Ver.1-(13-07-2017)

Elective Courses Syllabus – Monsoon 2017

Sl. No	Course Code	Course Name
1.	SCI541	Advanced Biomolecular Architecture
2.	CSE435	Advanced Computer Networks
3.	CSE545	Advances in Data Mining
4.	ECE441	Adaptive Signal Processing
5.	ECE461	Analog & Mixed Signal Design
6.	CSE419	Compilers
7.	CSE411	Complexity and Advanced Algorithms
8.		Complex Digital System Design
9.	CLG421	Computational Linguistics I
10.	HSS422	Classical Text Reading I
11.	HSS511	Classical Text Reading III
12.	IMA303	Differential Equations
13.	CSE478/ ECE 478	Digital Image Processing
14.	CSE441	Database Systems
15.	CSE445	Data Warehousing & Data mining
16.	ECE469	Design for Testability
17.	CEG444	Design of Mechanisms
18.	HSS441	East and west
19.	CEN211	Environmental Sciences
20.	CSE464	Game Design and Engineering
21.		Graph Theory

22.		Introduction to Sociology
23.	CSE498	Introduction to Game Theory
24.	HSS347a	Introduction to Gender Studies
25.	HSS343a	Introduction to History
26.	HSS316	Introduction to Philosophy
27.	HSS351a	Intro to Psychology
28.	CSE485	Intro to Cognitive Science
29.	HSS345a	Introduction to Shakespeare
30.	ECE539	Information Theory and Coding
31.	ECE451	Linear Control Systems
32.	CSE483	Mobile Robotics
33.	CSE482	Multi Agent Systems
34.	CSE472	Natural language Processing
35.	IMA404	Number Theory and Cryptology
36.		Performance Evaluation of Computer Systems
37.	CSE415	Principals of Programming Languages
38.	CEG511	Principals and practices of Organic Farming
39.	CSE540	Research in Information Security
40.	CSE991	Research Methodology
41.	HSS365	Science Technology and Society
42.	CSE591	Spatial Informatics
43.	ECE448	Speech Signal Processing
44.	CSE971	Speech Technology
45.	CSE861	Software Quality Engineering
46.	CSE471	Statistical Methods in AI
47.		Social Science Perspective on HCI
48.	CEG445	Technology Product Entrepreneurship

49.	HSS443	The society of Spectacle in the Ancient World
50.		Theories and Practices of Nationalism
51.		Topics in Machine Learning
52.	SCI751	Topics in Physics
53.	ECE438	Wireless Communications
54.	ECE536	Wireless Sensor Networks
55.	HSS338	Understanding Raga: Semi Classical forms of Indian Music

TITLE : Advanced Bio-Molecular Architecture

Course Code : SCI541

Credits : 3-1-0-4

Type-when : Monsoon- 2017

Faculty : Abhijit Mitra

Prerequisites : None

T ype: Domain core (M Tech Bioinformatics) + (post B Sc non chemistry background)

+ Domain requirement for MS by research/ PhD (Bioinformatics) + Science Elective for B Tech

Load: Total contact hours 5-6 hours per week

Live lectures: Two 1.5 hr lectures per week

Labs + Tutorials 1.5 - 3 hr per week

Assignment hours (including lab and reading assignments) around 5 hours per week

Objectives: First course on the basics of design principles of nature at the molecular level, which
would provide breadth in structural and biophysical approaches and 'chemenable' students to understand structures and interactions in Biology

Expected outcome:

1. Ability to write Lewis and other specialized structural formulae and use them to relate structures with properties
2. Ability to communicate with written structures of biological molecules
3 . Ability to understand standard IUPAC nomenclature and numbering
4. Ability to understand structural features including Chirality and prochirality, structure parameters including torsion angles, their definitions and standard values for biomolecules
5. Ability to build molecules in silico and familiarity with some visualization and analysis tools
6 . Understand the basis of computability of energetic of molecules and their ensembles
7. Ability to handle files containing structural information of molecules and mine structure databases of biological molecules

Course topics:

= Atomic structure and the periodic table
= Quantum mechanical approach to atomic structure and bonding
= Bonding and intermolecular forces
= Nomenclature and isomerism
= Configuration and Conformation
= Structure and properties of molecules
= Computation of energies of molecules and their interactions
= Small biomolecules
= Biological macromolecules: Proteins, Nucleic acids , Lipids and carbohydrates

Syllabus and topic wise Coverage:

Week Topics

1/1 Design principles of nature – chemistry at the atomic level

1/2 Quantum mechanical structure of the atom

2 Quantum mechanical structure of the atom:

Assignment : Structure of atoms - Due Week 3

3 Periodic table and its organization

o The electronic configuration of atoms and periodic properties of atoms in their free and bonded state

Assignment : Periodic properties – Due week 4

4 Bonding and intermolecular forces

o Theories of bonding

Assignment : Bonding – Due week 5

Dry lab on structure drawing tool

Assignment : Structure drawing – Due week 6

5 Bonding and intermolecular forces

o Types of bonds and their consequences

o Electron distribution in molecules and their representation

o Hybridization

o Resonance and aromaticity

o Intermolecular forces

Assignment : Bonding – Due week 7

6 Molecular structure

o Bond length, bond angle and shape of molecules

o Dipole moments

o Structural and stereo isomers

o Nomenclature

o Chirality and optical activity

o Representation of configuration

Tutorial

Assignment : Nomenclature and isomerism – Due week 8

7 Configuration and conformation

o Stereo chemical nomenclature

o Sugars and carbohydrates

Tutorial

Assignment : Representation of configuration /conformation – Due week 9

8 Configuration and conformation

o Representation of conformations, their energy barriers and torsion angles

9 Structure and properties of molecules

o Bond energy and type of bond breaking

o Basics of thermodynamics and kinetics

Tutorial

Assignment : Properties of molecules - Due Week 11

10 Structure and properties of molecules

o Acids and bases

o Reactivity's of molecules

Dry lab on structure building and visualizing tool

11 - 12 Study of amino acids and proteins

o Familiarity with the different amino acids and their classification

o Investigation of dipeptides and torsion angles

o Levels of protein structure and forces stabilizing them

o Primary structure and its relation with higher order structure

o Secondary structure and Ramachandran plot

Dry lab on structure visualizing tool

Assignment : Identification /classification of amino acids – Due week 12

Assignment : Ramachandran plot – Due week 13

13 Study of nucleic acids

o DNA- Components, chemical structures

o Base pairing and hydrogen bonding

o Types of DNAs A, B, Z and their structure parameters

Dry lab on structure analysis tool

14 Study of nucleic acids

o Nucleic acid databases

o Comparing DNA and RNA

o Nucleic acid protein interactions

Dry lab on structure analysis tool

Grading Plan:

Assignments and quizzes - 40%

Exams - 60 (15 + 15 + 30) % (1 midterm + 1 exam + 1 lab exam)

Total - 100%

Text books: Study material will be provided in the form of pdf files and web content

Also Atkins and Leach

Reference books

1. Bio-Chemistry – Stryer

2. Biochemistry – Voet, Voet and Pratt

3. Ralph H. Petrucci, General Chemistry: Principles & Modern Applications, 8th Edition, Addison Wesley Longman (2003)

4. P W Atkins, Elements of Physical Chemistry, 5/E, Oxford University Press (2010)

TITLE : Advanced Computer Networks

Course Code : CSE435

CREDITS : 3-1-0-4

TYPE-WHEN : Bouquet Core, Monsoon 2017

FACULTY NAME : Moumita Patra

PRE-REQUISITE : Computer Networks Course

OBJECTIVE : Introduce Advance Networking Concepts, Theories and Tools.

COURSE TOPICS:

Review of Network Basics (IPv4, TCP, Routing, etc); Telecom Networks; Multicast Routing Algorithms and protocols – IGMP, PIM-SM/DM, DVMRP; IPv6;; Anycast Routing algorithms in IPv6; Network Monitoring – SNMP, RMON; LDAP; VLAN; VPN – SSL, IPSec; Firewall and IPS Concepts; Network Redundancy, Load Balancers, Caching, Storage Networks; VSAT, GSM/CDMA/WiMax; Ad-Hoc networks, Sensor Networks, related algorithms; SDN; Network Simulation.

PREFERRED TEXT BOOKS:

• RFCs and Standards Documents

• Communication Networking – An Analytical Approach, Anurag-Manjunath-Joy

• TCP/IP Illustrated (Vol.1,2), Stevens

• More books will be identified in due course

REFERENCE BOOKS:

• Data Networks, Bertsekas-Gallager

• More references will be identified in due course

PROJECT: NA

GRADING:

– Assignments

– MidSem and EndSem Exams

– Lab Exercises

OUTCOME:

– Understanding core concepts/theories/algorithms of computer networks

– Hands-on capability on various network devices and tools

– Capability to design, implement and fine tune a computer network

REMARKS:

Course may have lab component, depending on class strength.

TITLE : Advances in Data Mining

Course Code : CSE545

Note: Please use course code for previously existing course

CREDITS : 3-0-0-4

TYPE-WHEN : CSE elective

FACULTY NAME : Kamal Karlapalem

PRE-REQUISITE : Data Warehousing and Data MIning

OBJECTIVE : To learn about latest techniques and applications of data mining.

COURSE TOPICS :

1. Understanding data and feature determination

2. Advanced techniques in Data Clustering and Outlier detection

3. Graph mining

4. Text Analytics

5. Time Series mining

PREFERRED TEXT BOOKS: Han & Kamber Data MIning

*REFERENCE BOOKS: Zaki, Data Mining & survey papers and other research papers

*PROJECT: A semester long term paper.

