distribution, Bivariate Normal Distribution.

UNIT VII: Function of Random Vector and Its Distribution (4 Lectures)

Function of Random Vectors, Methods to Find Distribution of Function of a Random Variable (Distribution Function, Jacobian and M.G.F Methods) and Their Expectations. Distribution of Order Statistics.

UNIT VIII: Sampling Distributions and Asymptotic Distributions (3 Lectures)

Joint Distribution of Sample Mean and Sample Variance Based on a Random Sample From Normal Distribution,Chi-Squared,Student's t and Snedcor's F-Distributions and Their Relation to Normal Distribution, Weak Law of Large Numbers, Central Limit Theorem.

UNIT IX: Statistics (1 Lectures)

Introduction to Statistical Inference Problems, Random Sample, Statistic, Population, Parameters.

UNIT X: Point Estimation (3 Lectures)

Point estimation problems, Method of Moments; Method of Maximum Likelihood, Invariance of Maximum Likelihood Estimators, Unbiased Estimators, Consistent Estimators, Criteria for Comparing Estimators.

UNIT XI: Interval Estimation (3 Lectures)

Interval Estimation Problems, Confidence Intervals, Confidence intervals for normal population(s): mean, difference of means, variance and ratio of variance, Confidence intervals for proportion and difference of proportions.

UNIT XII: Testing of Hypotheses (6 Lectures)

Null and Alternative Hypotheses, Simple and Composite Hypotheses, Critical Regions, Neyman-Pearson lemma, Most Powerful and Uniformly Most powerful Tests and their Examples, p-value, Likelihood ratio tests; Likelihood ratio tests for Statistical Hypotheses in One and Two Sample Problems Involving Normal Populations, Tests for Proportions, Chi-Square Goodness of Fit Test, Contingency Tables.

Engineering Mechanics

1. General

1.1 TITLE : : ENGINEERING MECHANICS

1.2 COURSE NUMBER : IE.**CMO 102**.14

1.3 CREDITS : : 3-1-0 (11 Credits)

1.4 SEMESTER- OFFERED : Both

1.5 Prerequisite: None

1.5 Syllabus Committee Member: Prof. S.K. Sinha (Convener), Dr. P. Bhardwaj, Dr. Amit Tyagi, Dr. N. Mallik (ME), Dr. Rajesh Kumar (CE)

2. OBJECTIVE : :

Engineering Mechanics adheres to a wide spectrum of Engineering Disciplines as a basic course at undergraduate level to understand the mechanics of statics and dynamics of a system hitherto, the system/body assumed to be rigid with no deformation under the application of tractions and forces. Principles based on Newtonian Mechanics, Variational Mechanics, D'Alembert's Principle etc. are core to the preliminary analysis of systems in equilibrium. The impetus of the study shall be understanding the continuum mechanics model with applicability to almost all branches of engineering for an ab initio stability assessment of miniature to mega scale structural designs.

3 COURSE CONTENT : :

Unit 1 . 6 Lectures

Introduction to position vector, force vector and moment vector, 3-D representation of force and couple; their moments about a point/line; Distributed-force systems

Unit 2 8 Lectures

Free Body diagram; Equilibrium of a body under 2D/3D force systems

Unit 3 6 Lectures

Dry friction; Self-locking; Belt friction;

Unit 4 6 Lectures

Truss; Virtual work Method; Potential Energy Method; Stability.

Unit 5 5 Lectures

Centroid of plane areas; Moment of inertia of plane areas; Perpendicular-axis and parallel-axis theorems; Principal Axes

Unit 6 8 Lectures

Rectilinear and curvilinear motion of a particles; Work and energy; Impulse and momentum; General plane motion of a rigid body; Instantaneous axis of rotation; Central impact.

3. **READINGS : :**

3.1 TEXT BOOKS : :

1. Title: Engineering Mechanics Author: I. H. Shames

2. Title: Engineering Mechanics Author: R. C. Hibbeler

Discrete Mathematics

GENERAL

1.1 TITLE:: **Discrete Mathematics**
1.2 *COURSE NUMBER (if known): MC.**CSO202**.15
1.3 CREDITS:: 3-0-0(9 Credits)
1.4 SEMESTER-OFFERED:: 3rd
1.5 PRE-REQUISITES:: Basic Maths
2. OBJECTIVE:
3. COURSE TOPICS:

UNIT 1

Statements: Defines, notion of propositions and examples.
Connectives: Negation, disjunction, conjunction, conditional and bi-conditional.
Statement formulas and truth tables. Programming on mathematical logic.
Formulas and tautologies: Well-formed formulas, tautologies, equivalence of formulas, duality laws and tautological implications, truth table.
Functionally complete sets of connectives: Functionally complete sets of connectives some other connectives, two state device and statement logic, logic GATES. *(1+4+5+3 Lectures)*

UNIT 2

Normal forms: Disjunctive normal form, conjunctive normal form, principal disjunctive normal form, principal conjunctive normal form, ordering and uniqueness of normal forms. **Different Notations**: Completely parenthesized infix notation and Police notation.
Theory of inference for the statement calculus: validity using truth tables, rules of inference, consistency of premises and indirect method of proof, automatic theorem proving.
(3+1+6 Lectures)

UNIT 3

Predicate calculus: Predicates, statement function, variables, and quantifiers, predicate formulas, free and bound variables, universe of discourse.
Inference theory of predicate calculus: Valid formulas and equivalences, valid formulas involving quantifiers, special valid formulas involving quantifiers, theory of inference of predicate calculus, formulas involving more than one quantifier.
Zorn's lemma and theory of mathematical induction. *(3+3+1 Lecture)*

UNIT 4

A brief recap of Relations and ordering: Relations, binary relations, equivalence relations, partial ordering, partially ordered sets.
Lattices: Definitions and examples, Lattices as partially ordered sets, some properties of lattices, lattices as algebraic systems, sub-lattices, direct product and homomorphism.
(1+2 Lectures)

UNIT 5

Boolean algebra: Definition and examples, sub-algebra, direct product and homomorphism. **Boolean functions**: Boolean forms, values of Boolean expressions and Boolean functions. Disjunctive and conjunctive normal forms. Boolean, expansion theorem, Representation and minimisation of Boolean functions, design examples using Boolean algebra, equivalence of finite state machines.
(2+5 Lectures)

4. READINGS

4.1 TEXTBOOK: Discrete Mathematical Structure with Application to Computer Science.By J. P. Tramblay and R Manohar (Tata-McGraw-Hill)

4.2 *REFERENCE BOOKS:

5. OTHER SESSIONS

5.1 *TUTORIALS: No
5.2 *LABORATORY: No
5.3 *PROJECT:: No

6. ASSESSMENT (indicative only)

6.1 HA: [10% GRADE]
6.2 QUIZZES-HA: [10% GRADE]
6.3 PERIODICAL EXAMS: [40% GRADE]
6.4 *PROJECT: [xx% GRADE]
6.5 FINAL EXAM: [40% GRADE]

7. OUTCOME OF THE COURSE: This one semester course in Discrete Mathematics is designed to introduce the students of mathematics and computing to mathematical logic and a brief application of logic to two state devices. In order to enable the student to read technical articles and books in computer science, the knowledge of predicate calculus is essential. The knowledge of Boolean algebra and its application to switching theory and sequential machines is a basic requirement for such students. Minimisation of Boolean functions is required in the logical design of digital computer systems. Taking into consideration the large size of the contents a separate one semester course on graph theory is recommended, which is not possible to club with it.

8. *EXPECTED ENROLLMENT FOR THE COURSE: 100

9. *DEPARTMENTS OTHER THAN YOUR OWN TO WHICH THIS COURSE WOULD BE OF INTEREST: Computer Science and Engineering

10. *ANY OTHER REMARKS: None

Computer System Organization

1. GENERAL
1.1 TITLE:: **Computer System Organization**
1.2 *COURSE NUMBER (if known):: MC.**CSO203**.15
1.3 CREDITS:: 3-0-2 (11 Credits)
1.4 SEMESTER-OFFERED:: III
1.5 PRE-REQUISITES:: - Computer Programming

2. OBJECTIVE:

1. Basic understanding of Digital logic and computer design, understanding the concepts and design aspects of combinational and sequential circuit design.

2. Computer organization: roles of processors, main memory, and input/output devices. Understanding the concept of programs as sequences of machine instructions. Understanding simple data path and control designs for processors. Understanding memory organization, including cache structures and virtual memory schemes.

3. COURSE TOPICS::

UNIT-I
Fundamentals of digital logic and Computer Design:
Switching devices, logic gates, digital integrated circuits technologies. Combination Logic Analysis Procedure, Design Procedure, Study of Different Combinational Circuits, HDL for Combinational Circuits. Synchronous Sequential Logic Sequential Circuits, Flip Flops, State Reduction and Assignment. Registers and Counters, Ripple Counters, Synchronous Counters. Memory and Programming Logic Introduction, Random Access Memory, Memory Decoding, Error Detection and Correction. Read Only Memory, Programmable Logic Array, Programmable Array Logic. Asynchronous Sequential Logic: Introduction, Analysis Procedure, Circuits with Latches, Design Procedure, Race Free State Assignment, Hazards.

UNIT-II

Introduction to computers, Register Transfer and Micro-operations, Computer Arithmetic: Addition and subtraction with signed magnitude, BCD addition and subtraction, Multiplication: Multiplication algorithm, Booth's multiplication, Array multiplier, Division algorithm: restoring and non-restoring division, array divider, Floating point arithmetic. Programming the basic computer.

Organization of a simple stored-program computer: Central Progressing Unit (CPU), Stack Organization, Register Stack, Memory Stack, Reverse Polish Notation. Instruction Formats, Three- Address, Two-Address, One- Address, and Zero-Address Instructions, Instruction cycle, Addressing Modes, Reduced Instruction Set Computer (RISC), CISC Characteristics RISC Characteristics.

UNIT-III

Memory Organization: Primary and auxiliary memory, Hierarchical memory organization, Cache memory concepts and cache mapping techniques, Associative Memory.
Control Unit: Hardwired and micro-programmed control unit.
Input-Output organization: Modes of transfer, Priority Interrupt, Direct memory access (DMA), Input-Output Processor (IOP), CPU-IOP Communication.

4. READINGS
4.1 TEXTBOOK::

1. Digital logic and computer design: M. Morris Mano, PHI
2. Computer System Architecture M. Morris Mano.
3. Computer Architecture and Organization, J.P. Hayes.

4.2 *REFERENCE BOOKS:

1. Computer Organization, 5-th edition, Carl Hamacher, Zvonko Vranesic, Safwat Zaki,
2. Advanced Computer Architecture, Kai Hwang
5. OTHER SESSIONS
5.1 *TUTORIALS:: NIL
5.2 *LABORATORY:: 02 Hours
5.3 *PROJECT::-

6. ASSESSMENT (indicative only)
6.1 HA:: [10% GRADE]
6.2 QUIZZES-HA:: [xx% GRADE]
6.3 PERIODICAL EXAMS:: [40% GRADE]
6.4 *PROJECT:: [xx% GRADE]
6.5 FINAL EXAM:: [50% GRADE]
7. OUTCOME OF THE COURSE::
8. *EXPECTED ENROLLMENT FOR THE COURSE:: 150
The specific course outcomes supporting the program outcomes are:

- Students will be able to understand the basic concepts of digital logic and design, computer organization, basic components of computer and their design aspects. Basic concepts of pipelining and parallel processing will also be introduced. should be able to solve basic binary math operations using the computer.

9. *DEPARTMENTS OTHER THAN YOUR OWN TO WHICH THIS COURSE WOULD BE OF INTEREST:: Maths and Computing, Electrical Engg.
10. *ANY OTHER REMARKS:: None

Information Technology Workshop-II (ITW-II)

1. GENERAL

1.1 TITLE:: **Information Technology Workshop-II (ITW-II)**

1.2 *COURSE NUMBER (if known):: DC.**CSE201**.15

1.3 CREDITS:: 9 [2-0-3]

1.4 SEMESTER-OFFERED:: III

1.5 PRE-REQUISITES:: Computer Programming and Information Technology Workshop-I

2. OBJECTIVE::

1. To introduce students to web application development, including the use of databases. 2. Introduce the basic concepts and emphasize use of technologies for developing the applications of Database using SQL, and concepts of socket programming using the scripting language used in ITW-I e.g. Python. 3. Introduce students to the idea of GUI programming.

3. COURSE TOPICS::

Unit 1: Client-server architecture. Anatomy of a web application. Introduction to relational databases. Building interactive web applications using databases, using Python.

Unit 2: Basic concepts necessary to develop tools using SQL. Socket programming using Python scripting language

Unit 3: Event based programming. GUI forms and designing GUIs. Using Python to create GUI applications.

4. READINGS

4.1 TEXTBOOK:: There is no single textbook. Please see the list of reference books.

4.2 *REFERENCE BOOKS::

(a) Python Web Programming. Steve Holden. New Riders Publishing.

(b) Introduction to Computation and Programming Using Python. John V. Guttag. MIT Press.

5. OTHER SESSIONS

5.1 *TUTORIALS:: One tutorial session in groups of maximum 30 students for clearing doubts and class assignments etc.

5.2 *LABORATORY:: One laboratory session for practice and practical assessments etc.

5.3 *PROJECT:: None

6. ASSESSMENT (indicative only)

6.1 HA::

6.2 QUIZZES-HA:: 10% GRADE

6.3 Class and Lab Assignments:: 10% GRADE

6.4 PERIODICAL EXAMS:: 20% GRADE

6.5 *PROJECT:: 20% GRADE

6.6 FINAL EXAM:: 40% GRADE

7. OUTCOME OF THE COURSE::

1. Students should be able to use languages like Perl, Python and Java to create reasonably sophisticated websites, building on to what they learnt in IT Workshop-I. 2. They should be able to write Object Oriented applications using Java. 3. They should be able to build simple GUIs.

8. *EXPECTED ENROLLMENT FOR THE COURSE:: 75

9. *DEPARTMENTS OTHER THAN YOUR OWN TO WHICH THIS COURSE WOULD BE OF INTEREST:: None

10. *ANY OTHER REMARKS:: None

Mathematical Methods

1. GENERAL

1.1 TITLE::Mathematical Methods
1.2 *COURSE NUMBER::IS**.MA 203.**14
1.3 CREDITS:: 3-1-0: Credits 11
1.4 *SEMESTER -OFFERED:: IV
1.5 Prerequisite: Engineering Mathematics I
1.6Syllabus of Committee Member: Dr. Subir Das (Convener), Dr. Rajeev

2. COURSE CONTENT

UNIT I: (12 Lectures)
Fourier transform, Laplace transform, Solution of differential equations by Laplace and Fourier transform methods, Applications of Laplace and Fourier transforms to Boundary value problems arising in Engineering Sciences.

UNIT II: (4 Lectures)
Hankel transform, Applications.

UNIT III: (4 Lectures)
Solutions of Laplace, Wave and Heat Conduction Equations.

UNIT IV: (8 Lectures)
Basic ideas of Discrete Fourier transform (DFT) and Finite Fourier transform (FFT), Z-transform, and Applications.

UNIT V: (7 Lectures) Ordinary Differential Equations: Power series and Frobenius methods, Hermite functions, Bessel functions, Modified Bessel functions, Applications. Legendre polynomials, Associated Legendre polynomials, Rodrigues formula, Orthogonality of Legendre polynomials, Hermite functions and Bessel functions, Sturm-Liouville problem.

UNIT VI: (4 Lectures)
Concept and calculation of Green's function, Approximate Green's function, Green's function method for differential equations.