GRADING: 10 quizzes or assignments 40% marks. Term paper 60% marks.

Must get at least 40/60 in Term paper to pass the course. To get 40/60 it should be of a novel, full-fledged work that addresses a significant problem, with algorithms, implementation and results. The term paper must be submitted by Midterm 2 exams time frame. By the end of 10_{th} week of classes.

OUTCOME:

Exposure to advanced data mining techniques and training to do research to address a problem.

TITLE : Adaptive Signal Processing

Course Code : ECE441

Credits : 3-1-0-4

Type-When : Monsoon 2017

Faculty Names : Ubaidulla

Pre-Requisite : Signals and Systems, Digital Signal Processing, Probability Theory and Random Processes

PRE-REQUISITE : Signals and Systems, Digital Signal Processing, Probability Theory and Random Processes

COURSE TOPICS :

1. Review of Random Signal Theory & Discrete Time Systems

2. System Models: All Pole, All Zero. Pole-Zero models

Lattice structures, Direct to lattice conversions of AP, AZ, PZ systems

The problem of Spectral Factorization

3. Signal Models :

AR, MA,&AARMA Processes

Generation of Random processes and whitening

The AR process and Yule Walker equations

4. Introduction to Adaptive Signal processing & applications:

5. Statistical approach to ASP:

Mean Square Error Criteria

MSE Estimation

Properties of the Quadratic Error Surface

Levinson Durbin Method, Steepest Descent Method

Least Mean Square(LMS)

6. Data Dependant Approach to ASP:

Least square techniques

Geometrical interpretation

LS, WLS & their statistical properties

Orthogonalization techniques QR decomposition, House Holder Transformation,

Givens' Rotation, Graham Schmidt Orthogonalization

Recursive Least Square techniques

7. Applications:

Echo cancellation

Channel identification/equalization

BOOKS:

Statistical & Adaptive signal Processing by Manolakis, Kogan & Ingle, and McGraw Hill Pub.

Adaptive Signal Processing by Alexander

Adaptive Signal Processing by Widrow, Pearson Education.

GRADING:

Assignment – 10%

Project – 10%

2-Mid terms examinations – 40%

End term examination – 40%

OUTCOME:

On successful completion of this course, students should be able to demonstrate a theoretical understanding and problem solving skills of statistical and data dependent approaches to the adaptive signal processing.

TITLE : Analog and Mixed Signal Design.

Course Code : ECE461.

CREDITS : 3-1-0-4

TYPE-WHEN : Monsoon 2017

FACULTY NAME: Azeemuddin Syed + Zia Abbas

PRE-REQUISITE : Basic Electronic Circuits & Semiconductor Devices.

OBJECTIVE : The primary objective of this course is to familiarize the students with the real world application of CMOS transistors and BJTs. This course focuses on the circuit realization in the transistor level and these circuits are the basic building blocks for numerous applications.

COURSE TOPICS :

1. Integrated-Circuit Devices and Modeling of pn Junctions, MOS and Bipolar Junction Transistors.
2. Current mirrors – single stage amplifiers – cascade amplifiers, differential amplifiers.
3. Operational amplifiers – Two stage and Three stage op-amps-other op-amp architectures.
4. Comparators – errors, switch capacitor circuits.
5. Sample and hold circuits – data converters (A/D and D/A).
6. PLLS, their analysis and design.

PREFERRED TEXT BOOKS:

1. David Johns, Ken Martin, Analog Integrated Circuit Design, John Wily & Sons 1997.
2. Paul R. Gray & Robert G. Mayor – Analysis and Design of Analog Integrated Circuits, John Wily & Sons 2001.

***REFERENCE BOOKS:**

1. Jacob Baker R et.al, CMOS Circuit Design, IEEE Press, Prentice Hall, India 2000.

GRADING:

Mid-Semester Exam-I: 20 %.

Mid-Semester Exam-II: 20 %.

End-Semester Exam: 30 %.

Surprise Quiz: 10 %.

Design Assignments and Laboratory: 20 %.

Total: 100 marks.

Title : Compilers

Course Code : CSE419

Credits : 3-1-0-4

Type When : Monsoon-2017

Faculty Name : Suresh Purini

Pre-Requisite : Formal Languages

OBJECTIVE: To learn the principles, techniques and tools behind designing and building a Compiler.

COURSE TOPICS:

Lexical Analysis, Syntax Analysis, Semantic Analysis, Run Time Environments, Intermediate Representations, Code Generation, Instruction Scheduling, Register Allocation, Local and Global Optimizations, Introduction to Data Flow Analysis

PREFERRED TEXT BOOKS:

Engineering a Compiler, By Keith Cooper and Lina Torczon

***REFERENCE BOOKS:**

Compilers by Aho, Hopcroft, Ullman, Sethi and Lam

***PROJECT:**

Students may have to build a Compiler for a toy programming language

GRADING:

percent each midterm, Final (30-40 percent) , Project (10-20 Percent)

CSE411 : Complexity & Advanced Algorithms 3-1-0-4

Course Code : CSE411

Type-when : Monsoon-2017

Faculty Name : Girish Varma + Saswata Shannigrahi

Pre-Requisite: Should have taken Introduction to Algorithms or equivalent

Objective: The course is aimed at undergraduates and graduates who have done a first course in algorithms and a first course in formal languages. This course is intended to build up further on the above two themes. About a third of the course will cover topics in formal languages/computing theory such as reductions, NP, NP-Completeness, the language hierarchy, classical undecidability results, and the like. The remaining two-thirds of the course shall focus on two notions of recent advances in algorithms: parallel algorithms, and randomized algorithms.

In the case of parallel algorithms, focus will be on algorithm design and problem solving using the PRAM model. Classical PRAM algorithm design techniques such as binary tree based computations, accelerated cascading, divide and conquer will be covered. Also included in the coverage are PRAM algorithms for lists, trees, and graphs.

Course Topics: Basic concepts in randomized algorithms will be covered with applications to parallel algorithms. Topics covered include tail inequalities, independence, application to symmetry breaking and the like. Computing theory: Reductions, NP and NP-completeness, Language hierarchy, recursive/recursively enumerable, Undecidability. Parallel Algorithms: Models of computation and Flynn's taxonomy including SIMD and MIMD; Design paradigms including divide and conquer, binary tree based computations, accelerated cascading; and the like; Parallel algorithms for lists and trees : list ranking, tree traversal and evaluation; Parallel graph algorithms: connected components, matrix based computations. Randomized Algorithms: Tail inequalities including Chernoff bounds; Examples for parallel/distributed symmetry breaking, Luby's algorithm, graph coloring; Online algorithms for paging.

Preferred Text Books: 1) Introduction to Parallel Algorithms, J. JaJa. 2) Randomized Algorithms, by R. Motwani and P. Raghavan. 3) Introduction to the Theory of Computation, M. Sipser, 2nd edition.

Outcome: At the end of the course, a student shall be able to understand the implications of parallelism in problem solving, design parallel algorithms, and also reason about the efficiency of the same.

CLG421 Computational Linguistics I 3-1-0-4

Faculty: Soma Paul + Dipti M Sharma
Objective: Basic knowledge of theoretical linguistics and its application in NLP.

Course Topics: Challenges in processing natural languages: Analyzing the structures, Dealing with ambiguities, Structural units in language: word, phrase, sentence, Morphology - Words and how they are formed, Basic building blocks in morphology - morphemes; Word formation (function based), inflectional, derivational, Word formation processes Affixation, suffixation, prefixation, infixation, Non-concatenative, Compounding, Morphotactics -- constraints on affixes; Morphophonology, Developing morphological analyzers and generators approaches, (a) Paradigm based - paradigm tables, add - delete rules, (b) Finite state machineries. 3. Syntax : Words in a sentence : word classes, Part of Speech, POS tagging, defining tagset for your language, Rule based part of speech taggers, Statistical part of speech taggers, Issues in tagging, Syntactic structures - Constituency, phrases and constituent structures, Subcategorization Agreement, Auxiliary verbs; Representing phrase structures, Deriving phrases using phrase structure rules (CFG), Dependency structure, Constraints on rules, Feature structure, Syntactic dependencies, Modifier - modified trees - Paninian approach, Karaka relations - karaka semantic model, karma and other karakas, tadarthya, Karaka vibhakti mapping, Lexical vibhakti giving the flexibilty of free word order, Choice of Vibhakti governed by TAM. Annotating syntactic relations - developing tagset, Lexical Semantics Subcategorization; Ambiguity, Sense relations - homonymy, polysemy, hypernymy, hyponymy, synonymy etc.

Preferred Text Books: 1. Jurafsky & Martin, 2000; Speech and Language Processing, Pearson Education. **2.** Bharati et al., 1995; Natural Language Processing. A Paninian Perspective. **3.** Fromkin, V, Robert Rodman, Nina Hyams (2002) An Introduction to Language, Thomson Wadsworth.

Outcome: At the end of the course the students will be able to understand and analyse actual language data and develop computational resources for various levels of language structures.

TITLE : Classical Text Reading I: Indic

COURSE CODE : HSS422

CREDITS : 3-1-0-4

TYPE-WHEN : Monsoon 2017, EH Stream Elective

PRE-REQUISITE : Classical Language: Sanskrit-I.

Faculty: JSR Anjaneya Prasad

OBJECTIVE:

The course would introduce students to reading of original texts. Texts with various literary styles such as poetry and prose will be read and explained.