3. READINGS

4.1 TEXTBOOK:

1. O. Scherzer (Ed.), Handbook of Mathematical Methods in Imaging, Springer, 2011.

2. G. S. Rao and K. K. Reddy, Mathematical Methods, I.K.International Pvt. Ltd., 2009.

3. W.W.Bell, Special functions for scientists and engineers, D.VanNostrand Company Ltd., London, 1968.

4. G. N. Watson, A Treatise on the Theory of Bessel Functions, Cambridge University Press, 1944.

5. G. F. Roach, Green's Functions, Cambridge University Press, 1995.

6. A. D. Poularikas, The Transforms and Applications Handbook, CRC Press, 1996.

Artificial Intelligence

1. GENERAL
1.1 TITLE:: **Artificial Intelligence**
1.2 *COURSE NUMBER (if known):: DC.**CSE 202**.15
1.3 CREDITS:: 11 [3-0-2]
1.4 SEMESTER-OFFERED:: IV
1.5 PRE-REQUISITES:: Data Structures, Discrete Maths
2. OBJECTIVE::
1. To introduce students to web application development, including the use of databases. 2. Introduce the concepts of Artificial Intelligence.
3. COURSE TOPICS::
Unit-I

Introduction and historical perspective, Hard and Soft AI – disciplines and applications, Theories of Intelligence, Detecting and Measuring Intelligence, Knowledge based approach, the prepare-deliberate engineering trade-off, Procedural v/s Declarative knowledge, Criticism of symbolic AI, Knowledge representation, desirable properties of KR schemata, Use of predicate calculus in AI.

Unit-II

Unification and Resolution, Architecture, design and manipulation of semantic networks, Frame Systems, Property Inheritance, Procedure Attachment, Conceptual Dependency, Current research areas in knowledge representation, Introduction to Natural Language, Processing, Syntax-Semantics-Pragmatics-Discourse analysis hierarchy, Recursive and Augmented – Transition Networks.

Unit-III

Expert Systems, Components, Production rules, Backwards vs Forward reasoning, Statistical reasoning, certainty factors, measure of belief and disbelief, Meta level knowledge, Introspection, Knowledge engineering case studies, Heuristic search of state space, DFS, BFS, UCS, choice of a search algorithm, Admissibility theorems, search performance metrics, Game playing, Alpha-Beta pruning, Quiescence search, Killer Move heuristic, AI programming environments.
AI oriented language and architecture – requirements and taxonomy, Case studies.

4. READINGS
4.1 TEXTBOOK::

- Artificial Intelligence: A new synthesis, Nils J Nilsson, Morgan Kaufmann Publishers.
- Artificial Intelligence, 2nd ed., Rich, Tata McGraw Hill.
- Artificial Intelligence, R.B. Mishra, PHI, India, 2010.

4.2 *REFERENCE BOOKS:: To be announced by convener
5. OTHER SESSIONS
5.1 *TUTORIALS:: No
5.2 *LABORATORY:: One laboratory session for practice and practical assessments etc.
5.3 *PROJECT:: None
6. ASSESSMENT (indicative only)
6.1 HA:: 0%
6.2 QUIZZES-HA:: 10% GRADE
6.3 Class and Lab Assignments:: 10% GRADE
6.4 PERIODICAL EXAMS:: 20% GRADE
6.5 *PROJECT:: 20% GRADE
6.6 FINAL EXAM:: 40% GRADE
7. OUTCOME OF THE COURSE::
1. Students should be able to learn the basic concepts and algorithms of Artificial Intelligence
8. *EXPECTED ENROLLMENT FOR THE COURSE:: 75
9. *DEPARTMENTS OTHER THAN YOUR OWN TO WHICH THIS COURSE WOULD BE OF INTEREST:: ----
10. *ANY OTHER REMARKS:: None

Algorithms

1. GENERAL

1.1 TITLE:: **Algorithms**

1.2 *COURSE NUMBER (if known):: **MC.CSO 203.15**

1.3 CREDITS:: 3-0-2 (11 Credits)

1.4 SEMESTER-OFFERED:: Semester IV

1.5 PRE-REQUISITES:: Computer Programming, Data Structures.

2. OBJECTIVE:: Upon completion of this course, students will be able to do the following:
Analyze the asymptotic performance of algorithms.
Demonstrate a familiarity with major algorithms.
Apply important algorithmic design paradigms and methods of analysis.
Synthesize efficient algorithms in common engineering design situations.

3. COURSE TOPICS::

UNIT-I

Algorithms, problems and instances, average and worst case analysis, elementary operations, Specifying an algorithm, Euclid's algorithm, data structures, asymptotic notation, Recursion and iteration, recurrence equation, Master's theorem.

UNIT-II

Divide and conquer: Sorting-Quick sort, Heap sort, Merge sort, Searching, binary search, changing two section of an array, finding the Median, matrix multiplication, string processing algorithms.
Greedy algorithms-Minimal spanning tree, shortest path, scheduling, and knapsack problem.

UNIT-III

Dynamic Programming: Shortest paths and 0/1 Knapsack, Traveling Salesman problem. Graphical algorithms-Traversing trees, Depth–First and Breadth–First search.
Backtracking-8–queens' problem, sum of subsets.
Problems classes P, NP and NP–completeness.

4. READINGS

4.1 TEXTBOOK:: Introduction to algorithms by Coreman, PHI, IIIrd Edition.

4.2 *REFERENCE BOOKS::

1. Computer Algorithms by Hoeowitz, Sahanai, and Rajashekaran,

2. Data Structures and Algorithm Analysis in C, by Mark Allen Weiss, 2nd edition, 1997, Addison-Wesley, ISBN 0-201-49840-5, Kleinberg and Tardos, Algorithm Design, 2005.

5. OTHER SESSIONS

5.1 *TUTORIALS:: 01 Hour

5.2 *LABORATORY:: 02 Hours

5.3 *PROJECT:: NIL

6. ASSESSMENT (indicative only)

6.1 HA:: [xx% GRADE] 10%

6.2 QUIZZES-HA:: [xx% GRADE] 10%

6.3 PERIODICAL EXAMS:: [xx% GRADE] 40%

6.4 *PROJECT:: [xx% GRADE]

6.5 FINAL EXAM:: [xx% GRADE] 40%

7. OUTCOME OF THE COURSE::

Students who complete the course will have demonstrated the ability to do the following:

Analyze worst-case running times of algorithms using asymptotic analysis.

Describe the divide-and-conquer paradigm and explain when an algorithmic design situation calls for it. Recite algorithms that employ this paradigm. Synthesize divide-and-conquer algorithms. Derive and solve recurrences describing the performance of divide-and-conquer algorithms.

Describe the greedy paradigm and explain when an algorithmic design situation calls for it. Recite algorithms that employ this paradigm. Synthesize greedy algorithms, and analyze them.

Describe the dynamic-programming paradigm and explain when an algorithmic design situation calls for it. Recite algorithms that employ this paradigm. Synthesize dynamic-programming algorithms, and analyze them.

Explain the major graph algorithms and their analyses.
8. *EXPECTED ENROLLMENT FOR THE COURSE:: 90
9. *DEPARTMENTS OTHER THAN YOUR OWN TO WHICH THIS COURSE WOULD BE OF INTEREST:: Maths and Computing
10. *ANY OTHER REMARKS:: None

Operating System

1. **General**
   1.1 Title: Operating System
   1.2 Course No: MC.CSO 204.14
   1.3 Objective: To give knowledge about fundamentals of operating system.
   1.4 Credits: [3-0-2] 11
   1.5 Semester offered: IV
   1.6 Prerequisite: Data Structure and Algorithm, Computer System Organization
   1.7 Course Topics:

Unit-I:

Computer System Structures. Operating System Structure- System Components, System Calls. Processes- Process Scheduling, Operation on Processes, Cooperating Processes. Threads. Scheduling- Scheduling Criteria, Scheduling Algorithms, Multiple-Processor Scheduling. Real-Time Scheduling. Process Synchronization- The Critical-Section Problem, Semaphores, Classic Problems of Synchronization, Monitors.

Unit-II

Deadlocks- System Model, Deadlock Characterization, Methods for Handling Deadlock, Deadlock Prevention, Deadlock Avoidance, Deadlock Detection, Recovery from Deadlock, Starvation.

Memory Management- Swapping, Contiguous Memory Allocation, Paging, Segmentation, Segmentation with paging. Virtual Memory- Demand Paging, Page Replacement, Allocation of Frames, thrashing.

Unit-III

File-System Interface and Implementation- File Concept, Directory Structure, Directory Implementation, Allocation Methods, Free-space Management, Efficiency and Performance, Recovery. I/O Systems- I/O Hardware, Application I/O Interface, Kernel I/O Subsystem, Transforming I/O to Hardware Operations,

STREAMS, Performance. Mass Storage Structure- Disk Structure, Disk Scheduling, Disk Management, Swap-Space Management, RAID Structure, Disk Attachment, Stable-Storage Implementation, Tertiary-Storage Structure. Protection and Security. A case study of modern operating systems

1.8 Text books:

1. "Operating System Concepts", 6th ed., Silberschatz-Galvin-Gagne, John Wiley & Sons.
2. "Operating System: A Modern Perspective", 2nd ed., Garry Nutt, Pearson Education.

Exploratory Project

1. GENERAL
1.1 TITLE:: **Exploratory Project**
1.2 *COURSE NUMBER (if known):: **DP.CSE291.15**
1.3 CREDITS:: [0-0-5] 5 Credits
1.4 SEMESTER-OFFERED:: Fourth (IV)
1.5 PRE-REQUISITES:: Data Structures and Computer Programming
2. OBJECTIVE:: The specific objectives of the course could depend on the problem definition for the project but the overall performance will be measured on the following criteria.
Course Contents:
a. Problem statement and literature survey- Students should be able to define the problem statement with clearly specified inputs and outputs. Goals for complex problems could evolve over time but it is necessary to have one in the beginning. A brief survey of the available literature and an initial draft of possible directions should suffice.
b. Modeling or Theoretical results- An appropriate model should be chosen for the problem. They should be able to reason the pros and cons of various models and choose a suitable one. It is important that they be in a position to defend their choices. The model should also involve the criteria by which they will quantify and test its performance. In case of theoretical work one should be able to describe the underlying mathematical basis of such problems in the literature.
c. Engineering or Mathematical tools- Numerous available methods could be put to use in implementing and testing the described model. They should demonstrate the ability to learn and put various methods to use. In theoretical study, grasp of mathematical tools used to put together a coherent argument or proof deriving the necessary results should be demonstrated.
d. Demonstration and Presentation- A model designed and implemented (or results derived or proved in case of theory) should be convincingly presented to showcase its positive and negative aspects. A demonstration to this end where applicable or a presentation in case of theoretical contributions should clearly describe the work. The work need not necessarily be novel or original and could be a clear exposition of otherwise hard concepts or a new perspective. The purpose is to measure understanding of the techniques and methods used and to appreciate the results in the larger context of their applicability in science and engineering. It is important to emphasize early on, the effort and time it takes to make a work presentable which is usually underestimated by most students.
A combination of the above criteria can be used to grade the work. Typically the following guidelines could be helpful for projects taken up as part of different semesters.
Evaluation procedure: Statement and Survey 25%, Engineering/Math Tools/Derivations 40%, Demonstration and Presentation 35%.
3. COURSE TOPICS:: Choice of student and the instructor.
4. READINGS
4.1 TEXTBOOK:: Instructor's choice.
4.2 *REFERENCE BOOKS:: Instructor's choice.
5. OTHER SESSIONS
5.1 *TUTORIALS:: No 5.2 *LABORATORY:: Yes 5.3 *PROJECT:: Yes
6. ASSESSMENT (indicative only)
6.1 HA:: [0% GRADE] 6.2 QUIZZES-HA:: [0% GRADE] 6.3 PERIODICAL EXAMS:: [0% GRADE]
6.4 *PROJECT:: [100% GRADE] 6.5 FINAL EXAM:: [0% GRADE]
7. OUTCOME OF THE COURSE:: Project goals as defined by the instructor.

8. *EXPECTED ENROLLMENT FOR THE COURSE::
9. *DEPARTMENTS OTHER THAN YOUR OWN TO WHICH THIS COURSE WOULD BE OF INTEREST:: None
10. *ANY OTHER REMARKS:: None

Universal Human Values 2: Self, Society and Nature

1. GENERAL
1.1 Title : Universal Human Values 2 : Self, Society and Nature
1.2 Course Number: **HU.H 201.14**
1.3 Credits : 1-2-0 – Credits 5
1.4 Semester offered : Even
1.5 Pre-requisites: Universal Human Values 1: Self & Family (desirable); 4-day Harmony-2 Workshop (co-requisite).

2. OBJECTIVE
The objective of the course is four fold:
1. Sensitization of student towards issues in society and nature.
2. Understanding (or developing clarity) of nature, society and larger systems, on the basis of human relationships and resolved individuals.
3. Strengthening of self reflection.
4. Development of commitment and courage to act.

(For elaboration on some of the above, consult course description for Universal Human Values 1: Self and Family).

3. COURSE TOPICS
In Universal Human Values 2 course, the focus is more on understanding society and nature on the basis of self and human relationships.
- Purpose and motivation for the course.
- Recapitulation (from the previous course) on ideas of self, pre-conditioning, and natural acceptance.
- Harmony in the self. Understanding human being as co-existence of self and body. Identifying needs and satisfying needs of self and body. Self observations. Handling peer pressure.
- Recapitulation on relationships. Nine universal values in relationships. Reflecting on relationships in family. Hostel and institute as extended family. Real life examples.
- Teacher-student relationship. Shraddha. Guidance. Goal of education.
- Harmony in nature. Four orders of nature – material order, plant order, animal order and human order. Salient features of each. Human being as cause of imbalance in nature. (Film **"Home"** can be used.)
- Human being as cause of imbalance in nature. Depletion of resources – water, food, mineral resources. Pollution. Role of technology. Mutual enrichment not just recycling.
- Prosperity arising out of material goods and understanding of self. Separation of needs of the self and needs of the body. Right utilization of resources. Understanding the purpose they try to fulfil.
- Recapitulation on society. Five major dimensions of human society. Fulfilment of the individual as major goal. Justice in society. Equality in human relationships as naturally acceptable. Establishment of society with abhaya (absence of fear).
- Ethical human conduct. Values, character and netikataa.
- Professional ethics. Conduct as an engineer or scientist.
- Holistic human being through holistic education in just order.

4. READINGS
4.1 Text Book
1. Human Values and Professional Ethics by R R Gaur, R Sangal, G P Bagaria, Excel Books, New Delhi, 2010

4.2 Reference Books

2 JeevanVidya: EkParichaya, ANagaraj, JeevanVidyaPrakashan, Amarkantak, 1999.
3 Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004.
4 The Story of Stuff (Book).
5 The Story of My Experiments with Truth - by Mohandas Karamchand Gandhi
6 On Education - J Krishnamurthy
7 Siddhartha - Hermann Hesse
8 Old Path White Clouds - ThichNhatHanh
9 On Education - The Mother
10 Diaries of Anne Frank - Anne Frank
11 Life and Philosophy of Swami Vivekananda
12 Swami Vivekananda on Himself
13 Small is Beautiful - E. F Schumacher.
14 Slow is Beautiful - Cecile Andrews
15 Economy of Permanence - J C Kumarappa
16 Bharat Mein Angreji Raj - PanditSunderlal
17 Mahatma and the Rose
18 The Poet and the Charkha
19 Rediscovering India - by Dharampal
20 Hind Swaraj or Indian Home Rule - by Mohandas K. Gandhi
21 Swaraj by Arvind Kejriwal
22 India Wins Freedom - Maulana Abdul Kalam Azad
23 Ramakrishna kijeevani - Romain Rolland (English)
24 Vivekananda - Romain Rolland (English)
25 Gandhi - Romain Rolland (English)
26 Autobiography of a Yogi – by ParamhansaYogananda
27 Gandhi and Question of Science – Sahasrabudhe

5. OUTCOME OF THE COURSE

At the end of the course, students are expected to become more aware of their surroundings, society, social problems and their sustainable solutions, while keeping human relationships and human nature in mind. They would have better critical ability. They would also become sensitive to their commitment towards what they believe in (humane values. humane relationships and humane society). It is hoped that they would be able to apply what they have learnt to their own self in different day-to-day settings in real life, at least a beginning would be made in this direction.

Materials Science and Engineering

1. GENERAL

1.1 TITLE::Materials Science and Engineering
1.2 *COURSE NUMBER::IE**.MO201.**14
1.3 CREDITS::3-1-0 - Credits - 11
1.4 *SEMESTER -OFFERED:: Both
1,5 PREREQUSITE: None
1.5 Syllabus Committee Member: Prof. R.K. Mandal (MT) (Convener), Prof. Om Prakash (CR), Prof. A.S.K. Sinha (CH), Prof. B.K. Srivastava (MN), Dr. R. Tyagi, Dr. M.Z. Khan Yusufzai, Dr. R.K. Gautam

2.OBJECTIVE

The students are expected to know about the uses of materials in various branches of engineering based on the philosophy of structure-property correlation. Properties of materials at various length scales are important for applications in various sectors. They refer to structural materials, electrical, and electronic materials,

3. COURSE CONTENT

UNIT I: (1 Lectures)
Introducing length scales relevant for materials science and engineering
Structures:
UNIT I: (10 Lectures)
Crystalline: 3D Lattices, Point and Space groups, crystal structures of important materials, CCP and HCP structures, defects and their importance,Indices of planes and directions in cubic and hexagonal crystal systems.
UNIT II: (2 Lectures) Non-crystalline and quasicrystalline structures
UNIT III: (3 Lectures)
Phase rule, phase diagrams of binary systems, microstructures, application of phase diagrams
Properties:
UNIT I: (4 Lectures)
Mechanical
UNIT II: (2 Lectures)
Electrical
UNIT III: (2 Lectures)
Electronic
UNIT IV: (2 Lectures)
Magnetic
UNIT V: (2 Lectures)
Composites

4. READINGS

4.1 TEXTBOOK

(a) Materials Science and Engineering-An introduction by William D.Callister Jr.
(b) Elements of Materials Science, by Van Vleck
(c) Materials science and engineering-a first course by V.Raghavan

5. OUTCOME OF THE COURSE

The course will facilitate students to realize importance of selection of materials based on property requirements

Database Management Systems

1. GENERAL
1.1 TITLE:: **Database Management Systems**
1.2 *COURSE NUMBER (if known):: DC.CSE301.16
1.3 CREDITS:: [3-0-2] 11 Credits
1.4 SEMESTER-OFFERED:: 5
1.5 PRE-REQUISITES:: Discrete Maths
2. OBJECTIVE:: To introduce students to the fundamentals of Database Systems. Focus will be from the viewpoint of database designer. This course exposes students to conceptual and logical design of Database Systems. Relational data model will be introduced and discussed in-length.
3. COURSE TOPICS::

Unit-I:
Introduction to DBMS, Introduction to the Relational Model
Database Design and the E-R Model, Relational Database Design

Unit-II:
Introduction to SQL, Intermediate SQL, Formal Relational Query Languages, Database Normalization

Unit-III:
Storage and File Structure, Indexing and Hashing, Query Processing, Transactions

4. READINGS
4.1 TEXTBOOK:: Avi Silberschatz, Henry F. Korth and S. Sudarshan “Database and System Concepts” Sixth Edition, McGraw-Hill, 2010
4.2 *REFERENCE BOOKS:: Ramez Elmasri and Shamkant B. Navathe, “Fundamentals of Database Systems”, 6rd Edition, Addison-Wesley, 2010
Raghu Ramakrishnan and Johannes Gehrke, “Database Management Systems” 3rd Edition, McGraw-Hill
5. OTHER SESSIONS
5.1 *TUTORIALS:: Yes
5.2 *LABORATORY:: Yes
5.3 *PROJECT::Yes

6. ASSESSMENT (indicative only)
6.1 HA:: [xx% GRADE]
6.2 QUIZZES-HA:: [10% GRADE]
6.3 PERIODICAL EXAMS:: [20% GRADE]
6.4 *PROJECT:: [30% GRADE]
6.5 FINAL EXAM:: [40% GRADE]
7. OUTCOME OF THE COURSE:: Students will be able to design and develop a Database system.
8. *EXPECTED ENROLLMENT FOR THE COURSE:: 85
9. *DEPARTMENTS OTHER THAN YOUR OWN TO WHICH THIS COURSE WOULD BE OF INTEREST:: None
10. *ANY OTHER REMARKS:: None

Computer Graphics

1. GENERAL
1.1 TITLE:: **Computer Graphics**
1.2 *COURSE NUMBER (if known):: **MC.CSO301.16/ OE.CSO. 301.16**
1.3 CREDITS:: 3-0-2 (11 Credits)
1.4 SEMESTER-OFFERED:: FIFTH
1.5 PRE-REQUISITES:: Data Structures, Computer Programming
2. OBJECTIVE:: The goal of subject is to provide the students a broad exposure to the computer graphics field in order to be prepared for follow-on study.

3. COURSE TOPICS::

Unit-I

Introduction and scope of subject, prerequisites, performance of graphics algorithms, model of computation, fundamental graphic algorithms. Graphics Hardware and Image Representation, Raster Scan Graphics: Basic Output primitives algorithms (Line, Circle, ellipse generation algorithms), Polygon Filling.

Unit-II

2D Geometric Transformations, 3D Geometric Transformations, Viewing and Clipping, Camera Models and Geometric Projections, Geometric Representations: Curves and Surfaces, Hidden Lines and Surfaces: Detection and Removal,

Unit-III

Other topics of Interest: Shading Illumination, Rendering and Ray Tracing, Solid Modelling Techniques, Animation and Virtual Reality.

Computational Geometry: Complexity notation, geometric data structures, geometric searching, point location problems, range search queries, Convex hull, Gaham's scan, Jarvis March, Quick Hul, Gift Wrapping, Beneath- beyond method, Proximity lower bounds, closest pair, Voronoi diagram, Triangulation, Art gallery problem, use of duality.

4. READINGS
4.1 TEXTBOOK::

1. Computer Graphics by Hearn and Baker, PHI
2. Preparata, Shamos, Computational Geometry- An Introduction.

4.2 *REFERENCE BOOKS::

1. Procedural Elements for Computer Graphics by Rogers, TMH.
2. Mathematical Elements for Computer Graphics by Rogers and Adams, Mac Graw Hills.
3. Computer Graphics: Schaum's Outline of Computer Graphics by Roy A Plastock
4. Research papers/Journal Articles from Standard Sources

5. OTHER SESSIONS
5.1 *TUTORIALS:: NA
5.2 *LABORATORY:: 03 hours/week (Practical assignments based on theory in OpenGL)
5.3 *PROJECT:: Mini projects to group of 3-4 students on advanced topics of the subject.
6. ASSESSMENT (indicative only)
6.1 HA:: [10% GRADE]
6.2 QUIZZES-HA:: [10% GRADE]
6.3 PERIODICAL EXAMS:: [40% GRADE]

6.4 *PROJECT:: [xx% GRADE]
6.5 FINAL EXAM:: [40% GRADE]

7. OUTCOME OF THE COURSE::

- Students will have an appreciation of the history and evolution of computer graphics, both hardware and software. Assessed by written homework assignment.
- Students will have an understanding of 2D graphics and algorithms including: line drawing, polygon filling, clipping, and transformations. They will be able to implement these. Assessed by tests and programming assignments.
- Students will understand the concepts of and techniques used in 3D computer graphics, including viewing transformations, hierarchical modeling, color, lighting and texture mapping. Students will be exposed to current computer graphics research areas. Assessed by tests, homework and programming assignments.
- Students will be able to use a current graphics API (OpenGL). Assessed by programming assignments.
- Students will be introduced to algorithms and techniques fundamental to 3D computer graphics and will understand the relationship between the 2D and 3D versions of such algorithms. Students will be able to reason about and apply these algorithms and techniques in new situations. Assessed by tests and programming assignments.

8. *EXPECTED ENROLLMENT FOR THE COURSE:: 85 (CSE: BTech.+IDD), 15 IMD (MnC)

9. *DEPARTMENTS OTHER THAN YOUR OWN TO WHICH THIS COURSE WOULD BE OF INTEREST:: Mathematics and Computing

10. *ANY OTHER REMARKS:: Multicore with Mathematics and Computing

Intelligent Computing

1. GENERAL

1.1 TITLE:: **Intelligent Computing**

1.2 *COURSE NUMBER (if known):: **BE.CSE311.16/ OE.CSE311.16**

1.3 CREDITS:: [3-0-0] 9 Credits

1.4 SEMESTER-OFFERED:: VII

1.5 PRE-REQUISITES:: Probability and Statistics, AI, C++/Java/ Matlab programming

2. OBJECTIVE:: Students will gain a working knowledge of the Intelligent computational approaches. The main focus will be on the details of the techniques, understanding why the techniques produce accurate results, identifying the types of problems each technique is suited for, and determining those problem areas for which a technique would be inappropriate. Students will receive "hands-on" experience with experimental computer science via class and lab exercises.

3. COURSE TOPICS::

Unit-I:

- Introduction to basic Intelligent computing techniques
- Evolutionary Computation : Genetic Algorithms, Evolutionary Strategies, Evolutionary Programming Particle Swarm Optimization and Ant Colony Optimization, Artificial Immune Systems ,Other Algorithms Harmony Search, Honey-Bee Optimization, Memetic Algorithms, Co-Evolution, Multi-Objective Optimization, Artificial Life, Constraint Handling.

Unit-II:

- Neural Networks : Mathematical Model of Neural Networks, Artificial Neural Network Learning Methods and Learning Strategies, Activation Functions, Multilayer-perceptron Network, Self-organizing Map (Kohonen network), Hopfield Network, Radial Basis Function (RBF) Network

Unit-III:

- Fuzzy Logic : Crisp set and Fuzzy set, Basic concepts of fuzzy sets, membership functions. Basic operations on fuzzy sets, Properties of fuzzy sets, Fuzzy relation.
- Hybrid System and its applications.

Unit-IV:

- Computational Logic: Modal Logic and Temporal Logic. Some applications of Modal Logic and Temporal Logic.
- Multi Agent Systems: Agent and their characteristics, Multi agent paradigm, coordination and communication and cooperation. Application to intelligent tutoring systems, E-commerce and E-learning.

4. READINGS

4.1 TEXTBOOK::

- Eberhart, E. and Y. Shi., *Computational Intelligence: Concepts and Implementations*, Morgan Kaufmann, San Diego, 2007.
- S. Rajasekaran and G.A.Vijaylakshmi Pai.. Neural Networks Fuzzy Logic, and Genetic Algorithms, Prentice Hall of India.

4.2 *REFERENCE BOOKS::

- Engelbrecht, A.P., *Computational Intelligence: An Introductio*n, John Wiley, New York, 2003.
- Konar, A., *Computational Intelligence: Principles, Techniques, and Applications*, Springer, Berlin, Germany, 2005.
- Thomas Weise, Global Optimization Algorithms: Theory and Application, 2009
- Gusz Eiben and Jim Smith, Introduction to Evolutionary Computing, 2007
- Andries Engelbrecht, Computational Intelligence: An Introduction, 2007
- Kenneth DeJong, Evolutionary Computation A Unified Approach, 2006
- Negnevitsky, M., *Artificial Intelligence: A Guide to Intelligent Systems*, Addison Wesley, 2002
- Fogel, D.B. and C.J. Robinson (Eds), *Computational Intelligence: The Experts Speak*, John Wiley, New York, 2003.

5. OTHER SESSIONS

5.1 *TUTORIALS:: No

5.2 *LABORATORY:: No
5.3 *PROJECT::Yes
6. ASSESSMENT (indicative only)
6.1 HA:: [10% GRADE]
6.2 QUIZZES-HA:: [0% GRADE]
6.3 PERIODICAL EXAMS:: [30% GRADE]
6.4 *PROJECT:: [10% GRADE]
6.5 FINAL EXAM:: [50% GRADE]
7. OUTCOME OF THE COURSE:
All students can learn how to use advanced computational intelligence techniques and a programming language to design a small intelligent system for a specific application. Students can learn how to write a high-quality review or conference paper with theoretical investigation. Practical simulations.
8. *EXPECTED ENROLLMENT FOR THE COURSE:: 85
9. *DEPARTMENTS OTHER THAN YOUR OWN TO WHICH THIS COURSE WOULD BE OF INTEREST:: MnC, EE, ECE
10. *ANY OTHER REMARKS:: None

Data Mining

GENERAL
1.1 TITLE:: **Data Mining**
1.2 *COURSE NUMBER (if known):: **BE.CSE321.16/OE.CSE321.16**
1.3 CREDITS:: [3-0-2] 11
1.4 SEMESTER-OFFERED:: Sixth (VI)
1.5 PRE-REQUISITES:: Data Structure, Algorithms, Probability and Statistical Analysis, Database.
2. OBJECTIVE:: To give knowledge about fundamentals of data mining

1. COURSE TOPICS::

Unit-I:
Introduction: Data Mining, , Motivation, Application, Data Mining—On What Kind of Data?, Data Mining Functionalities, Data Mining Task Primitives, Major Issues in Data Mining.
Data pre-processing: Descriptive Data Summarization, Data Cleaning, Data Integration and Transformation, Data Reduction, Data Discretization and Concept Hierarchy Generation.
Unit-II:
Association Rule: Mining Frequent Patterns, Associations, and Correlations: Basic Concepts and a Road Map, Association Rules, the Apriori Algorithm
Classification and Prediction:
Classification: Classification, Issues Regarding Classification, Classification by Decision Tree Induction, Bayesian Classification, Rule-Based Classification, Metrics for Evaluating Classifier Performance, Holdout Method and Random Sub sampling
Prediction: Prediction, Issues Regarding Prediction, Accuracy and Error Measures, Evaluating the Accuracy of a Classifier or Predictor.
Unit-III:
Clustering: Cluster Analysis, Agglomerative versus Divisive Hierarchical Clustering, Distance Measures in Algorithmic, Evaluation of Clustering.

4. READINGS
4.1 TEXTBOOK::
"Data Mining: Concepts and Techniques", Second Edition Jiawei Han and Micheline Kamber.
4.2 *REFERENCE BOOKS:: As per instructor choice
5. OTHER SESSIONS
5.1 *TUTORIALS::
5.2 *LABORATORY:: 02 Hours Implementation of Algorithms
5.3 *PROJECT:: Projects related to data mining

6. ASSESSMENT (indicative only)
6.1 HA:: [10% GRADE]
6.2 QUIZZES-HA:: [GRADE]
6.3 PERIODICAL EXAMS:: [30% GRADE]
6.4 *PROJECT:: [10% GRADE]
6.5 FINAL EXAM:: [50% GRADE]
7. OUTCOME OF THE COURSE::
8. *EXPECTED ENROLLMENT FOR THE COURSE:: 50
9. *DEPARTMENTS OTHER THAN YOUR OWN TO WHICH THIS COURSE WOULD BE OF INTEREST:: Maths and Computing, ECE, EE
10. *ANY OTHER REMARKS:: None

Graph Theory and Applications

1. GENERAL
1.1 TITLE:: **Graph Theory and Applications**
1.2 *COURSE NUMBER (if known):: DE.CSE302.16
1.3 CREDITS:: [3-0-0] 9
1.4 SEMESTER-OFFERED:: VII
1.5 PRE-REQUISITES:: Data Structure, Algorithm
2. OBJECTIVE:: Understanding and applying the concepts of Graph Theory and Applications
3. COURSE TOPICS::

Unit-I: Introduction, paths, connectedness, paths, circuits.

Unit-II: Planarity, domination, coloring, covering and partitioning, chromatic number, cut sets.

Unit-III: Isomorphism, matrix representation, matching in bipartite graphs, graph theoretic algorithms.

4. READINGS
4.1 TEXTBOOK::
Graph Theory By Narshim Deo, PHI.
4.2 *REFERENCE BOOKS:
5. OTHER SESSIONS
5.1 *TUTORIALS:: No
5.2 *LABORATORY:: No
5.3 *PROJECT::No
6. ASSESSMENT (indicative only)
6.1 HA:: [5% GRADE]
6.2 QUIZZES-HA:: [5% GRADE]
6.3 PERIODICAL EXAMS:: [40% GRADE]
6.4 *PROJECT:: [xx% GRADE]
6.5 FINAL EXAM:: [50% GRADE]
7. OUTCOME OF THE COURSE::

- An ability to understand advanced concepts in theory of computer science.
- An ability to understand advanced concepts in applications of computer science.
- An ability to apply knowledge of advanced computer science to formulate the analyze problems in computing and solve them.