COURSE TOPICS:

Introductory overview of classical Sanskrit/Pali/Prakrit literature would be given. Following extracts from three selected texts will be taught:

1. Philosophy and Ontology:

Selected sloka-s from 6th chapter of Vedanta Pancadasi of Vidyaranya known as Citradeepa Prakarana will be studied. They explain philosophical concepts of Vedanta in a nutshell. The main theory of adhyaopa and apavada are illustrated using an analogy of a printed colorful cloth which is white in its original state. Various other concepts will be explained in terms of four stages in the procedure of printing a plain cloth. Sloka-s will be explained with word to word meaning as well as conceptual meanings.

2. Society and Polity:

Kautilya's Arthasastra (selections from Vidyasamuddesha, Rajashrivrittam, Rajapranidhi chapters). It will be supplemented with explanations from Kamandaka's Nitisara. These chapters cover concerns regarding types of knowledge and duties of the head of polity and officials of polity. Interesting appendix in Arthasastra called tantra yukti will also be introduced. It deals with methodological aspects of theory building. The passages would be read in the class to get acquainted with prose reading.

3. Arts and Aesthetics:

6th chapter of Bharata's Natyasastra along with commentary of Abhinavagupta will be covered. The slokas dealing with rasa theory will be taught and Rasasutra will be discussed in detail with Abhinavgupta's explanations. Attention will also be paid to bhava-s and their mutual relationship with rasa-s.

After discussions, students will be assigned texts along with translations for individual projects on concepts therein.

PREFERRED TEXT BOOKS:

1. Pancadasi of Vidyaranya. English, Hindi, Telugu translations

2. Kautilya's Arthasastra. English, Hindi, Telugu translations

3. Natya Sastra of Bharata. English, Hindi, Telegu translations

GRADING:

Assignments 20%

2nd Mid Sem 20%

End Sem 40%

Project Report/Viva 20%

OUTCOME:

Aspects of Indic classical thought will be learnt through original source books.

REMARKS:

Instructor’s consent is required if student is taking it as an open Humanities elective

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TITLE : Complex Digital Systems Design

Course Code :

CREDITS : 4

TYPE-WHEN : Spring 2017

FACULTY NAME : Suresh Purini

PRE-REQUISITE : Digital Logic Design, Computer Systems Organization

OBJECTIVE : Learn to engineer complex digital systems such as processors,

audio/video encoders-decoders, deep neural networks etc., by understanding the architectural design space trade-offs.

COURSE TOPICS :

All the following architectural principles will be illustrated using Bluespec System

Verilog which is a Hardware Description Language.

1. Basic combinational circuit design (single cycle design approach).

2. Folded combinational circuit design (multi cycle design approach).

3. Pipelined combinational circuit design.

4. FIFOs and Ephimeral History Registers (EHRs).

5. Concurrency issues.

6. Parametric and polymorphic hardware designs.

7. Auto-tuning parametric designs.

8. Non-pipelined processors.

9. Pipelined processors.

10. Modular refinement.

PREFERRED TEXT BOOKS: None

REFERENCE BOOKS:

1. Computer Architecture: A Constructive Approach by Arvind et al.

2. BSV by Example by Rishiyur S. Nikhil and Kathy Czeck.

3. Bluespec System Verilog Reference Manual

***PROJECT:** Project constitutes a substantial component of the course. Some sample projects are as follows:

1. Pipelined processor design for RISC-V open instruction set architecture.

2. Hardware realization of deep neural networks, image processing, vision and machine learning algorithms.

3. Approximate computing circuit designs.

4. Bring your own favorite problem!

GRADING PLAN:

Type of Evaluation **Weightage (in %)**

Mid Sem-1 Exam	15
Mid Sem-2 Exam	15
End Sem Exam	None
Assignments	30
Project and Term Paper	40

TITLE **: Differential Equations**
Course Code **: IMA303**
CREDITS **: 3-1-0-4**
TYPE-WHEN **: Elective, Monsoon 2017**
FACULTY NAME **: Dr. BS Lakshmi**
PRE-REQUISITE **:** Calculus
Max.Limit **:**

OBJECTIVE **:** To understand the basic concepts of elementary differential equations, to learn to solve certain forms of first order and second order differential equations and applications.
To be able to use mathematical modeling of some physical phenomena using differential equations.

COURSE TOPICS **:**

1. First order ODEs
2. Second order ODEs
3. Higher order ODEs
4. Systems of equations
5. Phase-plane analysis
6. Laplace Transforms
7. Series Solutions
8. Mathematical modeling
9.

PREFERRED TEXT BOOKS:

Boyce di-Prima, Elementary Differential Equations and Boundary Value Problems (John Wiley and sons, Erwin Kreyszig, “Advanced Engineering Mathematics”, Wiley

***REFERENCE BOOKS:** Differential equations, dynamical systems and an Introduction to Chaos, Hirsch,M.W., Smale and Devaney (Elsevier), Differential Equations, S.L.Ross (John Wiley and sons)
George F. Simmons, Differential Equations With Applications and Historical Notes

***PROJECT:**

GRADING:

50% for 2 Tests and final exam
25% for assignments
25% for quizzes

OUTCOME:

Upon successful completion of the course the student must be able to

1. Solve first order differential equations using the techniques of separation of variable, integrating factors, power series and Laplace transforms. Understand the existence and uniqueness
2. Use Euler’s method to approximate solutions for first order ODEs
3. Find general and particular solutions of second order linear ODEs using the techniques of undetermined coefficients, variation of parameters, power series and Laplace transforms.
4. Solve homogeneous first order systems of linear ODEs
5. Use direction fields, phase lines and phase portraits to qualitatively analyze the solutions to differential equations.
6. Understand how to model simple physical phenomena using differential equations.

TITLE : Digital Inage Processing

Course Code : CSE 478

Note: Please use course code for previously existing course

CREDITS : 4

TYPE-WHEN : Monsoon 2017

FACULTY NAME : AVINASH SHARMA

PRE-REQUISITE : Not anything in particular but knowing basic matlab and basic linear algebra might help you in the course.

OBJECTIVE : Digital images are now everywhere, capturing particles at the scale of few nanometers to galaxies with size of several light years. Not just that, with the revolutionary spread of smart phones, now you find a camera almost in every pocket. It is not difficult to argue that there is no limit to the useful possible applications, which could be built by harnessing the information contained in these captured images.

So, if you are excited to work with images, this course is for you. The course will explain how images are stored in a computer (any digital machine) and how they can be processed to retrieve important information or to facilitate the visualization process. The course will cover applications like retouching personal photos, enhancement of astronomical and medical images, biometrics, special effects in movies, detecting edges and contours, image compression etc. The goal of the course is to impart strong fundamentals in image processing algorithms, covering both the theoretical and coding aspects. This course is also a building block for understanding more advanced computer vision techniques.

COURSE TOPICS :

(please list the order in which they will be covered)

1. Introduction (Exposure to wide range of imaging applications)
2. Image enhancement in spatial domain (intensity transforms, histogram processing, spatial filtering etc.)
3. Image enhancement by transformation to a different space (fourier transform, wavelet transform etc.)
4. Color Image Processing
5. Morphological Image Processing
6. Feature representation and description (point, line, edge, corner, SIFT)
7. Image compression
8. Some basics on image segmentation and object detection

PREFERRED TEXT BOOKS: Digital Image Processing (Gonzalez and Woods, 2nd and 3rd edition), Fundamentals of Digital Image Processing (Anil K. Jain).

***REFERENCE BOOKS:** Digital Image Processing (Gonzalez and Woods, 2nd and 3rd edition)

*PROJECT: The course will include a final project

GRADING:

55% theory (30% for two mid semester exams and 25% for end semester exam)

45% practice (20% marks on assignments and 25% for final project)

OUTCOME:

1) Understand how images are stored and represented in digital machines

2) Understand how image are processed by discrete, linear, time-invariant systems

3) Understand how images can be transformed and edited in different spaces (Fourier, DCT, Haar)

4) Understand how color is represented in images

5) Understand transformation from RGB to other color spaces and respective applications

6) Understand how images can be enhanced to improve subjective perception

7) Understand variety of filters for noise removal and restoration of images

8) Experiment how storage space for images can be significantly reduced without noticeable perceptual differences

9) Understand how videos are stored and how they can be processed

10) Understand morphological operations

11) Understand how salient points in image can be detected and represented (with applications like image stitching, object detection etc)

12) Discover variety of modern applications in image and video processing

13) Understand theoretical aspects of image processing algorithms (to understand research papers and implement them)

14) Gain hand on experience in developing image processing algorithms

15) Get initiated towards higher-level computer vision tasks

REMARKS:

Get ready with your laptops, we will have a lot of fun.

TITLE : Database Systems

Course Code : CSE441

CREDITS : 4

TYPE-WHEN : Monsoon-2017

FACULTY NAME : P. Krishna Reddy

PRE-REQUISITE : Students should have knowledge of SQL, database design and operating systems, programming language, algorithms.

OBJECTIVE : Databases have become essential part of every business. A database system can be used to manage large amounts of data in a persistent manner. The objective of this course is to study the methods that have been evolved over several decades to build database systems or database management systems software in a focused manner which include storage management, index management, query processing, recovery management and transaction management.

COURSE TOPICS

Introduction (3 hours); Data storage (3 hours); Representing data elements (3 hours); Index structures (3 hours); Multidimensional indexes (6 hours); Query execution (6 hours); The query compiler (6 hours); Coping with system failures (3 hours); Concurrency control (6 hours); More about transaction management (6 hours)

PREFERRED TEXT BOOKS:

1. Database System Implementation, Hector Garcia-Molina, Jeffrey D. Ullman and Jennifer Widon, Pearson Education, 2003

OTHER TEXT BOOKS:

2. Elmasri & Navathe, Fundamentals of Database Systems, Pearson Education, 5th Education.

3. Raghu Ramakrishnan and Johannes Gehrke, Database Management Systems, Third edition, Mc Graw Hill, 2003.

4. Abraham Silberschatz, Henry F.Korth, S.Sudarshan, Database system concepts, fifth edition, Mc Graw Hill, 2006.

PROJECT:

A practical project on indexing, query optimization, and transaction management will be given. The project will be evaluated.

GRADING:

PROJECT and Assignments: 30%; MIDSEM: 30%; ENDSEM: 40%

OUTCOME:

The course will help the students in understanding the fundamental concepts of several database
management systems like ORACLE, DB2, SYBASE and so on. Also, the students will understand the solutions/options to interesting problems which have been encountered by the designers of preceding DBMSs. Most important, the students will be exposed to internal design of DBMSs and able to tune the DBMSs to meet the performance demands of diverse applications.

TITLE : Data Warehousing and Data Mining

C ourse Code : CSE445

Credits : 3-1-0-5

Type-When : Monsoon-2017

Faculty Name : Vikram Pudi

OBJECTIVE: Learn techniques to extract actionable knowledge from lareg data sets.

COURSE TOPICS: Data warehouse is a repository that contains subject-oriented, non-volatile, integrated and time-variant database. The data warehouse is used for reporting purpose and on-line analytical processing. Data cubes and multi-dimensional data will be covered. Data mining consists of techniques to extract actionable from large data sets. Understanding data, distance measures, normalization, and subspaces of high dimensional data is needed. Algorithms for data clustering, classification and association rules will be studied. Projects will involve mining large data sets.

Approximate number of Lectures - Topics

3- What is data mining? Data Pre-processing, Distance measures,

understanding data

3 - Data clustering, k-means, k-mediods, dbscan, cure, outliers

3- Classification, Decision trees, Bayesian classifier

3 - Association Rules, FP-tree, Frequent Item Sets

3 - Data Warehousing, OLAP schema, data cube, storage and query processing

– materialized views

2 - Data cube analytics

2 - Graph Data Mining

3 - More on clustering, multiple clustering, subspace clustering

3 - More on classification, boosting, ROC, ensemble classifier

2 - Applications

PREFERRED TEXT BOOKS: Han & Kembar or Han, Kember, Pei Data Mining book, 2nd or 3rd edition.

***REFERENCE BOOKS:** Research papers

*PROJECT: Extract knowledge from large real-life data set

GRADING:

 Exams – 65% - midterm 15% each, and final 30%

 Assignments – 15%

 Project – 25%

OUTCOME: The student will understand techniques for data mining, and will be able to perform data mining tasks. Further, the student should be able to conduct research in data mining.

TITLE : Design for Testability

CREDITS : 3-1-0-4

TYPE-WHEN : Monsoon 2017

FACULTY NAME : Govind Krishnan

PRE-REQUISITE : A course on Digital Circuits (or) B.Tech

OBJECTIVE: To expose the students to the various techniques adopted to make the testing (complicated) of manufactured ICs. To make the students to take care of the testing aspects into account at the design stage itself.

COURSE TOPICS:

1) Introduction: Testing of electronic gadgets, various types of tests, VLSI design flow, role of modeling and simulation in testing.

2) Faults and fault modeling, detection of faults, fault simulation and its applications, functional testing, exhaustive and non-exhaustive testing, automatic testing procedures.

3) Design for testability: Various features are to be incorporated for carrying out testing from input & output pins, scan architecture, board level testing, signature analysis and testing.

4) Built in Self Test (BIST), BIST concepts, text pattern generation, BIST architectures.

5) Testing of Analog and mixed signal ICs, testing of system on chip.

PREFERRED TEXT BOOKS:

1) Miron Abramollici, Mellin A Breur, Arthur D. Friedman, Digital systems, testing and testable design, Jaico publishing house, 2001

2) Stanley L. Hurst, VLSI Testing, Digital and Mixed Analog / Digital Techniques, Institution of Electrical Engineers, 1998, London, United Kingdom.

3) Michael L. Bushnell, Vishwani D. Agarwal, Essentials of Electronic Testing for Digital & Mixed Signal FLSI Circuits, Springer 2000

***REFERENCE BOOKS:**

1. “VLSI Test Principles and Architectures: Design for Testability”,Laung-Terng Wang, Cheng-Wen Wu, Xiaoqing Wen

2. “VLSI Testing”, Stanley Leonard Hurst

3. “Electronic Design Automation”, Laung-Terng Wang, Yao-Wen Chang, Kwang-Ting (Tim) Cheng

4. “System-on-Chip Test Architectures: Nanometer Design for Testability”, Laung-Terng Wang, Charles

5. E. Stroud, Nur A. Touba

6. “Testing of Digital Systems”, Jha and Gupta

*PROJECT:

GRADING: 2 Mid Sem Exams 2 x 20 40 2 Surprise Tests 10 Final Examination 50 ---------

Total Marks 100 --------- A > 80 B 70 _ 79 C 60 _ 69 D 50 _ 59 E < 50

OUTCOME:

REMARKS:

East and West: Ancient India and the Far East in Greco-Roman sources

CREDITS: 3-0-0-4

TYPE-WHEN: Humanities Elective, Monsoon 2016

FACULTY NAME: Juan Pablo Sanchez

PRE-REQUISITE: None

REGISTRANT LIMIT: 100

OBJECTIVE: Despite their geographical remoteness, contacts between Ancient India and the Greco- Roman world have existed throughout centuries in different fields of culture, politics and trade. The purpose of the course is to the study nature of such contacts and how they were made possible, in a historical survey of the most representative Greco-Roman writers dealing with Ancient India and the Far East. Although most of those writers never journeyed into India and the Far East, we will see that they actually provided reliable and vivid descriptions of these regions, their products and inhabitants, and also of the people involved in trade or in military campaigns there.

COURSE DESCRIPTION AND METHODOLOGY:

The course will combine introductory lectures on selected topics with supervised reading sessions of Ancient Greek and Latin texts in translation.

Relevant political and cultural changes marked the nature and directness of these contacts between the Mediterranean world and Ancient India. A study of the historical background of such contacts and cultural interactions will help to clarify why, at different times, Ancient Greek and Roman writers were interested in different aspects of Indian history and culture and, in

general, were more or less prejudiced towards the Eastern world. Examples of topics to be covered in the lectures are the following:

- Herodotus and India under the Achaemenid rule
- Alexander the Great' conquests and his campaign in India
- Seleucid (Asia) and Ptolemaic (Egypt) trade/diplomatic contacts with India.
- The Greco-Bactrian Kingdom and the Indo-Greeks
- Rome's eastern trade.

Texts for discussion in class will be made available at least 1 session in advance, both in translation (usually English) and in the original language (Ancient Greek and Latin). As an assignment for the following scheduled session, each student will be responsible for a brief presentation of one aspect of the text (author, characters mentioned, historical background, etc.).

Students should prepare their presentations and the text before each reading session. They should check other related texts (at least in summary) and also reference books and on-line resources, when available; and then prepare a short presentation of 10-15 minutes with all type of supporting materials, such as handouts and/or Power Point presentations, if necessary. Students should bear in mind that concision, thoroughness of information and clarity of exposition will be highly regarded.

After students' presentations, texts will be further discussed in class with constant reference to the original version of the text (in Ancient Greek and Latin), in comments that will cover the linguistic/literary and historical/cultural aspects of the selected reading. Following this guided discussion in class, students will be then required to submit a short written essay. Again, brevity, concision and clarity of exposition re required.

REFERENCE BOOKS:

Text with Translations will be made available in soft form and in printed form for at least 1 session in advance. Further bibliographical references and online resources will be provided on

demand, as well as general advice and guidance for the presentations and written essays. However, students should be ultimately responsible for their own work.

GRADING:

Class Participation 10%

Assignments / Presentations 20%

Written Essays 20%

Final exam (Written Essay on a given topic + a commentary on a text) 50% (EndSem)

OUTCOME:

Students will be aware of the interest and importance of the relations between Ancient India and the Greco-Roman world through the appreciation of the historical, linguistic and literary issues involved in the commentary on Ancient sources.

TITLE **: Environmental Sciences**

CREDITS : **4**

TYPE-WHEN **:** BSD core & Open elective (Monsoon)

FACULTY NAME **:** Dr. Rama Chandra Pillutla

OBJECTIVE

The course mainly deals in understanding the causes, effects and possible solutions to mitigate the continuing problems of environmental degradation. It aims to fulfill the knowledge gap and also motivate students to integrate IT towards the environmental issues at global, national and local levels.

Course Content

1 Basic of Environmental Science & Technology

Basic concepts of environmental science & technology, major issues and challenges. Concepts of sustainable development, Ethics of stewardship, Scope of environmentally sound technologies.

2. Ecological Engineering

Ecological engineering as a tool for restoration of degraded ecosystems, Concepts and strategies of restoration.

3. Environmental Impact Analysis and IT

Assessing the environmental impact of an activity; use of non-renewable resources and other damage to the environment; take into account all phases from design and construction, through operational life, to final decommissioning and disposal. . Power consumption of various storage technologies. The environmental impact of data centres; tools for estimating and reducing the carbon footprint of data centres. Environmental issues surrounding the disposal and recycling of IT equipment.

4. The Environmental Effects of Communication systems

Balancing the environmental costs of communication systems against their environmental benefits.

5. IT and Environmental Sustainability

How, in the immediate- to near-term, can IT minimize its impact on the global environment?

How can IT support cultural and process changes that help people and organizations respond tactically, strategically, and systemically to create a more energy efficient world.