8. *EXPECTED ENROLLMENT FOR THE COURSE:: 85
9. *DEPARTMENTS OTHER THAN YOUR OWN TO WHICH THIS COURSE WOULD BE OF INTEREST:: None
10. *ANY OTHER REMARKS:: None

Multimedia Systems

1. GENERAL
1.1 TITLE:: **Multimedia Systems**
1.2 *COURSE NUMBER (if known):: DE.CSE303.16
1.3 CREDITS:: [3-0-0] 9 Credits
1.4 SEMESTER-OFFERED:: VIII [IDD]
1.5 PRE-REQUISITES::

- Any programming language.
- Knowledge in Computer Network and Operating System.

2. OBJECTIVE::
Multimedia has become an indispensable part of modern computer technology. In this course, students will be introduced to principles and current technologies of multimedia systems. Issues in effectively representing, processing, and retrieving multimedia data such as sound and music, graphics, image and video will be addressed. The students will gain hands-on experience in those areas by implementing some components of a multimedia streaming system as their term project. Latest Web technologies and some advanced topics in current multimedia research will also be discussed.
3. COURSE TOPICS::
Unit-I: Introduction to multimedia coding standards- JPEG, MPEG, digital audio compression.

Unit-II: Multimedia Communication – B-ISDN, ATM, multimedia networks, synchronization techniques. Multimedia storage and retrieval- Disk scheduling in multimedia I/O systems, streaming RAID, design of video-object databases, query-by-content.

Unit-III: Structural multimedia authoring, active learning through multimedia, designing on-demand multimedia service. Transport and display of multimedia conferences, distributed collaborative multimedia, case studies.
4. READINGS
4.1 TEXTBOOK::

1. Multimedia: Concepts and Practice, Stephen McGloughlin, November 2000, Prentice Hall
2. Digital Multimedia, Nigel Chapman and Jenny Chapman, Wiley, 2000.
3. Multimedia Systems, Standards, and Networks, A. Puri, T. Chen (editors.), Marcel Dekker, 2000
4. Multimedia Database Management Systems, Guojun Lu, Artech House Publishers, October 1999.
5. Multimedia: Computing, Communications and Applications, R. Steinmetz and K. Nahrstedt, Prentice Hall, 1997.

4.2 *REFERENCE BOOKS::

1. Multimedia Systems Design, P. K. Andleigh & K. Thakrar, Prentice Hall, 1996.
2. Image and Video Compression Standards: Algorithms and Architecture, V. Bhaskaran and K. Konstantinides, 2nd ed., Kluwer Academic Publishers, 1997.
3. Compressed Video over Networks, Ming-Ting Sun, Amy R. Reibman (editors.), Marcel Dekker, 2000
4. Internetworking Multimedia, Jon Crowcroft, Mark Handley and Ian Wakeman, Taylor and Francis, Morgan Kaufmann Publishers, 1999.

5. OTHER SESSIONS
5.1 *TUTORIALS:: No 5.2 *LABORATORY:: No 5.3 *PROJECT:: Yes
6. ASSESSMENT (indicative only)
6.1 HA:: [10% GRADE] 6.2 QUIZZES-HA:: [10% GRADE] 6.3 PERIODICAL EXAMS:: [40% GRADE]
6.4 *PROJECT:: [xx% GRADE] 6.5 FINAL EXAM:: [40% GRADE]
7. OUTCOME OF THE COURSE::
The ability to: describe different realisations of multimedia tools and the way in which they are used; analyse the structure of the tools in the light of low-level constraints imposed by the adoption of various QoS schemes (i.e. bottom up approach); analyse the effects of scale and use on both presentation and lower-

level requirements (ie top down approach); state the properties of different media streams; compare and contrast different network protocols and to describe mechanisms for providing QoS guarantees in the network.
8. *EXPECTED ENROLLMENT FOR THE COURSE::
9. *DEPARTMENTS OTHER THAN YOUR OWN TO WHICH THIS COURSE WOULD BE OF INTEREST:: None 10. *ANY OTHER REMARKS:: None

Professional Communication

1. GENERAL
1.1 TITLE: PROFESSIONAL COMMUNICATION
1.2 *COURSE NUMBER:: LM.**HL 301**.14
1.3 CREDITS:: **2-1-0 Credits 8**
1.4 *SEMESTER – OFFERED:: Both
1.5 Syllabus forming Committee: Prof. P. K. Panda
2. OBJECTIVE
The objective of this course is to acquaint the students about the mode and procedure of professional communication in work places. Since communication takes resources and its proper use can save time and human resources they should develop an attitude to become more particular in managing specific communication in a given context.
3. COURSE CONTANT
1. Introduction to Professional Communication
1.1 Professional Communication for Engineering and Technology
1.2 Communication Model and Function of Professional Communication
1.3 Basics of Technical Communication
1.4 Basics of Technical Writing
2. Basic Writing Skills
2.1 Function of sentence structures
2.2 Use of phrases and clauses in sentences
2.3 Importance of proper punctuation
2.4 Common Errors in writing
2.5 Organizing principles of paragraphs and documents
2.6 Techniques for writing precisely
3. Writing for professional requiremtns
6.1 Letters
6.2 Memos
6.3 Proposals
6.4 Technical Reports
4. Vocabulary Building
4.1 The concept of word formation and technical Vocabulary
4.2 Root words from foreign languages and their use in scientific terminology
4.3 Acquaintance with prefixes and suffixes from foreign languages in English to form derivatives used in science and technology.
5. Oral Presentation Skills
4.1 Planning a Presentation, Body Language, Voice, Preparing for Questions, Use of pictorial presentations.
4.2 Strategies of descriptive, informative and persuasive oral presentation (purpose, evidence and occasion)
4.3 Facing the Interview.
4.4 Presentation with Audio visual aids.
4. READINGS

BOOKS RECOMMENDED:
1. *Practical English Usage. Michael Swan. OUP. 1995.*
2. *Basic Communication Skills for Technology. Andrea J. Rutherford. Pearson Education. 2002.*
3. *Technical Writing: Process and Product. S.J. Gerson and S.M. Gerson Pearson Education. 2006.*
4. *Technical Communication: A Reader Centered Approach. Paul V. Anderson.*

5. *Technical Report Writing Today. D.G. Riordan and S.E. Pauley. Biztantra. 2008.*
4.1 TEXTBOOK::
4.2 *REFERENCE BOOKS::
5. OUTCOME OF THE COURSE::
Students will gain knowledge on brief overview of the subject.

Stream Project

1. GENERAL
1.1 TITLE:: **Stream Project**
1.2 *COURSE NUMBER (if known):: DP.CSE391.16
1.3 CREDITS:: [0-0-10] 10
1.4 SEMESTER-OFFERED:: V (Fifth)
1.5 PRE-REQUISITES:: Basic knowledge of stream subjects, Data Structures, Algorithm, Computer Programming
2. OBJECTIVE:: The specific objectives of the course could depend on the problem definition for the project but the overall performance must be measured on the following criteria.
a. Problem statement and literature survey- Students should be able to define the problem statement with clearly specified inputs and outputs. Goals for complex problems could evolve over time but it is necessary to have one in the beginning. A brief survey of the available literature and an initial draft of possible directions should suffice.
b. Modeling or Theoretical results- An appropriate model should be chosen for the problem. They should be able to reason the pros and cons of various models and choose a suitable one. It is important that they be in a position to defend their choices. The model should also involve the criteria by which they will quantify and test its performance. In case of theoretical work one should be able to describe the underlying mathematical basis of such problems in the literature.
c. Engineering or Mathematical tools- Numerous available methods could be put to use in implementing and testing the described model. They should demonstrate the ability to learn and put various methods to use. In theoretical study, grasp of mathematical tools used to put together a coherent argument or proof deriving the necessary results should be demonstrated.
d. Demonstration and Presentation- A model designed and implemented (or results derived or proved in case of theory) should be convincingly presented to showcase its positive and negative aspects. A demonstration to this end where applicable or a presentation in case of theoretical contributions should clearly describe the work. The work need not necessarily be novel or original and could be a clear exposition of otherwise hard concepts or a new perspective. The purpose is to measure understanding of the techniques and methods used and to appreciate the results in the larger context of their applicability in science and engineering. It is important to emphasize early on, the effort and time it takes to make a work presentable which is usually underestimated by most students.
A combination of the above criteria can be used to grade the work. Typically the following guidelines could be helpful for projects taken up as part of different semesters.
Semesters III/IV/V- Statement and Survey 25%, Engineering/Math Tools/Derivations 40%, Demonstration and Presentation 35%
Semesters VI/VII/VIII- Statement and Survey 20%, Modeling/Results 30%, Engineering/Math Tools/Derivations 30%, Demonstration and Presentation 20%
3. COURSE TOPICS:: Choice of student and the instructor.
4. READINGS
4.1 TEXTBOOK:: Instructor's choice.
4.2 *REFERENCE BOOKS::
5. OTHER SESSIONS : 5.1 *TUTORIALS:: No 5.2 *LABORATORY:: Yes 5.3 *PROJECT:: Yes 6. ASSESSMENT (indicative only)
6.1 HA:: [0% GRADE] 6.2 QUIZZES-HA:: [0% GRADE] 6.3 PERIODICAL EXAMS:: [0% GRADE]
6.4 *PROJECT:: [100% GRADE] 6.5 FINAL EXAM:: [0% GRADE]
7. OUTCOME OF THE COURSE:: Project goals as defined by the instructor.
8. *EXPECTED ENROLLMENT FOR THE COURSE::

9. *DEPARTMENTS OTHER THAN YOUR OWN TO WHICH THIS COURSE WOULD BE OF INTEREST:: Institute must encourage projects spanning multiple departments. Department should not be a constraint and there should a framework to collaborate and contribute productively. Advising and grading structure should be worked out appropriately to avoid hassles for the students and to ensure smooth progress of the project. Such collaboration fosters innovation and facilitates functional solutions to socially relevant problems.
10. *ANY OTHER REMARKS:: None

Software Engineering

1. GENERAL
1.1 TITLE:: Software Engineering
1.2 *COURSE NUMBER (if known):: **DC.CSE304.16**
1.3 CREDITS:: 3-0-0 (9 credits)
1.4 SEMESTER-OFFERED:: Sixth (VI)
1.5 PRE-REQUISITES:: Data Structures, Programming Languages:

2. OBJECTIVE::

To understand and adhere to professional ethical standards in the system development and modification process, especially by accepting responsibility for the consequences of design decisions and design implementations. Basically the main objectives are how to develop software in efficient way in terms of cost, effort and quality.
3. COURSE TOPICS::
UNIT-I
Introduction: Phases in Software development, software development process models, role of metrics and measurement.
Software Requirement specification (SRS): Role of SRS, problem analysis, requirement specification, validation of SRS document, metrics, monitoring and control, Object-Oriented analysis.

UNIT-II
Planning a software Project: Cost estimation, project scheduling, staffing and personnel planning, team structure, software configuration management, quality assurance plans, monitoring plans, management.
System Design: Objective, principles, module level concepts, coupling and cohesion, methodology-structured and object oriented, Design specification and verification, Metrics, Object-Oriented Design.

UNIT-III
Detailed Design: Specification, design language, verification, Monitoring and control.
Coding: Practice, documentation, verification, correctness proving, metrics, monitoring and control.
Testing: Fundamentals, functional and structural testing, test plans, test case specifications, test case execution and analysis.

4. READINGS
4.1 TEXTBOOK:: 1. Software Engineering Roger Pressman, McGraw-Hill Science
2. Fundamentals of Software Engineering, Rajeev mall, PHI
3. Software Engineering: Theory and Practice, 2nd ed., S. L. P fleeger, Pearson Education.
4.2 *REFERENCE BOOKS:: 1. SOFTWARE ENGINEERING CONCEPTS by Richard Fairley, McGraw-Hill Science
2. An Integrated Approach to Software Engineering, Pankaj Jalote, Springer Science & Business Media.
5. OTHER SESSIONS
5.1 *TUTORIALS::
5.2 *LABORATORY:: No
5.3 *PROJECT:: Different Projects are Given to each student or group of students .

6. ASSESSMENT (indicative only)
6.1 HA:: [10% GRADE] 6.2 QUIZZES-HA:: [xx% GRADE] 6.3 PERIODICAL EXAMS:: [30% GRADE]
6.4 *PROJECT:: [10% GRADE] 6.5 FINAL EXAM:: [50% GRADE]
7. OUTCOME OF THE COURSE:: Students learn the systematic Approach to the design, development, operation, and maintenance of a software system. Learned the ability to analyze and implement solutions to complex problems involving computers.
8. *EXPECTED ENROLLMENT FOR THE COURSE::
9. *DEPARTMENTS OTHER THAN YOUR OWN TO WHICH THIS COURSE WOULD BE OF INTEREST:: None
10. *ANY OTHER REMARKS:: None

THEORY OF COMPUTATION

1. GENERAL
1.1 Course Name:: **THEORY OF COMPUTATION**
1.2 *COURSE NUMBER (if known):: **MC.CSO302.16**
1.3 CREDITS:: [3-0-0] 9
1.4 SEMESTER-OFFERED:: Fifth (V)
1.5 PRE-REQUISITES:: Discrete Maths
2. OBJECTIVE:: The objective of this course is to provide basic definitions that are associated with theory of computation and to give an overview, applications, environment of computation.
3. COURSE TOPICS::
Unit-I

Mathematical preliminaries, alphabet, strings, languages, states, transitions, finite automata and regular expressions, pushdown automata and context free languages and grammars, context sensitive languages and grammars, Chomsky hierarchy.

Unit-II

Turing Machines: Turing hypothesis, Turing computability, no deterministic, multitape and other versions of Turing machines, Church's thesis, primitive recursive functions,

Unit-III

Godelization, recursive functions, recursively enumerable sets and Turing computability, Universal Turing machines.
Unsolvability: The halting problem, partial solvability, Turing innumerability, acceptability and decide ability, unsolvable problems about Turing Machines and recursive functions, Post's correspondence problem examples, Review of prepositional and predicate calculus: syntax, satisfiability, validity.

4. READINGS:: After studying the course the readers are familiar with the concepts of theory of computation.
4.1 TEXTBOOK:: Cambridge Mass USA-2013.

1. Introduction to Automata, Formal Lanuages and Computation, Peter Linz, Narosa Publishing House.
2. Theory of Computer Science, K.L.P. Mishra, PHI, India

4.2 *REFERENCE BOOKS::
Computability - B. Jack Copeland, Carl J. Posy, Oron Shagrir The MIT Press
5. OTHER SESSIONS
5.1 *TUTORIALS:: No 5.2 *LABORATORY:: No 5.3 *PROJECT:: No
6. ASSESSMENT (indicative only)
6.1 HA:: [5% GRADE]
6.2 QUIZZES-HA:: [5% GRADE]
6.3 PERIODICAL EXAMS:: [40% GRADE]
6.4 *PROJECT:: [xx% GRADE]
6.5 FINAL EXAM:: [50% GRADE]
7. OUTCOME OF THE COURSE:: At the end of the course the students will be able to learn the basic concepts of theory of computation.
8. *EXPECTED ENROLLMENT FOR THE COURSE:: 85

9. *DEPARTMENTS OTHER THAN YOUR OWN TO WHICH THIS COURSE WOULD BE OF INTEREST:: Maths and Computing
10. *ANY OTHER REMARKS:: None

Computer Architecture

1. GENERAL
1.1 TITLE:: **Computer Architecture**
1.2 *COURSE NUMBER (if known):: DC.CSE305.16
1.3 CREDITS:: 3-0-0 (9 Credits)
1.4 SEMESTER-OFFERED:: VI
1.5 PRE-REQUISITES:: - Computer System Organization
2. OBJECTIVE:
1. Basic understanding of Microprocessors and Computer Architecture.
3. COURSE TOPICS::

UNIT-I

Microprocessors, Microcomputers and Assembly Language, Introduction to 8085 Assembly Language Programming, Microprocessor Architecture and Microcomputer Systems, 8085/8086 Microprocessor Architecture and Memory Interfacing, Interfacing I/O Devices
Introduction to 8085/8086 Instructions, Programming Techniques with Additional Instructions, Counters and Time Delays, Interfacing Data Converters, Programmable Interface Devices: 8155 I/O and Timer; 8279 Keyboard/Display Interface
Serial I/O and Data Communication

UNIT-II

Types and classification of architecture, Parallel computers, hypercube, systolic arrays models, Principles of scalable performance, Processor and memory hierarchy, Bus, Cache and shared memory, pipelining and super scalar techniques.
Classification of architectures, Array processors, Vector processors, Vectorisation methods, supercomputers, Cray – cyber, etc.