6. Environmental Economics

World environmental history and economic development, Valuation of natural resources, Sustainable agriculture and development, Cost benefit analysis and integrated economic modeling, Environmental indicators and their use in resource management

7. Climate Change & Abatement Technologies

Technologies to minimize and combat climate change

8. Environmental Legislation & Impact Assessment

Important legislations related with environment; Environmental Auditing; Environmental Ethics

9. Socio-economic Dimensions of Environmental Management

<u>Reference Books</u>

1. Environmental Science – The natural environment and human impact (1998): A. R. W. Jackson and J. M. Jackson, Longman

2. Environmental Science (2001): S. C. Santra, New Central Book Agency (P) Ltd

3. Environmental Science (6th ed) (1997): Jr. G. T. Miller, Wadsworth Pub. Co.

4. Dimensions of Environmental and Ecological Economics (2005): N. C. Sahu & A. K. Choudhury (Ed), Universities Press

GRADING: Assignments: 20%; Project work: 20%; Midterm exams: 30%; Final exam:30%

Outcome:

Understanding various environmental issues of concern

Identify and evaluate environmental technologies

Interpret local environmental technologies.

Implications of IT to combat emerging environmental problems

TITLE **: Ethics**

Course Code **:**

CREDITS **:** Four

TYPE-WHEN **:** Monsoon-2017

FACULTY NAME **:** Jolly Thomas

PRE-REQUISITE **:**

OBJECTIVE :

1. Examine major theories in ethics by dividing the various approaches in ethics to normative ethics, meta-ethics and applied ethics.
2. To look into some of the possible scenarios or cases in which one would face moral dilemma in deciding what would be the (morally) right thing to do. Response to such question or moral dilemma will lead to normative approach in ethics. Thus, the objective is to see various approaches in normative ethics.
3. Examine some of the major approaches in meta-ethics to understand the nature of morality. For example, to enquire whether there is only one absolute morality or is morality relative.
4. Examine some of the actual moral issues such as abortion, animal rights, environmental issues etc.

COURSE TOPICS:

Topic 1: Normative Ethics

Consequentialism

Deontology

Virtue Ethics

Social contract theory

Topic 2: Meta-Ethics

Non-naturalism

Non-cognitivism

Moral Realism and Moral relativism

Moral Skepticism and Intuitionism

Topic 3: Applied Ethics

Abortion

Duties to animals

Environmental Ethics

Engineering ethics

Situated Ethics

PREFERRED TEXT BOOKS:

Russ Shafer-Landau (ed.) 2013. *Ethical Theory: an Anthology*. Wiley-Blackwell.

George Sher (ed.) 2012. *Ethics: Essential Readings in Moral Theory*. Routledge.

Hugh LaFollette (ed.) 2000. *The Blackwell Guide to Ethical Theory*. Blackwell.

Peter Singer (ed.) 1991. *A Companion to Ethics*. Wiley-Blackwell.

***PROJECT:** None.

GRADING PLAN:

Type of Evaluation	**Weightage (in %)**
Participation in class room discussions and interactions	20
End Sem Exam	30
Assignments	20
Term Paper and Presentation	30

OUTCOME: Students will be able to distinguish between meta-ethical, normative ethical and applied ethical concerns from each other. Students will be able to critically think and examine actual problems mentioned in the applied ethics based on the theories in normative and meta ethics.

REMARKS: This course will give more emphasis on normative and applied ethics, though the topics from meta-ethics are discussed.

TITLE : Game Design and Engineering
Course Code : CSE464
CREDITS : 4
TYPE-WHEN : Monsoon 2017
FACULTY NAME : Kavita Vemuri
PRE-REQUISITE : None
OBJECTIVE : The course introduces aspects fundamental to game design, genres, technology analysis and development for market. The course gives equal emphasis to digital, board and physical games.
COURSE TOPICS : This course is designed to introduce the critical aspects of games design and development. Students will go through a structured process involving theory and practical classes to understand game development. Equal emphasis is given to non-virtual or digital games including board games, electronic games like rhythm mat and/or games that require physical devices. The main goal is to get create patentable ideas. The theory classes will cover aspects like theme, narrative, technology(single player versus multiplayer, managing data, rendering etc.,), game play, player experience, material analysis in the case of physical games, marketing and animation. In game play, basics like game engine (digital) and game logic models

will also covered. Experts from industry will cover animation and certain topics in marketing. In the lab class, the teams will huddle to conceptualize the idea, structure the game design documents, present their ideas and finalize technology issues. The secondary or even primary goal in some cases is to use of CAD/CAM like tools to come up with schematics of any physical implement
required for the game and actually solder, cut, fabricate and paint ….

Syllabus (theory classes)

1. What is a game?
- Games Overview - A Theory of Fun; History of Games.
- History of Computer Games

2. What are the elements of a game?
In this part, we cover the elements of a game, with emphasis on the four major ones. Case studies of g ames in which one or more of these elements have made the game will be analysed.
- Mechanics: rules & procedures of the game.
- Story: events that bind the game together.
- Aesthetics: game's look, feel and sounds.
- Technology: high-technology to materials (paper, sensors, wood etc.,)

3. Principles of Game Design:
-Layers of Game Design
- Design Issues
- Preproduction and Documentation
- Design Trade Offs
- Poor Design
End of this part, the Game Design Document is prepared.

3. Who is the player?
- Game Genre and player
- Cutting through the noise from player (likes, dislikes...)

4. What is player's experience?
- measuring player's experience
- Cognitive behavior measurement techniques
Understanding and measuring player's experiences during game play is an important test for optimal game designs. Player's experiences are recorded by many techniques. This part will analyze each of the technique and the value addition of each. Some experimental work will be required using tools like simple EEG, ECG/GSR and eye tracking.

5. How to design game mechanics?
- Decision-making, types of decisions

- Flow theory.
- Special dynamics: feedback loops, emergence and intentionality

6. What's game interface?
- User Interface design.
- Differences between digital and non-digital UI.
- User Interface iteration

7. How to create a game script/story?
- Linear & Nonlinear storytelling

8. Building a game with technologies
-Analysis of game engines (Unity, XNA)
- AI versus HI in game development.
- Computer graphics & animation
- Physics engine –collision detection

9. Testing a game.
- Solo testing.
- Critical analysis
- Designer testing.
- Player testing

10. Marketing the game

11. Ethics, Culture, Violence in Games and Responsibilities

PREFERRED TEXT BOOKS:
1. The Art of Game Design, Jesse Schell, 2008. 2. Challenges for Game Designers, Brenda Brathwaite
***REFERENCE BOOKS:**
1. Characteristics of Games, Elias, Garfield, and Gutschera, 2012, MIT Press
2. Game Design and Development: Introduction to the Game Industry. Moore, Michael.
Reference papers on serious games, board games, swarm/biological behavior, cognition and games etc.,
***PROJECT:**
Each team of 3 will conceptualize, design, prototype and test 2 unique games .
Number of Project: 2
P1: Design and prototype a board game that explains a concept. This can be trading, friendship, education, jobs, global trade, social media etc., think on the lines of games like monopoly, go, chess etc., Use readily available material to make the prototype. Game play, rules and player demographics will make up your report.

P2: Design and develop/engineer a game virtual or live-action game that can be used for physical
therapy. Virtual game – for carpal tunnel syndrome (look up the web for this occupational hazard). Liveaction game: which can help people exercise their lower back (a major issue with people who sit for long hours)? Materials for the virtual game can include Kinnect or joy sticks. Interfaces need be assembled. For the live-action, raw materials which are readily available need to be used and also fabrication like injection molding should be avoided. Sensors can be used, if electronic games are selected.

GRADING:
Game ideas (15%), Mid-term (25%), Assignments (15%), projects (50%).
OUTCOME:
At least couple of design patents. Selected games ideas to the annual Game Developer Conference, transfer/license and most importantly connecting theory to practice/real product
REMARKS:
The course requires a lot lab type of work. Considering that animation experts and animators are not available, some creativity is encouraged to create avatars, characters for the digital games and layouts for the physical games. Half of the class hours will be in a lab room or work space. This space will be kept open throughout the semester for students to work at any time.

TITLE : **Graph Theory**
Course Code :
CREDITS : 4
TYPE-WHEN : Elective-Monsoon-2017
FACULTY NAME : Saswata Shannigrahi

PRE-REQUISITE : Discrete Mathematics
OBJECTIVE : Introducing basic graph theory

COURSE TOPICS:

1. Matching
2. Planar Graphs
3. Coloring
4. Ramsey's Theorem
5. Turan's Theorem
6. Random Graphs
7. Graph Minor Theory
8. Hypergraphs
9. Introduction to advanced proof techniques in graph theory

PREFERRED TEXT BOOKS: R. Deistel. Graph Theory, Second Edition, 2000.

***REFERENCE BOOKS:** Douglas B. West**,** Introduction to Graph Theory, Second Edition, 1996.

***PROJECT:** None

GRADING PLAN:

Type of Evaluation	Weightage (in %)
Mid Sem-1 Exam	**20**
Mid Sem-2 Exam	**20**
End Sem Exam	**40**
Assignments	**20**
Project	**None**
Term Paper	**None**
Other Evaluation _____	**None**

OUTCOME:

-The student will have deep understanding of graph theory.
-The student will be able to write proofs for properties/results of graph theory.

REMARKS: None

TITLE : Introduction to Sociology
Course Code :
Note: Please use course code for previously existing course

CREDITS : Four
TYPE-WHEN : Monsoon 2017
FACULTY NAME : Radhika Krishnan

PRE-REQUISITE : **UG 3, UG 4**
OBJECTIVE : This course aims to introduce students to basic concepts and theories in the field of sociology, while briefly discussing various sociological methods. It will introduce students to sociological approaches to various social institutions such as caste, class, tribe, family, religion and gender. It will also touch upon sociological approaches to politics, urbanisation, industrialisation, development and ecology.

COURSE TOPICS:
(1) Sociological concepts
(2) Sociological methods
(3) Study of social institutions in India
(4) Sociology of Politics, urbanisation, industrialisation and development

PREFERRED TEXT BOOKS:
Anthony Giddens, *Sociology* (Malden: Polity Press, 2009).

***REFERENCE BOOKS:**
Alpa Shah, *In the Shadows of the State: Indigenous Politics, Environmentalism, and Insurgency in Jharkhand, India* (Durham, NC: Duke University Press, 2010).
Carol Upadhyay, *Reengineering India: Work, capital, and class in an offshore economy* (Delhi: Oxford University Press, 2016).
Friedrich Engels, *The origin of the family, private property and the State* (New Delhi: Penguin, 2010).
Gail Omvedt, *Dalit Visions: the Anticaste movement and Indian Cultural Identity* (New Delhi: Orient Blackswan, 2006).
Indu Banga (ed.), *City in Indian history* (New Delhi: Manohar, 1991).
M.N. Srinivas, *Social Change in Modern India* (New Delhi: Orient Longman, 1985).
Nivedita Menon (ed.), *Gender and Politics in India* (New Delhi: Oxford University Press: 2001).
Ramachandra Guha (ed.), *Social Ecology* (New Delhi: Oxford University Press, 1994).
Shilpa Phadke et. al., *Why Loiter: Women and Risk on Mumbai Streets* (New Delhi: Penguin, 2011).
Uma Ramaswamy, *Work, Union and Community: Industrial man in South India* (Delhi: Oxford University Press, 1983).
***REFERENCE ARTICLES:**
Will be shared with students during the course of the semester. Each module in this course will have a reference reading list which can be used by students.

***PROJECT:** None.

GRADING PLAN:

Type of Evaluation	Weightage (in %)
Mid Sem-1 Exam	**20%**
Mid Sem-2 Exam	**20%**
End Sem Exam	**40%**
Assignments	
Project	
Term Paper (In Lieu of Mid Sem-1)	
Other Evaluation (Term Paper and Presentation)	**20%**

OUTCOME: The student will get an overview of theories, concepts and methods in Sociology. The lectures, discussions, readings and projects will enable the student to relate to contemporary debates and to engage with the complexity of contemporary Indian society. Apart from understanding various social institutions in India, s/he will grapple with modern sociological concerns related to gender, the urban space, industrialization and the ecological contradictions of development.

REMARKS: The course will be based on lectures and the students will be expected to read the material mentioned in the reading list.

TITLE : Introduction to Gender Studies

Course Code : HSS347a

CREDITS : 4

TYPE-WHEN : Monsoon 2017

FACULTY NAME : Tejaswini Madabhushi

PRE-REQUISITE : NA

OBJECTIVE : To introduce students to basic concepts in gender theory and feminist practice and help the students locate themselves using these concepts.

COURSE TOPICS :

Unit I: Core Concepts and Ideas
Privilege What is privilege? How does privilege influence gender relations in our society?
Gender – Gender as construct; activity or discussion.
Lived Experience and Knowledge – what is knowledge, and who are the agents of knowledge? Lived experiences of gender and other marginalizations/oppressions as a source of knowledge.

Unit II: Historical Underpinnings
Important moments in the history of western feminisms.
Important moments in the history of Indian feminisms.

Unit III: Present-day Questions and Problems (Local and International)
Gender and the Home (The Personal is Political)
Gender and the Workplace
Gender and Media– ads, TV/film, online gaming culture, social media; BBC documentary *Blurred Lines* on gender harassment and stereotyping in online gaming culture and social media
Gender and Sexual Violence
Gender and Science
Gender and Education

Unit IV: Gender and Intersectionalities
Introduction – What are intersectionalities, and why is it important to study them when we study gender?
Gender and Class – what do we mean by class; how class modifies/intensifies the experience in the workplace, science, education, home
Gender and Caste – what do we mean by caste; how class modifies/intensifies the experience in the workplace, science, education, home.
Queering Gender – what does "queer" mean, and what are the different categories of queer?

PREFERRED TEXT BOOKS:

Peggy Mcintosh, White Privilege: Unpacking the Invisible Knapsack

Amy S. Wharton, The Sociology of Gender: An introduction to Theory and Research (Pg 18- 23)

Pat Mainardi, "The Politics of Housework" in Estelle B. Freedman (ed) The Essential Feminist Reader *(Pg 288-295)*

B. R. Ambedkar, Castes in India: Their Mechanism, Genesis and Development in *Indian Antiquity*, May 1917, Vol XLI

Leela Dubey, "Caste and Women" in Mary E. John (ed) Women's Studies in India : A Reader

Dipta Bhog, "Gender and Curriculum" in Mary E.John (ed) Women's Studies in India : A Reader *(Pg 352-360)*

Maitreyi Krishnaraj, "Understanding Violence against Violence" in *Economic and Political Weekly*, Vol. 42, No. 44 (Nov. 3 - 9, 2007), pp. 90-91

(Soft Copies will be provided for all the articles)

***REFERENCE BOOKS:**

A. Revathi and V. Geetha, The Truth About Me: A Hijra Life Story

GRADING:
1 midterm – 15%
1 exam – 35%
Short/Long assignments on individual instructors' discretion – 50%

OUTCOME: The students will be familiar with contemporary issues in gender discourse. They will be able to question their prior opinions and reorient themselves towards a more methodologically derived understanding on gender relations.

TITLE : Introduction to Game Theory

Course Code: CSE498

CREDITS : 3-0-0-4
TYPE-WHEN : MONSOON 2017
FACULTY NAME: Sujit Gujar

PRE-REQUISITE: Basic Knowledge in Linear Algebra, Probability Theory and comfortable in basic maths

OBJECTIVE:
Game theory is a mathematical model to analyze and predict behavior of strategic agents. In the modern world, where every individual has access to the Internet and immense computing power, game theory has become an important, useful and relevant tool in day to day life to design protocols in various contexts, analyze negotiations or induce cooperation. The objective in this course is to introduce students to game theory and different types of games such as non-cooperative games, cooperative games, games with incomplete information. Additionally the students will be exposed to various tools and solution concepts in game theory.

COURSE TOPICS:
(a) What is game? Extensive form games vs strategic form games, two player zero sum games, mini-max theorem, dominant strategy equilibrium, Nash equilibrium and its existence. Co-operative game theory, core, imputations, Shapley value, Nash bargaining solution.
(b) Mini-max Theorem, Nash Theorem, Shapley's Theorem for core and algorithmic aspects of these theorems.
(c) Game with incomplete information, introduction to mechanism design, revelation principle, voting schemes.
(d) Application of the above concepts will be illustrated with use cases in wireless communication, e-Commerce, social networking, crowdsourcing and, cloud management. (If time permits, advance topics such as) Arrows impossibility theorem, price of anarchy in routing games.

PREFERRED TEXT BOOKS:
"Game Theory and Mechanism Design" by Y Narahari.

***REFERENCE BOOKS:**
"Game Theory: Analysis of Conflict", by Roger B. Myerson.
***PROJECT:**
Students are expected to work in groups and develop a small software in Java to compute various solution concepts taught in the class.
GRADING PLAN:
Type of Evaluation Weightage (in %)
Mid Sem-1 Exam 20
Mid Sem-2 Exam 20
End Sem Exam 40
Assignments 10
Project 10
Term Paper -
Other Evaluation _____
OUTCOME:
At the end of the course a student should be able to
(i) Model and generate strategies for two person games.

(ii) Take a strategy decision problem and model it as appropriate game theoretic problem
(iii) Understand of different kinds of games and what kind of solutions are possible and their meaning
(iv) Apply mechanism design to design games for specific outcomes.
REMARKS: The course is designed for senior undergraduate students. Postgraduate students are also welcomed.

HSS343a **Introduction to History** **3-1-0-4**

TYPE-WHEN :

FACULTY NAME : Aniket Alam

PRE-REQUISITE:

ObJective : This course intends to introduce the non-historian student to the discipline of history and equip him/her with some ideas of how to look at the contemporary world with a historical perspective.

COURSE TOPICS:(1) Development of the ideas of memory, past and history;
(2) Conception of time;
(3) Making of the modern discipline of history;
(4) The main theories of history;
(5) The main methods of history.

PREFERRED TEXT BOOKS: E. H. Carr: *What is History*.
Marc Bloch, *The Historian's Craft*.

***REFERENCE BOOKS:** Romila Thapar, *Time as a Metaphor of History: Early India*.
Bernard S. Cohen, "History and Anthropology: The State of Play". Chapter in *An Anthropologist among the Historians and Other Essays*.

Ranajit Guha, "On Some Aspects of the Historiography of Colonial India". Chapter one in *Subaltern Studies* Vol 1.
Mircea Eliade, *The Myth of the Eternal Return: Cosmos and History*.

***PROJECT:** Written analysis of either one film or novel or a contemporary news event using historical methods.

GRADING PLAN:

Type of Evaluation	Weightage (in %)
Mid Sem-1 Exam	**20%**
Mid Sem-2 Exam	**20%**
End Sem Exam	**40%**
Assignments	
Project	**20%**
Term Paper	
Other Evaluation _____	

OUTCOME: The student will be able to identify the main theories and methods of the discipline of history. S/he will also be use some of these to understand and explain contemporary events.

REMARKS: The course will be divided into two parts. Part One will consist of lectures and readings which will introduce the students to the readings and also give information about the main theories and theoreticians of history. The readings will total about 250 printed pages. Part Two will consist of class discussions and group presentations, based on analysing films, novels and contemporary new reports using ideas and methods learnt in part one.