UNIT-III

Multiprocessors: System interconnects, cache coherence and synchronization mechanisms, Multicomputer generations, multipart memory, routing schemes, multi vector computers, Simulation of multiprocessors.
Scalable, Multithreaded and Dataflow architectures, design issues, Data flow machines, Distributed system, CISC vs RISC, RISC processors, super scalar processors, VLIW architectures.
4. READINGS
4.1 TEXTBOOK::
Microprocessors Architecture programming with the 8085, 3rd ed., Gaonkar, Penram International Publishing
Microprocessor by Douglus V Hall
Microprocessor by Berry B. Brey
Advanced Computer Architecture by Kai Hwang
4.2 *REFERENCE BOOKS:
Advanced Microprocessors and Peripherals, 1st ed., A. K. Roy-K.M.Bhurchandi, Tata McGraw Hill.
5. OTHER SESSIONS
5.1 *TUTORIALS:: NIL 5.2 *LABORATORY:: 02 Hours/week 5.3 *PROJECT::-
6. ASSESSMENT (indicative only)
6.1 HA:: [10% GRADE] 6.2 QUIZZES-HA:: [xx% GRADE] 6.3 PERIODICAL EXAMS:: [40% GRADE]
6.4 *PROJECT:: [xx% GRADE] 6.5 FINAL EXAM:: [50% GRADE]
7. OUTCOME OF THE COURSE::
8. *EXPECTED ENROLLMENT FOR THE COURSE:: 150
The specific course outcomes supporting the program outcomes are:

- Students will be able to understand the basic concepts of digital logic and design, computer organization, basic components of computer and their design aspects. Basic concepts of pipelining

and parallel processing will also be introduced. should be able to solve basic binary math operations using the computer.

9. *DEPARTMENTS OTHER THAN YOUR OWN TO WHICH THIS COURSE WOULD BE OF INTEREST:: EE, MnC,

10. *ANY OTHER REMARKS:: None

Computer Vision

1. GENERAL

1.1 TITLE:: **Computer Vision**

1.2 *COURSE NUMBER (if known):: BE.**CSE312**.16**/ OE.CSE312.16:**

1.3 CREDITS:: [3-0-2] 11

1.4 SEMESTER-OFFERED:: Sixth (VI)

1.5 PRE-REQUISITES::

2. OBJECTIVE::

Introduce the student to analytical tools and methods which are currently used in digital image processing as applied to image information for human viewing. Then apply these tools in the laboratory in image restoration, enhancement, segmentation, feature extraction, pattern recognition, compression and other computer vision related tasks.

3. COURSE TOPICS::

Unit-I

Fundamentals, Image Formation, Sampling and quantization, Mathematical Preliminiries, Image Transformations, Image Enhancement and restoration.

Unit-II

Image segmentation, Feature Extraction and Selection, Object Representation, Morphological image processing.

Unit-III

Object Recognition

Pattern Recognition: Statistical, Structural, Neural and Hybrid Techniques, and Selected topic, Recent Developments.

4. READINGS

4.1 TEXTBOOK::

1. Fundamental of image processing by R.C. Gonzalez
2. Digital image processing by A.K. Jain

4.2 *REFERENCE BOOKS::

2. Image Processing and Analysis by Milan Sonka
3. Selected Research papers from international journal

5. OTHER SESSIONS

5.1 *TUTORIALS::

5.2 *LABORATORY:: 02 Hours Implementation of Algorithms

5.3 *PROJECT:: Projects related to computer vision

6. ASSESSMENT (indicative only)

6.1 HA:: [10% GRADE] 6.2 QUIZZES-HA:: [GRADE] 6.3 PERIODICAL EXAMS:: [30% GRADE] 6.4 *PROJECT:: [10% GRADE] 6.5 FINAL EXAM:: [50% GRADE]

7. OUTCOME OF THE COURSE::

To understand (i.e., be able to describe, analysis and reason about) how digital images are represented, manipulated, encoded and processed, with emphasis on algorithm design, implementation and performance evaluation.

8. *EXPECTED ENROLLMENT FOR THE COURSE:: 50

9. *DEPARTMENTS OTHER THAN YOUR OWN TO WHICH THIS COURSE WOULD BE OF INTEREST:: Maths and Computing, Biomedical Engg., ECE, EE
10. *ANY OTHER REMARKS:: None

Parallel Computing

1. GENERAL
1.1 TITLE:: **Parallel Computing**
1.2 *COURSE NUMBER (if known):: **BE.CSE322.16/ OE.CSE322.16**
1.3 CREDITS:: [3-0-2] 11Credits
1.4 SEMESTER-OFFERED:: VI
1.5 PRE-REQUISITES:: Algorithms, Computer Architecture.
2. OBJECTIVE:: This is a graduate level course on parallel computing with the objective to familiarize students with the fundamental concepts, techniques and tools of parallel computing. Participation in this course will enable you to better use parallel computing in your application area, and will prepare you to take advanced courses in more specific areas of parallel computing
3. COURSE TOPICS::
Unit-I: Review of multiprocessor and distributed systems, Conditions of parallelism, program partitioning and program flow mechanisms. Parallel Models: Shared memory model, message memory model, data parallel model, object-oriented model, functional and logic models. Parallel Algorithms: Cost, Efficiency, PRAM algorithms, Mesh algorithms, hypercube algorithms, combinational circuit algorithms.
Unit-II: Parallel languages and compilers: Language features for parallelism, parallel language constructs, optimizing compilers for parallelism, dependency analysis, code optimization and scheduling, loop parallelization and pipelining.
Unit-III: Parallel program development: Parallel programming environments, synchronization and multiprocessing modes, shared variable program structures, message passing, program development, mapping programs onto, multicomputers. Multiprocessor UNIX (design goals)-Master slave and multithreaded Unix, multicomputer Unix extension, Mach/OS kernel architecture, OSF/1 architecture and programming environment.
4.READINGS
4.1 TEXTBOOK:: Parallel Computing – theory and practice, Michael J. Quinn, McGRAW-HILL, 1994.
4.2 *REFERENCE BOOKS:: Scalable Parallel Computing: Technology, Architecture, Programming, Kai Hwang & Zhiwei Xu, McGRAW-HILL, 1997;
Parallel Programming: Techniques and Applications Using Networked Workstations and Parallel Computers, Barry Wilkinson and MiChael Allen, Second Edition, Prentice Hall, 2005;
Distributed Systems: Concepts and Design, George Coulouris, Jean Dillimore, Tim Kindberg, Addison-Wesley, 2005;
Distributed Algorithms, Nancy Lynch, Morgan Kaufmann, 1997;
Distributed Operating Systems, Andrew S. Tanenbaum, Prentice Hall, 1990; MPI: http://www.mpi-forum.org/docs/docs.html; PVM : http://www.csm.ornl.gov/pvm/pvm_home.html; The GRID2: Blueprint for a New Computing Infrastructure, Ian Foster and Carl Kesselman, Morgan Kaufmann 2004; Grid Computing: Making the Global Infrastructure a Readlity, Fran Berman, Geoffgrey Fox and Tony Hey.

5. OTHER SESSIONS
5.1 *TUTORIALS:: No 5.2 *LABORATORY:: Yes 5.3 *PROJECT::No
6. ASSESSMENT (indicative only)
6.1 HA:: [10% GRADE] 6.2 QUIZZES-HA:: [10% GRADE] 6.3 PERIODICAL EXAMS:: [10% GRADE]
6.4 *PROJECT:: [xx% GRADE] 6.5 FINAL EXAM:: [40% GRADE]
7. OUTCOME OF THE COURSE:: Students will have:
Understanding of parallel hardware constructs, to include instruction-level parallelism, supercomputer architecture, multicore processor design
Understanding of language design issues related to parallel programming
Understanding of Operating System support for parallel computing
Ability to use OpenMP and MPI
Ability to identify and classify dependencies
Ability to produce medium-scale parallel programs

8. *EXPECTED ENROLLMENT FOR THE COURSE::
9. *DEPARTMENTS OTHER THAN YOUR OWN TO WHICH THIS COURSE WOULD BE OF INTEREST:: None
10. *ANY OTHER REMARKS::

Operations Research

1. GENERAL

1.1 TITLE:: **Operations Research**

1.2 *COURSE NUMBER (if known):: DE.CSE304.16

1.3 CREDITS:: [3-0-0] 9

1.4 SEMESTER-OFFERED:: VI

1.5 PRE-REQUISITES:: Maths-I and II

2. OBJECTIVE:: To introduce about the concepts of operations research and its Engineering Applications

3. COURSE TOPICS::

Unit-I: Linear programming, extreme point solutions, simplex method, computational procedures, duality problems, degeneracy, Revised simplex, sensitivity analysis.

Unit-II: Nonlinear programming, dynamic programming, integer programming, combinational optimization, transportation and assignment problems.

Unit-III: Networks flows, simple inventory models, Queuing Models and Networks, global optimization techniques and their applications.

4. READINGS
   4.1 TEXTBOOK::
   4.2 REFRENCE BOOKS::
   4.3 5. OTHER SESSIONS
      5.1 *TUTORIALS:: No
      5.2 *LABORATORY:: No
      5.3 *PROJECT:: No

6. ASSESSMENT (indicative only)
6.1 HA:: [05% GRADE]
6.2 QUIZZES-HA:: [05% GRADE]
6.3 PERIODICAL EXAMS:: [30% GRADE]
6.4 *PROJECT:: [xx% GRADE]
6.5 FINAL EXAM:: [50% GRADE]
7. OUTCOME OF THE COURSE:: Understanding the concepts of Operations Research
8. *EXPECTED ENROLLMENT FOR THE COURSE:: 25
9. *DEPARTMENTS OTHER THAN YOUR OWN TO WHICH THIS COURSE WOULD BE OF INTEREST:: CSE, MnC
10. *ANY OTHER REMARKS:: None

Information Retrieval

1. GENERAL
1.1 TITLE:: **Information Retrieval**
1.2 *COURSE NUMBER (if known):: DE.CSE305.16
1.3 CREDITS:: 9
1.4 SEMESTER-OFFERED:: VI
1.5 PRE-REQUISITES:: DBMS

2. OBJECTIVE:: Objective of the course is to introduce students to Information Retrieval systems. Expose them to various retrieval models with emphasis on pros and cons of these models. Discuss mechanisms of web search along with the details of ranking algorithms. Introduce basic concepts of text categorization and recommender systems.

1. COURSE TOPICS::

Unit-I: Introduction to Information Retrieval: Goals and history of IR. The impact of the web on IR, unstructured and semi-structured text. Basic IR Models Inverted index and Boolean queries. Boolean and vector-space retrieval models; ranked retrieval; text-similarity metrics; TF-IDF (term frequency/inverse document frequency) weighting; cosine similarity; Basic Tokenizing, Indexing, and Implementation of Vector-Space Retrieval: Simple tokenizing, stop-word removal, and stemming; inverted indices; efficient processing with sparse vectors

Unit-II: Experimental Evaluation of IR: Performance metrics: recall, precision, and F-measure;
Query Operations: Relevance feedback; Query expansion; Query languages.
Text Representation: Word statistics; Porter stemmer; index term selection; using thesauri. metadata and markup languages (SGML, HTML, XML)

Unit-III: Web Search: Introduction; Spidering; Interfaces; Link Analysis
Text Categorization: Categorization algorithms; Language-Model Based Retrieval;
Text Clustering; Applications to web search and information organization.

Unit-IV: Recommender Systems: Collaborative filtering and content-based recommendation of documents and products. Information Extraction and Integration: Extracting data from text;
semantic web; collecting and integrating specialized information on the web.

4. READINGS
4.1 TEXTBOOK:: Manning, Raghavan and Schutze, “Introduction to Information Retrieval”, Cambridge University Press.
4.2 *REFERENCE BOOKS:: Baeza-Yates and Ribeiro-Neto, “Modern Information Retrieval”, Addison-Wesley
5. OTHER SESSIONS
5.1 *TUTORIALS:: nil
5.2 *LABORATORY:: nil
5.3 *PROJECT:: Yes
6. ASSESSMENT (indicative only)
6.1 HA:: [xx% GRADE]
6.2 QUIZZES-HA:: [xx% GRADE]
6.3 PERIODICAL EXAMS:: [30% GRADE] 30
6.4 *PROJECT:: [30% GRADE] 30
6.5 FINAL EXAM:: [40% GRADE]40
7. OUTCOME OF THE COURSE:: Students will be able to design a Retrieval system.
8. *EXPECTED ENROLLMENT FOR THE COURSE:: All the 8th Sem IDD students of CSE
9. *DEPARTMENTS OTHER THAN YOUR OWN TO WHICH THIS COURSE WOULD BE OF INTEREST:: None

Stream Project/ UG Project

1. GENERAL
1.1 TITLE:: **Stream Project/ UG Project**
1.2 *COURSE NUMBER (if known):: DP.CSE392.16
1.3 CREDITS:: [0-0-5] 5
1.4 SEMESTER-OFFERED:: VI (Fifth)
1.5 PRE-REQUISITES:: Basic knowledge of stream/core subjects, Data Structures, Algorithm, Computer Programming
2. OBJECTIVE:: The specific objectives of the course could depend on the problem definition for the project but the overall performance must be measured on the following criteria.
a. Problem statement and literature survey- Students should be able to define the problem statement with clearly specified inputs and outputs. Goals for complex problems could evolve over time but it is necessary to have one in the beginning. A brief survey of the available literature and an initial draft of possible directions should suffice.
b. Modeling or Theoretical results- An appropriate model should be chosen for the problem. They should be able to reason the pros and cons of various models and choose a suitable one. It is important that they be in a position to defend their choices. The model should also involve the criteria by which they will quantify and test its performance. In case of theoretical work one should be able to describe the underlying mathematical basis of such problems in the literature.
c. Engineering or Mathematical tools- Numerous available methods could be put to use in implementing and testing the described model. They should demonstrate the ability to learn and put various methods to use. In theoretical study, grasp of mathematical tools used to put together a coherent argument or proof deriving the necessary results should be demonstrated.
d. Demonstration and Presentation- A model designed and implemented (or results derived or proved in case of theory) should be convincingly presented to showcase its positive and negative aspects. A demonstration to this end where applicable or a presentation in case of theoretical contributions should clearly describe the work. The work need not necessarily be novel or original and could be a clear exposition of otherwise hard concepts or a new perspective. The purpose is to measure understanding of the techniques and methods used and to appreciate the results in the larger context of their applicability in science and engineering. It is important to emphasize early on, the effort and time it takes to make a work presentable which is usually underestimated by most students.
A combination of the above criteria can be used to grade the work. Typically the following guidelines could be helpful for projects taken up as part of different semesters.
Semesters III/IV/V- Statement and Survey 25%, Engineering/Math Tools/Derivations 40%, Demonstration and Presentation 35%
Semesters VI/VII/VIII- Statement and Survey 20%, Modeling/Results 30%, Engineering/Math Tools/Derivations 30%, Demonstration and Presentation 20%
3. COURSE TOPICS:: Choice of student and the instructor.
4. READINGS 4.1 TEXTBOOK::Instructor's choice. 4.2 *REFERENCE BOOKS::
5. OTHER SESSIONS 5.1 *TUTORIALS:: No 5.2 *LABORATORY:: Yes 5.3 *PROJECT::Yes
6. ASSESSMENT (indicative only)
6.1 HA:: [0% GRADE] 6.2 QUIZZES-HA:: [0% GRADE] 6.3 PERIODICAL EXAMS:: [0% GRADE]
6.4 *PROJECT:: [100% GRADE] 6.5 FINAL EXAM:: [0% GRADE]
7. OUTCOME OF THE COURSE:: Project goals as defined by the instructor.
8. *EXPECTED ENROLLMENT FOR THE COURSE::
9. *DEPARTMENTS OTHER THAN YOUR OWN TO WHICH THIS COURSE WOULD BE OF INTEREST:: Institute must encourage projects spanning multiple departments. Department should not be a constraint and there should a framework to collaborate and contribute productively. Advising and grading structure should be worked out appropriately to avoid hassles for the students and to ensure smooth progress of the project. Such collaboration fosters innovation and facilitates functional solutions to socially relevant problems. 10. *ANY OTHER REMARKS:: None

IH.H301.16: Humanities Course – New

Syllabus to be included

COMPILER DESIGN

1. GENERAL
1.1 THEORY :: **COMPILER DESIGN**
1.2 *COURSE NUMBER (if known):: DC.CSE401.17
1.3 CREDITS:: [3-0-0] 9
1.4 SEMESTER-OFFERED:: VIII
1.5 PRE-REQUISITES:: Discrete Maths, Data structures, Algorithms, Programming
2. OBJECTIVE:: The objective of this course is to provide basic definitions that are associated with compiler design and to give an overview, applications, environment of compiler.
3. COURSE TOPICS::
Unit-I:
Introduction, Language and Syntax, Regular Language, Analysis of Context-free Language, Attributed Grammars and Semantics, Problem of Compilation i.e. Translation, Analysis-Synthesis Technique for Language Processing, Natural and Programming Languages, Compiler, Assembler and Interpreters, passes of a complier/interpreter.Lexical analysis, Lexical or Tokens Symbol Table, Hashing.