HSS351a **Introduction to Psychology** **3-1-0-4**

Type when: Monsoon 2017

Faculty Name: Priyanka Srivastava

Pre-requisite: None

Course Topics:

Objective: The aim of the course is to introduce various research-driven topics in psychological science. This course will help you understand how we perceive, think, feel and act, both as an individual as well as a social-cultural being. Emphasizing the role of critical thinking, empirical investigation and research design in psychology, this course will specifically highlight how psychological phenomena and processes are scientifically investigated.

Topics:

1. **Introduction to Psychology**
2. **The Matter of the Mind**
3. **Evolutionary Psychology**
4. **Human Development**
5. **Sensation, Perception, Attention, and Awareness**
6. **Consciousness**
7. **Learning**
8. **Memory**
9. **The Social Mind**
10. **Motivation and Emotion**
11. **Stress, Coping, and Health**

Books:

1. **Psychology: from Inquiry to Understanding, 3ed. 2014., by Lilienfeld, Lynn, Namy, & Woolf.**

Teaching approach: The course will be lecture cum seminar course. Students will be introduced to undergraduate-level introductory topics and issues in psychology. Relevant lecture videos and reading material will be provided before each topic.

In this course, we'll use online lectures from active scientists in the field of Psychological Sciences from MIT and University of Toronto. I have planned to follow MIT and Coursera,

Introduction to Psychology Course for lectures, followed by twice a week active discussions in our scheduled classes. Mostly the lectures will be considered from Coursera videos on Introduction to Psychology by Prof. Joordens, except topic 10 and 11, which will be covered from MIT opencourseware (OCW) by Prof. Gabrielli.

To ensure the participation of each student, each student will be given a chance to briefly talk about the topic based on the assigned readings. Each student will be required to do at least one presentation.

Assignments: This exercise will consist of two brief write-ups (about 1000-1500 words) about psychological phenomena that will be assigned to them based on our everyday experiences. For instance, some of the questions will be as following:

1. How media affect the way we think? 2. Do we freely choose our actions or are they determined beforehand by factors beyond our awareness and control? 3. How our brain sculpted? 4. How do we develop an attitude about people, things, and events? 5. How your behavior get shaped? 6. Are there laws of perception?

The purpose of the assignment is to evaluate the conceptual mapping of the everyday phenomenon to psychological investigation and scope of generalization. This exercise will involve critically review of peer-reviewed journal articles and/or book chapters and state their position in reference to the topic assigned to them. General feedback will be given to students after evaluation.

Project: In this exercise students will be required to conduct an empirical study to understand the psychological phenomena or processes by employing the research methods used in psychological sciences. Students will be encouraged to replicate the classic psychological studies and get mesmerized with similar / contradictory findings ☺

Grading:

1. Assignments: 20%
    a. Brief Write up (10%)
    b. Class presentations (5%)
    c. Peer review (5%)
2. Quizzes 10%
3. Mid-Term II – 20%
4. Final Term – 20%

5. Project – 30%
    a. Project ideas (10%)
    b. Conducting study (10%)
    c. Final report and presentation (10%)

Outcome: By the end of the course students will be able to:

1. understand the research issues in Psychological Science
2. conduct an empirical investigation, by employing experimental or non-experimental approach and result interpretation

Remarks:

Maximum number: 35-40 students

Online Courses Link – massive open online courses

1. Coursera – Prof. Steve Joordens, Univesity of Toronto, Ontorio, Canada (https://class.coursera.org/intropsych-001)
2. CMU – Open Learning Initiative – Prof. … with Norma Bier director of OLI group.
3. Yale University – Prof. Paul Bloom , Lectures available on Youtube. (https://www.youtube.com/playlist?list=PL6A08EB4EEFF3E91F&feature=plcp)
4. MIT – Prof. John Gabrieli (http://ocw.mit.edu/courses/brain-and-cognitive-sciences/9-00sc-introduction-to-psychology-fall-2011/index.htm)
5. edX – Dr. Janeen Graham (https://courses.edx.org/courses/course-v1:SMES+PSYCH101x+2T2015/courseware/f3763236185c4c41ac182ad823e70b64/5e6428fae8ed446ba4ca1f07f80bc9c1/)

TITLE : Introduction to Cognitive Science

Course Code : CSE 485

Note: Please use course code for previously existing course

CREDITS : 4

TYPE-WHEN : Monsoon Semester (Aug-Dec)

FACULTY NAME : Priyanka Srivastava + Vinoo Alluri

PRE-REQUISITE : None (Open mind, Enthusiasm and Motivation!)

OBJECTIVE: The focus of this course is to understand the relationship between mind and behaviour or brain and behaviour. The objective is to give an appreciation for various Cognitive and Emotional processes that brain/mind sub-serves, what is known currently about these, the experimental methods used in unraveling these processes and finally some Philosophical and theoretical issues related to Mind and Consciousness. This is the first course in Cognitive Science that prepares the ground for students so that they can take other courses that focus on Computational / Mathematical Models, more detailed issues related to Cognitive Neuroscience, applications in Human-Computer Interaction, Neuroimaging Methods, etc. Apart from understanding the principles of Cognitive Science, the course requires students to actually conduct experiments on human subjects to study any one of the topics covered in the class as part of the Project.

COURSE TOPICS: Introduction, History of Cognitive Science, Basics of Human Brain Anatomy, Learning and Development, Movement and Action, Vision and Attention, Auditory processes, Memory, Reasoning and Decision Making, Emotion, Language and Speech, Cognitive Disorders, Basic issues in Philosophy of Mind and Consciousness.

PREFERRED TEXT BOOKS: (PDF copies of material from the following will be made available for reading) Berm□lez, J. L. (2010). Cognitive Science: An Introduction to the Science of the Mind, Cambridge University Press. Friedenberg, J. and Silverman. G. W. (2006). Cognitive Science: An Introduction to the Study of Mind, Sage Publications (First Edition) Kandel, E.R., Schwartz, J. H., Jessell,

T. M., Siegelbaum, S. A., Hudspeth, A. J. (2012). Principles of Neural Science, (Fifth Edition), McGraw Hill.

***REFERENCE BOOKS:** Bechtel, W., & Graham, G. (Eds.). (1998). A Companion to Cognitive Science. Malden, MA: Blackwell. Gazzaniga, M., Ivry, R. B., & Mangun, G. R. (2002). Cognitive neuroscience: the biology of the mind. Cambridge: MIT press. Thagard, P. (2005). Mind: Introduction to Cognitive Science, Cambridge, MA: MIT Press. Marr, D. C. (1982). Vision: A Computational Investigation into the Human Representation and Processing of Visual Information. San Francisco: W. H. Freeman. Searle, John R. (2005). Mind: A Brief Introduction (Fundamentals of Philosophy Series), Oxford University Press.

***PROJECT:** Students will be assigned projects where small groups have to take up one topic from the course topics. The group will design and conduct experiments on human subjects and then process /analyze and interpret the data collected from the experiments. Performance assessment will be based on Group presentation, Viva and a Final report submission.

GRADING (indicative only): Mid-term Exams (2): 30% Final Exam: 40% Project: 20% Quizzes, Assignments, Class Attendance and Participation: 10%

OUTCOME: At the end of the course, students will have an appreciation of the principles of Cognitive Science and theoretical issues related to Mind and Consciousness. It is expected that students would acquire both the knowledge of the state-of-the-art in Cognitive Science and also practical experience and appreciation of how empirical studies are conducted to investigate human behaviour.

REMARKS:

Title: Introduction to Philosophy: God, Knowledge and Consciousness

Credits: 4

Type-When: This is based on EdX course:
https://www.edx.org/course/introduction-philosophy-god-knowledge-mitx-24-00x
Students have to register at the above link to download study material for a self-study and attend a group discussion session once a week for 1.5 hrs.
Evaluations will be done by the course instructor and **not** EdX.
Monsoon 2017

Faculty : Jolly Thomas

Pre Requisite: none

Objective: This course will look at some perennial philosophical problems: Is there a God? What is knowledge, and how do we get it? What is the place of our consciousness in the physical world? As this course is meant to develop self-learning, it is not lecture-based. This course will be carried out by having discussions and writing assignments as well as term paper. This will help to develop the critical reasoning and argumentative skills more generally.

Course topics and related readings

Part 1: God

Week 01

Meeting 1: Introduction (For God: The Ontological Argument)

Meeting 2: Assessing Arguments

Week 02

Meeting 3: For God: We See Design

Meeting 4: Against God: The Problem of Evil

Week 03

Meeting 5: For God: Pascal's Wager

Part 2: Knowledge and Justified Belief

Week 04

Meeting 6: What is Knowledge?

Meeting 7: SkepticismAbout Knowledge

Week 05

Meeting 8: SkepticismAbout Justified Belief, Part 1: The Old Problem of Induction

Meeting 9: SkepticismAbout Justified Belief, Part 2: The New Problem of Induction

Part 3: Mind and Consciousness

Week 06

Meeting 10: How Things Feel

Meeting 11: Science Strikes Back

Week 07

Meeting 12: Thinking Machines

Part 4: Free Will

Week 08

Meeting 13: Free Will and Determinism

Meeting 14: Freedom Without Alternatives

Week 09

Meeting 15: A Compatibalist Theory of Free Will

Part 5: Personal Identity

Week 10

Meeting 16: The Psychological Criterion of Personal Identity Over Time I

Meeting 17: The Psychological Criterion of Personal Identity Over Time II

Grading:

Assignments = 20%

Discussion group participation = 30%

Term paper 20%

Final exam = 30%

HSS345a **Introduction to Shakespeare** **3-1-0- 4**

TYPE-WHEN **: Monsoon 2017**

FACULTY NAME **: Aruna Chaluvadi**

PRE-REQUISITE **: 3rd and 4th year students**

OBJECTIVE: To introduce Shakespeare through critical readings of Selections from his Plays and Sonnets

COURSE TOPICS :

Brief Biography, Tragedies: Introduction and reading Selections from Othello, Hamlet, Macbeth and King Lear.