Unit-II:
Parser, Formal Grammar and Languages, BNF and Syntax diagram. Notation for Formal Grammar, Shift Reduce Parser- (SLR, LALR etc.). Precedence Parsing Techniques, Recursive Descent parsing etc. Semantic Analysis, Internal Form, Polish Strings, Syntax Trees Quadruples Triples and Indirect Triples.

Unit-III:
Synthesis, Code Optimization and Generation, Run Time Storage Handling, Error Detection, Correction and Reporting.

4. READINGS:: After studying the course the readers are familiar with compiler design.
4.1 TEXTBOOK:: Compiler Design, Aho-Ullman-Sethi, Pearson Education.

4.2 *REFERENCE BOOKS::
Compiler Construction ***Niklaus*** **Wirth. Zurich 2005** . Revised version available on open text on Internet ***originally*** published by ***Addison*** W***esley*** in 1996.
5. OTHER SESSIONS
5.1 *TUTORIALS:: No 5.2 *LABORATORY:: No 5.3 *PROJECT::
6. ASSESSMENT (indicative only)
6.1 HA:: [10% GRADE] 6.2 QUIZZES-HA:: [10% GRADE] 6.3 PERIODICAL EXAMS:: [40% GRADE]
6.4 *PROJECT:: [xx% GRADE] 6.5 FINAL EXAM:: [50% GRADE]
7. OUTCOME OF THE COURSE:: After completing this course/subject the students will be able to understand the concepts of compiler design and will be able to design a compiler for a high level language.
8. *EXPECTED ENROLLMENT FOR THE COURSE:: 85
9. *DEPARTMENTS OTHER THAN YOUR OWN TO WHICH THIS COURSE WOULD BE OF INTEREST:: None
10. *ANY OTHER REMARKS:: None

Natural Language Processing

1. GENERAL

1.1 TITLE**:: Natural Language Processing**

1.2 *COURSE NUMBER (if known):: BE.**CSE411**.16/ **OE.CSO.411.16**

1.3 CREDITS:: [3-0-0] 9

1.4 SEMESTER-OFFERED:: V/VII

1.5 PRE-REQUISITES:: Programming, Data Structures and Algorithms, Databases

2. OBJECTIVE::

1. To introduce problem solving methods and algorithm development. 2. To teach programming language C. 3. To teach how to design, code, debug and document programs using techniques of good programming style.

3. COURSE TOPICS::

UNIT-1: Introduction to NLP. Language Structure and Analyzer - Overview of language, requirement of computational grammar. Words and their Analysis. Tokenization. Stemming. Morphological Analysis. POS tagging.

UNIT-2: Local word grouping. Paninian Grammar - The semantic model, Free word order and vibhakti, Paninian theory, Active, Passive, Central. Paninian Parser - Core parser, constraint parser, preference over parses, lakshan charts, sense disambiguation. Machine Translation.

UNIT-3: Lexical functional grammar, LFG and Indian languages, Tree Adjoining Grammar, Comparing TAG and PG. Government and Binding, Comparing GB with PG. Automatic parsing: rules based and statistical. Introduction to some other NLP problems.

4. READINGS

4.1 TEXTBOOK::

A. Speech and Language Processing by Jurafsky and Martin

B. Natural Language Processing: A Paninian Perspective by Akshar Bharati, Vineet Chaitanya and Rajeev Sangal

4.2 *REFERENCE BOOKS::

5. OTHER SESSIONS

5.1 *TUTORIALS:: One tutorial session for clearing doubts and class assignments etc.

5.2 *LABORATORY:: None

5.3 *PROJECT:: A project towards the end of the course

6. ASSESSMENT (indicative only)

6.1 HA:: 7% GRADE

6.2 QUIZZES-HA:: 6% GRADE

6.3 Class and Lab Assignments:: 7% GRADE

6.4 PERIODICAL EXAMS:: 25% GRADE

6.5 *PROJECT:: 15%

6.6 FINAL EXAM:: 40% GRADE

7. OUTCOME OF THE COURSE::

1. Understand NLP problems and survey the literature about that problem 2. Propose a new or adapted technique for solving that problem 3. Evaluate and compare the results with other approaches 4. Implement the technique as a tool usable by others

8. *EXPECTED ENROLLMENT FOR THE COURSE:: 85

9. *DEPARTMENTS OTHER THAN YOUR OWN TO WHICH THIS COURSE WOULD BE OF INTEREST:: All departments

10. *ANY OTHER REMARKS:: None

Distributed Computing

1. GENERAL

1.1 TITLE:: **Distributed Computing**

1.2 *COURSE NUMBER (if known):: DE.CSE421.17/OE.CSE421.17

1.3 CREDITS:: [3-0-0] 9

1.4 SEMESTER-OFFERED:: VII

1.5 PRE-REQUISITES:: Computer networks, operating system, algorithms

2. OBJECTIVE:: This course covers a series of current cloud computing technologies, including technologies for Infrastructure as a Service, Platform as a Service, Software as a Service, and Physical Systems as a Service.

The course is also highly project oriented, involving hand-on exploration of existing technologies as well as development of new technologies.

1. COURSE TOPICS::

Unit-I: Overview of Computing Paradigm, Recent trends in Computing. Grid Computing, Cluster Computing, Distributed Computing, Utility Computing.

Unit-II: Cloud Computing, Introduction to Cloud Computing, History of Cloud Computing, Cloud service providers, Pros and Cons of Cloud Computing, Benefits of Cloud Computing, Cloud computing vs. Cluster computing vs. Grid computing, Cloud Computing Architecture, Service Models (XaaS), Infrastructure as a Service(IaaS), Platform as a Service(PaaS), Software as a Service(SaaS).

Unit-III: Deployment Models, Public cloud, Private cloud, Hybrid cloud, Community cloud, Cloud security, Case Study on Open Source & Commercial Clouds: Eucalyptus, Microsoft Azure, Amazon EC2.

Related research papers

4. READINGS

4.1 TEXTBOOK::

Distributed Computing by Dollymore

Cloud Computing (Wind) by Dr. Kumar Saurabh, 2nd Edison, Wiley India

4.4 REFRENCE BOOKS:: Cloud Computing: Principles and Paradigms, Editors: Rajkumar Buyya, James Broberg, Andrzej M. Goscinski, Wile, 2011

Cloud Computing: Principles, Systems and Applications, Editors: Nikos Antonopoulos, Lee Gillam, Springer, 2012

5. OTHER SESSIONS

5.1 *TUTORIALS::No 5.2 *LABORATORY:: No 5.3 *PROJECT:: Yes

6. ASSESSMENT (indicative only)

6.1 HA:: [5% GRADE] 6.2 QUIZZES-HA:: [5% GRADE] 6.3 PERIODICAL EXAMS:: [30% GRADE]

6.4 *PROJECT:: [10% GRADE] 10%

6.5 FINAL EXAM:: [50% GRADE]

7. OUTCOME OF THE COURSE:: Applying key comparative methodologies to assess the comparative advantages and disadvantages of public vs. private computing clouds

Applying relevant methods to assess the important security and sustainability challenges involved in adopting various cloud architectures and making informed decisions for the organizations

8. *EXPECTED ENROLLMENT FOR THE COURSE:: 25

9. *DEPARTMENTS OTHER THAN YOUR OWN TO WHICH THIS COURSE WOULD BE OF INTEREST:: None

10. *ANY OTHER REMARKS:: None

Stream Project/ UG Project

1. GENERAL
1.1 TITLE:: **Stream Project/ UG Project**
1.2 *COURSE NUMBER (if known):: DP.CSE491.17
1.3 CREDITS:: [0-0-10] 10
1.4 SEMESTER-OFFERED:: VII (Seventh)
1.5 PRE-REQUISITES:: Basic knowledge of stream/core subjects, Data Structures, Algorithm, Computer Programming

2. OBJECTIVE:: The specific objectives of the course could depend on the problem definition for the project but the overall performance must be measured on the following criteria.

a. Problem statement and literature survey- Students should be able to define the problem statement with clearly specified inputs and outputs. Goals for complex problems could evolve over time but it is necessary to have one in the beginning. A brief survey of the available literature and an initial draft of possible directions should suffice.

b. Modeling or Theoretical results- An appropriate model should be chosen for the problem. They should be able to reason the pros and cons of various models and choose a suitable one. It is important that they be in a position to defend their choices. The model should also involve the criteria by which they will quantify and test its performance. In case of theoretical work one should be able to describe the underlying mathematical basis of such problems in the literature.

c. Engineering or Mathematical tools- Numerous available methods could be put to use in implementing and testing the described model. They should demonstrate the ability to learn and put various methods to use. In theoretical study, grasp of mathematical tools used to put together a coherent argument or proof deriving the necessary results should be demonstrated.

d. Demonstration and Presentation- A model designed and implemented (or results derived or proved in case of theory) should be convincingly presented to showcase its positive and negative aspects. A demonstration to this end where applicable or a presentation in case of theoretical contributions should clearly describe the work. The work need not necessarily be novel or original and could be a clear exposition of otherwise hard concepts or a new perspective. The purpose is to measure understanding of the techniques and methods used and to appreciate the results in the larger context of their applicability in science and engineering. It is important to emphasize early on, the effort and time it takes to make a work presentable which is usually underestimated by most students.

A combination of the above criteria can be used to grade the work. Typically the following guidelines could be helpful for projects taken up as part of different semesters.

Semesters III/IV/V- Statement and Survey 25%, Engineering/Math Tools/Derivations 40%, Demonstration and Presentation 35%

Semesters VI/VII/VIII- Statement and Survey 20%, Modeling/Results 30%, Engineering/Math Tools/Derivations 30%, Demonstration and Presentation 20%

3. COURSE TOPICS:: Choice of student and the instructor.

4. READINGS
4.1 TEXTBOOK:: Instructor's choice.
4.2 *REFERENCE BOOKS::

5. OTHER SESSIONS
5.1 *TUTORIALS::
5.2 *LABORATORY::
5.3 *PROJECT::

6. ASSESSMENT (indicative only)
6.1 HA:: [0% GRADE]
6.2 QUIZZES-HA:: [0% GRADE]
6.3 PERIODICAL EXAMS:: [0% GRADE]
6.4 *PROJECT:: [100% GRADE]
6.5 FINAL EXAM:: [0% GRADE]

7. OUTCOME OF THE COURSE:: Project goals as defined by the instructor.

8. *EXPECTED ENROLLMENT FOR THE COURSE::

9. *DEPARTMENTS OTHER THAN YOUR OWN TO WHICH THIS COURSE WOULD BE OF INTEREST:: Institute must encourage projects spanning multiple departments. Department should not be a constraint and there should a framework to collaborate and contribute productively. Advising and grading structure should be worked out appropriately to avoid hassles for the students and to ensure smooth progress of the project. Such collaboration fosters innovation and facilitates functional solutions to socially relevant problems.
10. *ANY OTHER REMARKS::

Academic Writing for Science and Technology

2. GENERAL
1.1 TITLE: ACADEMIC WRITING FOR SCIENCE AND TECHNOLOGY
1.2 *COURSE NUMBER::LM.**HL 501**.14
1.3 CREDITS:: 2-1-0 — 8
1.4 *SEMESTER-OFFERED:: Both
1.5 Syllabus Committee: Prof. P, K. Panda
3. OBJECTIVE

To acquaint the students to the rhetoric of academic/research writing.
4. COURSE CONTANT

ACADEMIC WRITING FOR SCIENCE AND TECHNOLOGY
1. Introduction to English for special purpose(ESP)
(a) Theory and practice of academic writing (English for global communication needs)
(b) Overcoming writer‘s block(from outlining to Story boarding)
(c) Introduction to types of discourse(Expressive, expository, persuasive, analytical)
(d) Critical thinking in academic writing(Ability to select and reject content)
(e) Basics of writing (clarity in use of words and sentences)
(f) Creating textual dynamics and concepts of formatting.
2. Organization principles in academic writing
(a) Problem Solution
(b) Chronological
(c) Spatial
(d) Order of priority
(e) Sequential
(f) Cause and effect
(g) Analytical
(h) Formal classification
(i) Partitioning
(j) Segmenting
3. Preparation of Pictorial presentations (types and utility)
(a) Pictures
(b) Graphs
(c) Charts
(d) Figures

(e) Diagrams

4. Self-editing procedures:

(a) Adding,
(b) Deleting,
(c) Comparing,
(d) Contrasting,
(e) Linking,
(f) Grammar Check,
(g) Spell Check,
(h) Proofreading etc.

5. Introduction to Documentation and style manuals

(A) Integratingothers‘ text into research material
(a) Quoting
(b) Paraphrasing
(c) Summarizing
(d) Writing a thesis statement
(e) Writing introduction and conclusion
(B) Introduction to different types of standard documentation procedures (MLA, APA, IEEE etc.)

6. Introduction to IPR (intellectual property rights and plagiarism)

(a) Intellectual property right
(b) Introduction to Copy Right laws
(c) How to avoid plagiarism

7. Writing assignments

(a) Research papers
(b) Technical Reports
(c) News letters
(d) Book reviews
(e) Organization profiles

5. READINGS

4.1 TEXTBOOK::

4.2 *REFERENCE BOOKS::

1. How to Write and Publish a Scientific Paper. R.A. Day. Greenwood Press. 2011.
2. Scientific English: a guide to scientist and professionals. 2ndEdn. R.A. Day. Orient Black swan. 2000.
3. Assignment and Thesis Writing. 4th Edition. Millicent Poole and Jonathan Anderson. Wiley and Sons. 2011.
4. Science and Technical writing. Philip Ruben. 2ndEdn. Rutledge (Foundation Books). 2004.
5. Critical Thinking, Academic Writing and Presentation Skills. Marilyn Anderson. Promod K. Nayar and Madhuchanda Sen. Pearson. 2012.

6.1 FINAL EXAM::

6. OUTCOME OF THE COURSE::

Students will gain practical knowledge to prepare documents necessary for academic purposes.

Computer Networks

1. GENERAL
1.1 THEORY :: **Computer Networks**
1.2 *COURSE NUMBER (if known):: DC.CSE401.17
1.3 CREDITS:: [3-0-2] 11 Credits
1.4 SEMESTER-OFFERED:: Seventh (VII)
1.5 PRE-REQUISITES:: Data structures, Computer System Organization, Operating system, Programming
2. OBJECTIVE:: The objective of this course is to provide basic exposure to computer networks theory and implementations
3. COURSE TOPICS::

Unit-I
Introduction – Uses of networks, hardware, software, classification, reference, models, and examples networks, standardization.
Physical layer – Theoretical basis, guided transmission medium, wireless transmission, communication satellites, PSTN, mobile telecom system.
Data link layer – Design issues, error detection and correction, protocols. Medium access control sublayer-channel allocation, multiple access protocols, Ethernet, wireless LANs,
broadband wireless, bluetooth, switching.

Unit-II
Network layer – Routing algorithms, congestion control, QoS, internet working.
Transport layer – UDP, TCP, performance issues, service models, remote procedure call, real time transport protocol.

Unit-III
Application layer – DNS, E-mail, world wide web, HTTP, multimedia. Network security- basic concepts.
Selected Topics in computer networks.

4. READINGS:: After studying the course the students are familiar with computer network concepts and applications.
4.1 TEXTBOOK::

1. "Computer Networks", 4th ed., A.S. Tanenbaum, PHI.
2. "Data communication and Networking", Behrouz *A. Forouzan.*

4.2 *REFERENCE BOOKS:: As prescribed by instructor.
5. OTHER SESSIONS
5.1 *TUTORIALS:: NIL 5.2 *LABORATORY:: 02 hours/week 5.3 *PROJECT:: Mini Projects
6. ASSESSMENT (indicative only)
6.1 HA:: [10% GRADE] 6.2 QUIZZES-HA:: [0% GRADE] 6.3 PERIODICAL EXAMS:: [30% GRADE]
6.4 *PROJECT:: [10% GRADE] 6.5 FINAL EXAM:: [50% GRADE]
7. OUTCOME OF THE COURSE:: After completing this course/subject the students will be able to understand the concepts of computer networks.
8. *EXPECTED ENROLLMENT FOR THE COURSE:: 85
9. *DEPARTMENTS OTHER THAN YOUR OWN TO WHICH THIS COURSE WOULD BE OF INTEREST:: None
10. *ANY OTHER REMARKS:: -

Pattern Recognition

1. GENERAL

1.1 TITLE:: **Pattern Recognition**

1.2 *COURSE NUMBER (if known):: BE.CSE412.17/OE.CSE412.17

1.3 CREDITS:: [3-0-2] 11 Credits 1.4 SEMESTER-OFFERED:: VIII

1.5 PRE-REQUISITES::

Algorithms, Probability theory.

2. OBJECTIVE::

This course deals with pattern recognition which has several important applications. For example, multimedia document recognition (MDR) and automatic medical diagnosis are two such.

3. COURSE TOPICS::

Unit-I

Preliminary concepts and pre-processing phases, coding, normalization, filtering, linear prediction, Feature extraction and representation thresholding, contours, regions, textures, template matching.

Unit-II

Data structure for pattern recognition, statistical pattern recognition, clustering Technique and application. Study of pattern classifiers: Supervised and unsupervised.

Unit-III

Pattern Classifiers: Naïve Bayes, Linear Discriminant Analysis, k- nearest neighbour (K-NN), Artificial Neural Network etc. and Case studies.

4. READINGS

4.1 TEXTBOOK::

1. R.O.Duda, P.E.Hart and D.G.Stork, Pattern Classification, John Wiley, 2001.
2. K. Fukunaga, Statistical pattern Recognition; Academic Press, 2000.
3. Devi V.S.; Murty, M.N., Pattern Recognition: An Introduction, Universities Press, Hyderabad, 2011

4.2 *REFERENCE BOOKS::

1. S.Theodoridis and K.Koutroumbas, Pattern Recognition, 4th Ed., Academic Press, 2009.

5. OTHER SESSIONS

5.1 *TUTORIALS:: No 5.2 *LABORATORY:: 02 hours/week 5.3 *PROJECT:: Mini projects

6. ASSESSMENT (indicative only)

6.1 HA:: [10% GRADE] 6.2 QUIZZES-HA:: [0% GRADE] 6.3 PERIODICAL EXAMS:: [30% GRADE] 6.4 *PROJECT:: [10% GRADE] 6.5 FINAL EXAM:: [450% GRADE]

7. OUTCOME OF THE COURSE::

The students shall after the course be able to

* design systems and algorithms for pattern recognition , with focus on sequences of patterns that are analyzed using, e.g., hidden Markov models (HMM).
* analyse classification problems probabilistically and estimate classifier performance.
* understand and analyse methods for automatic training of classification systems.
* apply Maximum-likelihood parameter estimation in relatively complex probabilistic models, such as mixture density models and hidden Markov models.
*Study and implementation of various supervised and un-supervised classifiers

8. *EXPECTED ENROLLMENT FOR THE COURSE:: 50

9. *DEPARTMENTS OTHER THAN YOUR OWN TO WHICH THIS COURSE WOULD BE OF INTEREST:: MnC, Biomedical Engg., EE, ECE

10. *ANY OTHER REMARKS:: None

Machine Learning

Course Name: **Machine Learning**
Semester offered : VIII
Credits: 3-0-0 (9)
Course Code: **BE.CSE422.17/ OE.CSE422.17**
Topics: Statistical Machine Learning and other related topics.
Detailed course contents to be included.

Biometrics

1. GENERAL
1.1 TITLE:: **Biometrics**
1.2 *COURSE NUMBER (if known):: **BE.CSE413.17/ OE.CSE413.17**
1.3 CREDITS:: [3-0-2] 11
1.4 SEMESTER-OFFERED:: VIII
1.5 PRE-REQUISITES:: Computer Vision
2. OBJECTIVE: This course concentrates on the unique advantages that biometrics brings to computer security, but also addresses challenging issues such as security strength, recognition rates, and privacy, as well as alternatives of passwords and smart cards.
3. COURSE TOPICS:
Unit-I: Introduction to Biometrics, Review of related theories/terms, Face Recognition
Unit-II: Iris Recognition, Fingerprint Recognition, Voice/Speaker recognition, Other Biometrics, Multimodal Biometrics.
Unit-III: Privacy and other issues in biometrics, Applications of biometrics & future trends.
4. READINGS
4.1 TEXTBOOK::
Anil K Jain, Patrick Flyn, Arun A Ros, “Handbok of Biometrics”, Springer, 208
Biometrics, J. D. Woodward, N. M. Orlans, P.T. Higgins, McGraw-Hill Osborne Media, 2002.
4.2 *REFERENCE BOOKS::
Samir Nanavati, Michael Thieme, Raj Nanavati, “Biometrics – Identiy Verifcation in a Networked World”,
Paul Reid, “Biometrics for Network Security”, Pearson Education
3. John R Vaca, “Biometric Technologies and Verifcation Systems”,
5. OTHER SESSIONS
5.1 *TUTORIALS:: No
5.2 *LABORATORY:: Yes
5.3 *PROJECT:: Yes
6. ASSESSMENT (indicative only)
6.1 HA:: [10% GRADE]
6.2 QUIZZES-HA:: [xx% GRADE]
6.3 PERIODICAL EXAMS:: [30% GRADE]
6.4 *PROJECT:: [10% GRADE]
6.5 FINAL EXAM:: [50% GRADE]
7. OUTCOME OF THE COURSE: Students will gain knowledge in the building blocks of this field: pattern recognition, security and privacy, and secure systems design. The formal component of the course will involve a research project, writing a research paper, and making a presentation on a subject.
8. *EXPECTED ENROLLMENT FOR THE COURSE:: 50
9. *DEPARTMENTS OTHER THAN YOUR OWN TO WHICH THIS COURSE WOULD BE OF INTEREST:: MnC, EE, ECE
10. *ANY OTHER REMARKS:: None

Seminar

Course Name: **Seminar**
Semester offered : VIII
Credits: 0-0-3 (3)
Course Code: DC.CSE402.17
Topics: Each and every student has to deliver a seminar on recent research/technical topics related to CSE through power point presentations. Duration of presentation should be minimum of 30 minutes.
Detailed breakup of marks to be decided by the course instructor depending on quality of content, presentation, answer to queries, communication skills etc.

NEURAL NETWORKS

1. GENERAL
1.1 TITLE:: **NEURAL NETWORKS**
1.2 *COURSE NUMBER (if known):: DE.CSE451.17
1.3 CREDITS:: [3-0-0] 9 Credits
1.4 SEMESTER-OFFERED:: VII
1.5 PRE-REQUISITES:: AI, Prob and Statistics, Algorithms, Data Structure
2. OBJECTIVE:: To teach fundamentals of neuro computing with applications to computer engg problems.
3. COURSE TOPICS:: Unit I (~ 10 hours): Introduction, preliminaries, biological perspective, ANN building blocks, Single unit mappings, learning algorithms
Unit II (~ 10 hours): Feed forward networks, architectures and training algorithms, learnability theorems, stochastic optimization as a training paradigm, network minimization
Unit III(~ 9 hours) Recurrent networks, BAM, Self-organization, Fuzzy NNs, Hardware implementations
4. READINGS
4.1 TEXTBOOK:: Jacek Zurada: Neural Networks
Bose and Liang: Neuro computing

4.2 *REFERENCE BOOKS::
5. OTHER SESSIONS
5.1 *TUTORIALS:: nil
5.2 *LABORATORY:: nil
5.3 *PROJECT:: Implementation based on a recent paper
6. ASSESSMENT (indicative only)
6.1 HA:: [10% GRADE]
6.2 QUIZZES-HA:: [10% GRADE]
6.3 PERIODICAL EXAMS:: [30% GRADE]
6.4 *PROJECT:: [10% GRADE]
6.5 FINAL EXAM:: [50% GRADE]
7. OUTCOME OF THE COURSE:: Students will develop appreciation of brain like connectionist computing and their application to hard CS problems
8. *EXPECTED ENROLLMENT FOR THE COURSE:: 85
9. *DEPARTMENTS OTHER THAN YOUR OWN TO WHICH THIS COURSE WOULD BE OF INTEREST::None
10. *ANY OTHER REMARKS:: None

Fault Tolerant Computing

1. GENERAL

1.1 TITLE:: Fault Tolerant Computing

1.2 *COURSE NUMBER (if known):: DE.CSE452.17

1.3 CREDITS:: [3-0-0] 9

1.4 SEMESTER-OFFERED:: VII

1.5 PRE-REQUISITES:: Basics of Software Engineering , Distributed System, Database Management System-, Computer Network , Computer organization.

2. OBJECTIVE::.

- Hardware and software fault tolerant with concurrency.
- To examine the concepts and techniques for redundant designs which can make a system fault tolerant, i.e. still functioning correctly in the presence of failures, in hardware, software and communications.
- To discuss the importance of fault tolerance in the design of safety critical systems.
- To examine testing techniques and algorithms in hardware, software and communications.

1. COURSE TOPICS::

Unit-I: Models of Computers with faults, Classification of faults and failures, Fault tolerance by massive redundancy.

Unit-II: Fault detection, recovery and reconfiguration, modeling, Case study of representative fault tolerant computing systems, Software reliability, N-modular redundancy, N-version Programming.

Unit III: Fault tolerance in concurrent software, Gracefully degrading systems, performability, Architectural design of fault tolerant computing systems.

4. READINGS

4.1 TEXTBOOK:: 1. Fault Tolerant Systems by I. Koren and C.M. Krishna.

4.2 *REFERENCE BOOKS::

1. Design and Analysis of Fault-Tolerant Digital Systems Barry W. Johnson.

5. OTHER SESSIONS

5.1 *TUTORIALS::

5.2 *LABORATORY:: No

5.3 *PROJECT:: Different Projects are Given to each student or group of students

6. ASSESSMENT (indicative only)

6.1 HA:: [10% GRADE] 6.2 QUIZZES-HA:: [xx% GRADE] 6.3 PERIODICAL EXAMS:: [30% GRADE]

6.4 *PROJECT:: [xx% GRADE]

6.5 FINAL EXAM:: [60% GRADE]

7. OUTCOME OF THE COURSE:: To develop an understanding of the issues of reliability and its evaluation in the design of computer systems, and to emphasize their importance.

8. *EXPECTED ENROLLMENT FOR THE COURSE:: 85

9. *DEPARTMENTS OTHER THAN YOUR OWN TO WHICH THIS COURSE WOULD BE OF INTEREST:: None

10. *ANY OTHER REMARKS:: None

Real Time Systems

1. GENERAL

1.1 TITLE:: **Real Time Systems**

1.2 *COURSE NUMBER (if known):: DE.CSE453.17

1.3 CREDITS:: [3-0-0] 9 1.4 SEMESTER-OFFERED:: VII

1.5 PRE-REQUISITES::

2. OBJECTIVE::

Student Learning Objectives:

- Real-time scheduling and schedulability analysis
- Formal specification and verification of timing constraints and properties
- Design methods for real-time systems
- Development and implementation of new techniques to advance the state-of-the-art real-time systems research

2. COURSE TOPICS::

Unit-I: Real Time System - Issues in Real-Time Computing, Structure of a Real-Time Systems, Characterizing Real-Time System and Tasks. Task Assignment and Scheduling- Classical Uniprocessor Scheduling Algorithms, Uniprocessor Scheduling of IRIS Tasks, Fault-Tolerant Scheduling. Programming Language and Tools- Desired Language Characteristics, Data Typing, Control Structure, Facilitating Hierarchical Decomposition, Packages, Run-Time Error (Exception) Handling etc.

Unit-II: Real-Time Databases – Basic Definition, Real-Time vs. General-Purpose Databases, Main Memory Databases, Transaction Priorities, Transaction Aborts, Concurrency Control Issues, Disk Scheduling Algorithms. Databases for Hard Real-Time Systems.

Unit-III: Real-Time Communication – Network Topologies, Protocols. Fault-Tolerance Techniques – Causes, Types, Detection, Fault and Error Containment, Redundancy, Data Diversity, Reversal Checks, Malicious or Byzantine Failures, Integrated Failure Handling. Reliability Evaluation Techniques. Clock Synchronization-Impact of Faults, Fault-Tolerant Synchronization in Hardware, Synchronization in Software.

4. READINGS

4.1 TEXTBOOK::

2. Rajib Mall, "Real-Time Systems: Theory and Practice," Pearson, 2008.
3. Jane W. Liu, "Real-Time Systems" Pearson Education, 2001.

4.2 *REFERENCE BOOKS:

1. Krishna and Shin, "Real-TIme Systems," Tata McGraw Hill. 1999.

5. OTHER SESSIONS

5.1 *TUTORIALS:: No 5.2 *LABORATORY:: No 5.3 *PROJECT::No

6. ASSESSMENT (indicative only)

6.1 HA:: [5% GRADE] 6.2 QUIZZES-HA:: [5% GRADE] 6.3 PERIODICAL EXAMS:: [40% GRADE]

6.4 *PROJECT:: [xx% GRADE] 6.5 FINAL EXAM:: [50% GRADE]

7. OUTCOME OF THE COURSE::

- An ability to understand advanced concepts in theory of computer science.
- An ability to understand advanced concepts in applications of computer science.
- An ability to apply knowledge of advanced computer science to formulate the analyze problems in computing and solve them.

8. *EXPECTED ENROLLMENT FOR THE COURSE:: 85

9. *DEPARTMENTS OTHER THAN YOUR OWN TO WHICH THIS COURSE WOULD BE OF INTEREST:: None

10. *ANY OTHER REMARKS:: None

Software Re-use and Re-engineering

1. GENERAL

1.1 TITLE:: **Software Re-use and Re-engineering**

1.2 *COURSE NUMBER (if known):: DE.CSE454.17

1.3 CREDITS:: [3-0-0] 9

1.4 SEMESTER-OFFERED:: VII

1.5 PRE-REQUISITES:: Software Engineering

2. OBJECTIVE:: To understand the concepts of Software Re-use and Re-engineering and applying them to the software development process.

3. COURSE TOPICS::

Unit-I

WHAT IS SOFTWARE REUSE? Origins of Software Reuse, Reuse and the Software Life Cycle, Software Reuse, Rapid Prototyping, and Evolving Systems, Typical Duties of Members of a Reuse Team , Reengineering and Reuse, Library Issues , Potential Disadvantages of Reuse, Legal and Contractual Issues with Software Reuse, The Current Status of Software Reuse Summary

TECHNIQUES : Domain Analysis, An Example - Domain Analysis of the Linux Operating System, Domain Analysis Revisited , Object-Oriented Approaches, Standard Interfaces, Designing for Reuse , Using Reuse to Drive Requirements Analysis, Metrics for Reuse.

REUSE LIBRARIES: General Reuse Library Issues, Organizational Issues for Reuse Libraries, Managerial Issues for Reuse Libraries, Research Issues in Reuse Library Organization, Reuse Libraries for C++ Language Software, Reuse Libraries for C Language Software, Reuse Libraries for Higher Level Language Software.

Unit-II

CERTIFICATION OF REUSABLE SOFTWARE COMPONENTS: The Need for Certification, The Difference Between Certification and Testing , Suggested Standards and Practices for Certification of Software Artifacts, Code Certification, Requirements Certification , Design Certification , Test Plan and Test Results Certification, Documentation Certification, System Certification, The Role of Metrics, An Overview of Software Reliability , Certification, Testing, and Reliability Modelling, Certification of Potentially Reusable Software Components is not Always Necessary.

THE ECONOMICS OF SOFTWARE REUSE: Life Cycle Leverage, Cost Models for Reuse Using the Classic Waterfall Life Cycle, Reuse in the Requirements or Specification Phase, Reuse in the Design phase, Reuse in the Coding phase, Reuse in the Testing and Integration phase, Reuse in the Maintenance phase, A Cost Model for Reuse Using the Rapid Prototyping Model , A Cost Model for Reuse for a System Developed Using the Spiral Model , A Cost Model for Reuse for a System Using Only COTS, Other Reuse-Based Cost Estimation Models , Estimation of Other Resources in Reuse-based Environments , The Economic Reuse Quantity.

Unit-III

REENGINEERING: Program Translation, An example of semantic reasoning in reengineering , Transitioning to an Object-Oriented System, Specifications for a File System Simulation, Procedurally-based System Design, Implementation Details for a Procedurally-based Disk Simulation, Source Code for Procedural System (Optional) , Reengineering a Procedurally-based System into an Object Oriented One, An Object-Oriented Disk Simulation Program 6.10 Source Code for an Object-Oriented Solution , Comparison of Object-Oriented and Procedural Solutions.

CASE STUDIES: Introduction, Methodology Used for the Collection of Metrics Data, Results , Recommendations , Some Reuse Activities at Hewlett-Packard , Hypothetical Failed Software Reuse Program.

TOOLS FOR SOFTWARE REUSE: The InQuisiX System of Reuse Tools , A Simple Text-Based System, The AT&T BaseWorX Application Platform, A Knowledge-Based Tool for Reuse, Issues with Network-based Tools for Software Reuse.

4. READINGS
4.1 TEXTBOOK::

SOFTWARE REUSE: METHODS, MODELS, AND COSTS by Ronald J. Leach, McGraw-Hill publishing company, New York.
4.2 *REFERENCE BOOKS:: As prescribed by the instructor.

5. OTHER SESSIONS
5.1 *TUTORIALS:: No
5.2 *LABORATORY::No
5.3 *PROJECT::Yes

6. ASSESSMENT (indicative only)
6.1 HA:: [10% GRADE]
6.2 QUIZZES-HA:: [xx% GRADE]
6.3 PERIODICAL EXAMS:: [30% GRADE]
6.4 *PROJECT:: [10% GRADE]
6.5 FINAL EXAM:: [50% GRADE]

7. OUTCOME OF THE COURSE:: Students will be able to understand the concepts of software re-use and re-engineering for software development process.

8. *EXPECTED ENROLLMENT FOR THE COURSE:: 30

9. *DEPARTMENTS OTHER THAN YOUR OWN TO WHICH THIS COURSE WOULD BE OF INTEREST:: None

10. *ANY OTHER REMARKS:: None

Advanced Databases

1. GENERAL
1.1 TITLE:: **Advanced Databases**
1.2 *COURSE NUMBER (if known):: **BE.CSE461.17**
1.3 CREDITS:: [3-0-2] 11 Credits
1.4 SEMESTER-OFFERED:: VIII
1.5 PRE-REQUISITES:: DBMS
2. OBJECTIVE:: To introduce students to the Advanced Database Systems. This course exposes students to Query and Transaction Processing . Advanced topics like Data Mining, Warehousing and Retrieval will be discussed.
3. COURSE TOPICS::
Unit-I: Fundamentals, Query Processing, Query Optimization.

Unit-II: Transactions, Concurrency Control, Recovery System, Database-System Architectures, Parallel Databases, Distributed Databases.

Unit-III: Data Warehousing and Mining, Information Retrieval, Object-Based Databases, XML

4. READINGS
4.1 TEXTBOOK:: Avi Silberschatz, Henry F. Korth and S. Sudarshan "Database and System Concepts" Sixth Edition, McGraw-Hill, 2010
4.2 *REFERENCE BOOKS:: Ramez Elmasri and Shamkant B. Navathe, "Fundamentals of Database Systems", 6rd Edition, Addison-Wesley, 2010
Raghu Ramakrishnan and Johannes Gehrke, "Database Management Systems" 3rd Edition, McGraw-Hill
5. OTHER SESSIONS
5.1 *TUTORIALS:: No
5.2 *LABORATORY:: Yes
5.3 *PROJECT:: Yes
6. ASSESSMENT (indicative only)
6.1 HA:: [10% GRADE]
6.2 QUIZZES-HA:: [xx% GRADE] 10
6.3 PERIODICAL EXAMS:: [30% GRADE] 20
6.4 *PROJECT:: [10% GRADE] 30
6.5 FINAL EXAM:: [50% GRADE] 40
7. OUTCOME OF THE COURSE:: Students will be able to understand various architectures of databases and will be able to contribute to the field.
8. *EXPECTED ENROLLMENT FOR THE COURSE::
9. *DEPARTMENTS OTHER THAN YOUR OWN TO WHICH THIS COURSE WOULD BE OF INTEREST:: MnC
10. *ANY OTHER REMARKS:: None

Data Compression

1. GENERAL
1.1 TITLE:: **Data Compression**
1.2 *COURSE NUMBER (if known):: DE.CSE462.17
1.3 CREDITS:: [3-0-0] 9 Credits
1.4 SEMESTER-OFFERED:: VIII
1.5 PRE-REQUISITES:: Discrete Maths and Data Structures

2. OBJECTIVE:: To learn the basic concepts of data compressions for compression of text, image, audio, and video for efficient storage and transmission of data over network.

3. COURSE TOPICS::

Unit-I: Mathematical Preliminaries – Information theory, average information content, Entropy. Source models-Physical, probabilistic, Markov, Composite models. Uniquely decodable codes.
Unit-II: Huffman coding, arithmetic coding, Dictionary techniques, predictive coding. JPEG-LS, CCITT group 3, 4 recommendations, comparison of MH, MR, MMR, JBIG.
Lossy coding – distortion criteria, Human visual system, conditional entropy, average mutual information, differential entropy.
Unit-III:
Scalar and vector quantization, differential encoding, transforms, sub-band and wavelets, video compression techniques and standards. Performance metrics for compression algorithms.

4. READINGS
4.1 TEXTBOOK::

- Introduction to Data Compression, 2nd ed., Khalid Sayood, Morgan Kaufmann publishers.

4.2 *REFERENCE BOOKS:: As prescribed by the instructor

5. OTHER SESSIONS
5.1 *TUTORIALS:: No
5.2 *LABORATORY::No
5.3 *PROJECT:: Yes
6. ASSESSMENT (indicative only)
6.1 HA:: [10% GRADE]
6.2 QUIZZES-HA:: [0% GRADE]
6.3 PERIODICAL EXAMS:: [30% GRADE]
6.4 *PROJECT:: [10% GRADE]
6.5 FINAL EXAM:: [50% GRADE]
7. OUTCOME OF THE COURSE::
Development of concepts of data compression for text, image, audio, and video.
8. *EXPECTED ENROLLMENT FOR THE COURSE:: 85
9. *DEPARTMENTS OTHER THAN YOUR OWN TO WHICH THIS COURSE WOULD BE OF INTEREST:: None
10. *ANY OTHER REMARKS:: None

Cyber Security

1. GENERAL
1.1 TITLE:: **Cyber Security**
1.2 *COURSE NUMBER (if known):: DE.CSE463.17
1.3 CREDITS:: [3-0-0] 9 Credits
1.4 SEMESTER-OFFERED:: VIII
1.5 PRE-REQUISITES:: Discrete Maths and Data Structures
2. OBJECTIVE:: This subject focuses on cyberthreats and cybersecurity, provides the much needed awareness in the times of growing cybercrime episode
Comprehensive treatment of important topic cybersecurity to help students understand the implications of cybercrime. The course provides adequate orientation on laws in reference to cybercrime and cybersecurity taking into account the Indian as well as global scenario.
Creating awareness through simple practical tips and tricks, educates readers to learn how to avoid becoming victims of cybercrime.

3. COURSE TOPICS::
Unit-I: Introduction. Phenomenon of cybercrime: Definitions, topology of cybercrime, development of computer crime and cybercrime, Extent and impact of cybercrime offences, Offences against the confidentiality, integrity and availability of computer data and systems, Content-related offences, Copyright and trademark related offences, Computer-related offences, Combination offences.
Unit-II: The challenges of fighting cybercrime: Opportunities, general challenges, and legal challenges. Capacity building: Cybersecurity and cybercrime, Capacity building methodology, Strategy as a starting point, the relevance of policy, the role of regulators in fighting cybercrime, high standards in developing countries.
Unit-III:
Overview of activities of regional and international organizations
Legal response: Definitions, substantive criminal law, digital evidence, jurisdiction, procedural law, international cooperation, Liability of Internet providers.

4. READINGS
4.1 TEXTBOOK::
a. Cybersecurity: Understanding cybercrime, phenomenon, challenges, and legal response
ITU Report, November' 2014 www.itu.int/ITU-D/cyb/cybersecurity/legislation.html
b. Cyber Security: Understanding Cyber Crimes, Computer Forensics and Legal Perspectives**,** By Nina Godbole and Sunit Belapure , Wiley India

4.2 *REFERENCE BOOKS:: As prescribed by the instructor

5. OTHER SESSIONS
5.1 *TUTORIALS:: No 5.2 *LABORATORY::No 5.3 *PROJECT:: Yes
6. ASSESSMENT (indicative only)
6.1 HA:: [10% GRADE] 6.2 QUIZZES-HA:: [0% GRADE] 6.3 PERIODICAL EXAMS:: [30% GRADE]
6.4 *PROJECT:: [10% GRADE] 6.5 FINAL EXAM:: [50% GRADE]
7. OUTCOME OF THE COURSE::
Development of concepts of data compression for text, image, audio, and video.
8. *EXPECTED ENROLLMENT FOR THE COURSE:: 85
9. *DEPARTMENTS OTHER THAN YOUR OWN TO WHICH THIS COURSE WOULD BE OF INTEREST:: None
10. *ANY OTHER REMARKS:: None

Soft Computing

1. GENERAL
1.1 TITLE:: **Soft Computing**
1.2 *COURSE NUMBER (if known):: **BE.CSE464.17/ OE.CSE464.17**:
1.3 CREDITS:: [3-0-2] 11 Credits
1.4 SEMESTER-OFFERED::
1.5 PRE-REQUISITES:: Probability and Statistics, Vectors, C++/Java/ Matlab programming.
2. OBJECTIVE:: In this course we will study the techniques of soft computing, especially evolutionary computation, fuzzy logic, GA and neural networks. We will begin with introductory discussions of how the techniques function in solving problems in the real world. Then we will move on to the hybrid of multiple techniques and how to choose the appropriate techniques for the problems that you want to solve.
3. COURSE TOPICS::
Unit-I: **Soft Computing:** Introduction, requirement, different tools and techniques, usefulness and applications.
Fuzzy sets and Fuzzy logic: Introduction, Fuzzy sets versus crisp sets, operations on fuzzy sets, Extension principle, Fuzzy relations and relation equations, Fuzzy numbers, Linguistic variables, Fuzzy logic, Linguistic hedges, Applications, fuzzy controllers, fuzzy pattern recognition, fuzzy image processing, fuzzy database.
Unit-II: **Artificial Neural Network:** Introduction, basic models, Hebb's learning, Adaline, Perceptron, Multilayer feed forward network, Back propagation, Different issues regarding convergence of Multilayer Perceptron, Competitive learning, Self-Organizing Feature Maps, Adaptive Resonance Theory, Associative Memories, Applications.
Unit-III: **Evolutionary and Stochastic techniques:** Genetic Algorithm (GA), different operators of GA, analysis of selection operations, Hypothesis of building blocks, Schema theorem and convergence of Genetic Algorithm, Simulated annealing and Stochastic models, Boltzmann Machine, Applications.
Unit-IV:
Rough Set: Introduction, Imprecise Categories Approximations and Rough Sets, Reduction of Knowledge, Decision Tables, and Applications.
Hybrid Systems: Neural-Network-Based Fuzzy Systems, Fuzzy Logic-Based Neural Networks, Genetic Algorithm for Neural Network Design and Learning, Fuzzy Logic and Genetic Algorithm for Optimization, Applications.
4. READINGS
4.1 TEXTBOOK::

- Fuzzy sets and Fuzzy logic by George Klir , Bo Y uan, PHI
- Neural Networks, Fuzzy logic and Genetic Algorithms, Synthesis and applications by S. Rajsekharan, Vijayalaxmi Pai
- Intelligent Hybrid Systems, D. Ruan, Kluwer Academic Publisher, 1997

4.2 *REFERENCE BOOKS::

- Neural Fuzzy Systems, Chin-Teng Lin & C. S. George Lee, Prentice Hall PTR.
- Neural Networks, S. Haykin, Pearson Education, 2ed, 2001.

- Genetic Algorithms in Search and Optimization, and Machine Learning, D. E. Goldberg, Addison-Wesley, 1989.
- Learning and Soft Computing, V. Kecman, MIT Press, 2001.

5. OTHER SESSIONS
5.1 *TUTORIALS:: No 5.2 *LABORATORY:: Yes 5.3 *PROJECT:: Yes
6. ASSESSMENT (indicative only)
6.1 HA:: [10% GRADE] 6.2 QUIZZES-HA:: [xx% GRADE] 6.3 PERIODICAL EXAMS:: [30% GRADE]
6.4 *PROJECT:: [10% GRADE] 6.5 FINAL EXAM:: [50% GRADE]
7. OUTCOME OF THE COURSE:: All students can learn how to use Soft Computing techniques and a programming language to design a small intelligent system for a specific application. Students can learn how to write a high-quality review, conference paper with theoretical investigation
8. *EXPECTED ENROLLMENT FOR THE COURSE:: 50
9. *DEPARTMENTS OTHER THAN YOUR OWN TO WHICH THIS COURSE WOULD BE OF INTEREST:: MnC, Biomedical Engg., EE, ECE 10. *ANY OTHER REMARKS:: None

Cryptography

1. GENERAL
1.1 TITLE:: **Cryptography**
1.2 *COURSE NUMBER (if known):: DE.CSE465.17
1.3 CREDITS:: [3-0-0] 9 Credits
1.4 SEMESTER-OFFERED:: VIII
1.5 PRE-REQUISITES::

- Any programming language.
- Knowledge in Computer Network and Operating System.

2. OBJECTIVE:: To learn the basic concepts of cryptography and applying in various Engineering applications
3. COURSE TOPICS::
Unit-I: Introduction, symmetric cryptography, one-way hash functions, digital signatures, pseudorandom sequence generation.
Unit-II: Intermediate, advanced and esoteric protocols, disclosers of secrets, zero – knowledge proofs, digital certified mail, secure multi-party computation.
Unit-III: Key management, generating and storing keys, key length, lifetime of keys.
Algorithm types and models, self-synchronizing stream ciphers, block Vs stream ciphers.
DES, AES, RC2, IDEA, RC5, CRAB, RSA, COMSET, PGP, legal issues.

4. READINGS
4.1 TEXTBOOK::
a. Introduction to Cryptography with Coding Theory by Wade Trappe, Lawrence Washington
b. Introduction to Cryptography: Principles and Applications By Hans Delf, Helmut Knebl, Springer

4.2 *REFERENCE BOOKS::
5. OTHER SESSIONS
5.1 *TUTORIALS::
5.2 *LABORATORY::
5.3 *PROJECT::
6. ASSESSMENT (indicative only)
6.1 HA:: [10% GRADE]
6.2 QUIZZES-HA:: [10% GRADE]
6.3 PERIODICAL EXAMS:: [40% GRADE]
6.4 *PROJECT:: [xx% GRADE]
6.5 FINAL EXAM:: [40% GRADE]

7. OUTCOME OF THE COURSE::
Development of concepts of cryptography and its application in information and network security.
8. *EXPECTED ENROLLMENT FOR THE COURSE:: 85
9. *DEPARTMENTS OTHER THAN YOUR OWN TO WHICH THIS COURSE WOULD BE OF INTEREST::
10. *ANY OTHER REMARKS:: None