Comedies: Introduction and reading Selections from Taming the Shrew, The Merchant of Venice.

Histories and Other Plays: Introduction and reading Selections from Henry iv Part 1 & 2, The Tempest, Antony and Cleopatra.

Sonnets: Introduction and Readings
Discussion after Viewing 3 Movies: The Merchant of Venice, Hamlet, and Othello

PREFERRED TEXT BOOKS: Sixty Selections from Shakespeare, Gerard Bridge

***REFERENCE BOOKS: http://absoluteshakespeare.com/plays/plays.htm, http://www.shakespeare-online.com/, https://ebooks.adelaide.edu.au/s/shakespeare/william/**

***PROJECT:**

GRADING PLAN:

Type of Evaluation	Weightage (in %)
Mid Sem-1 Exam	**15%**
Mid Sem-2 Exam	**15%**
End Sem Exam	**20%**
Assignments : View at least one in each month (3 Movies or BBC dramas) for and write critical appreciation of Shakespeare	**3 x10 = 30%**
Term Paper - Characters and Contexts in Shakespeare	**20%**

OUTCOME: Introduction to Shakespeare

REMARKS:

TITLE : Information Theory and Coding

Course Code : ECE539

Note: Please use course code for previously existing course

CREDITS : 3-1-0-4

TYPE-WHEN : Aug-Dec (monsoon) 2016

FACULTY NAME : Lalitha V

PRE-REQUISITE : Basics of probability theory are a must

OBJECTIVE : To introduce students to the basics of information theory, which establishes the limits of communication and data compression.

COURSE TOPICS :

1. Motivation for digital communication and information theory, Probability overview.
2. Source Coding - Entropy and its properties, Relative entropy, Mutual information, Huffman codes and optimality, Asymptotic Equipartition Property and Typical set based source coding.
3. Channel coding - Channel capacity motivation and definition, Discrete memoryless channel, Channel coding theorem for DMC- achievability and converse.
4. Gaussian channel - Differential entropy, Gaussian channel with power limitation, Gaussian channel coding theorem and converse.
5. Error control coding - Goals, Block codes and bounds, Repetition Hamming code, Convolutional codes, Viterbi hard decision decoding.

TEXT:

1. “Elements of Information Theory”, Thomas Cover and Joy Thomas.
2. “Error Control Coding” Shu Lin and Costello.

REFERENCES

1. “Information theory”, Robert Ash.
2. “Information Theory, Inference and learning algorithms”, David McKay (available online)
3. “Error Correction Coding”, Todd K Moon.
4. “Stochastic Processes”, Sheldon M Ross.
5. “Introduction to Probability”, Bertsekas and Tsitsiklis (Available online).
6. “Principles of Digital Communications”, by Robert Gallager (Lecture notes available online).

TITLE : Linear Control Systems

Course Code : ECE451

CREDITS : 3-1-0-4

TYPE-WHEN : Monsoon-2017

FACULTY NAME : Rambabu Kalla + Abhishek Sarkar

PRE-REQUISITE : None

OBJECTIVE : To obtain basic understanding of feedback control theory.

COURSE TOPICS :

INTRODUCTION – Definition and examples of control systems, Open and closed loop control systems, Disturbances and parameter variations, Motivation for feedback, Generic block diagram of a feedback control system, control system terminology, Classification of control systems

MATHEMATICAL MODELING – Modeling of systems from 1st principles, Analogous systems, Linearization of non-linear models, Transfer function of linear system, State variable models, Transfer function from state equation, Block diagrams and block diagram reduction, Signal flow graphs

STABILITY OF LINEAR SYSTEMS – Concept of stability, Routh-Hurwitz Criteria, Relative stability

SYSTEM PERFORMANCE AND CHARACTERISTICS – Steady state and transient responses, Performance of a second order systems, Steady state and transient performance parameters

DESIGN OF FEEDBACK CONTROL SYSTEMS – Root locus method, design of state variable feedback system, Notion of controllability and observability, Full state feedback control design, observer design, Integrated full-state feedback and observer

PREFERRED TEXT BOOKS: Modern Control Systems by Dorf and Bishop

***REFERENCE BOOKS:** Modern Control Engineering by Ogata

GRADING: 1. Periodic Assignments/Quiz: 20 marks

2. Mid-term Examinations: 20 + 20 marks

3. End Semester Examination: 40 marks

TITLE : Mobile Robotics

Course Code : CSE483

Note: Please use course code for previously existing course

CREDITS : 4

TYPE-WHEN :

FACULTY NAME : Dr K Madhava Krishna

PRE-REQUISITE : None

OBJECTIVE: The course introduces the student to fair detail on the basic modules for automating a mobile robot such as localization, mapping, navigation, planning and collision avoidance. The course draws upon state of the art practices in probability and statistical methods, optimization techniques and shows how they are dovetailed to a robotics setting. The course has a strong coding and project component in the form of 3 projects wherein the student is expected to simulate and implement the algorithms taught in class.

COURSE TOPICS:

Month 1: Introduction to Path Planning, AI style planning, Kinematics, randomized planning, trajectory optimization, collision avoidance in dynamic environments

Month 2: Kalman and Extended Kalman Filters (EKF), EKF based Localization and SLAM

Month 3 till End: Graph Optimization, Graph SLAM, Occupancy Grid Mapping, Exploration

PREFERRED TEXT BOOKS: Probabilistic Robotics by Wolfram Burgard, Deiter Fox and Sebastian Thrun

***REFERENCE BOOKS:** Research papers uploaded on course portal

*PROJECT: 3 projects

GRADING:

Mid Exam: 20

End Exam: 20

Projects: 20*3 = 60

Class Performance, Interaction: 10

OUTCOME: The student is expected to be aware of state of the art mobile robotic algorithms and should feel comfortable reading and assimilating state of the art research papers in areas covered in the course/class.

REMARKS:

TITLE **: Multi agent Systems**

Course Code **: CSE 482**

CREDITS **: 3**

TYPE-WHEN **:**

FACULTY NAME **: Praveen Paruchuri**

PRE-REQUISITE **: Artificial Intelligence (CSE 371)**
OBJECTIVE **: How should a group of agents act ?**

COURSE TOPICS **:**
(please list the order in which they will be covered)

Introduction and Applications
Automated Negotiation Basics
Distributed CSPs
Distributed Constraint Optimization
Review of Game Theory Basics
Automated Negotiation Algorithms
Bayesian Stackelberg Games
Security Applications for Games
Adjustable Autonomy in Human-Agent Teams
Decentralized MDP and POMDP

PREFERRED TEXT BOOKS: Multiagent Systems by Yoav Shoham and Kevin Leyton-Brown

***REFERENCE BOOKS:** Artificial Intelligence, 3rd edition by Stuart Russell and Peter Norvig.

***PROJECT: Yes if class strength < 35**

GRADING PLAN: For less than 35 students

Type of Evaluation	Weightage (in %)
Mid Sem-1 Exam	**-**
Mid Sem-2 Exam	**15**
End Sem Exam	**30-35**
Assignments	**20**
Project	**20-25**
Term Paper	
Other Evaluation _____	**10**

OUTCOME: Multi-agent systems have found applications in a variety of settings starting from everyday activities like meeting scheduling to solving poker games to improving security at airports and ports to modeling of massive fight sequences in movies. The outcome of this course is to equip students with the general principles behind the design of multi-agent systems.

REMARKS: Should be viewed as a follow on to the basic Artificial Intelligence course.

TITLE : **Natural Language Processing**

Course Code : CSE472

CREDITS : 3-0-1-4

TYPE-WHEN : Monsoon-2017

FACULTY NAME : Manish Srivastava

PRE-REQUISITE : Intro to NLP

OBJECTIVE : This is the advanced course in Natural Language Processing intended for honors, dual degree, BTP, MTech and PhD students.

COURSE TOPICS : In this course, students get an overview of various areas in NLP and the current research trends in each of them. The topics covered include machine translation (rule based & statistical), discourse, statistical parsing, word sense disambiguation, natural language generation, coreference resolution, semantic role labeling etc.. The course also covers two of the most popular machine learning methods (Expectation-Maximization and Maximum Entropy Models) for NLP. Students would be introduced to tools such as NLTK, CoreNLP to aid them in their research.

***PROJECT:** There will be a mini project and research readings once every alternate week.

TITLE **: Number Theory and Cryptology**
Course Code **: IMA404**
Credits : 3-1-0-4
Type-When : Monsoon-2017
Faculty Name : Rajat Tandon
Max.Limit **:**
Pre-Requisite : A little bit of abstract algebra including the basic concepts of groups, rings and fields. Concept of limit in real analysis. A little bit about matrices.

OBJECTIVE: To introduce the students to the number theoretic aspects of Cryptography

COURSE TOPICS: Finite Fields, Legendre Symbol, Euler's Theorem, Polynomial time algorithm, Primality Testing, Carmichael Numbers, RSA and discrete log, an Introduction to the use of Elliptic Curves in Cryptology.

PREFERRED TEXT BOOKS: An Introduction to Number Theory and Cryptography by Neal Koblitz (Springer)

***REFERENCE BOOKS:** Cryptology by Stillwell

***PROJECT:** No project

GRADING: On the basis of two tests 25 marks each and a final exam of 50 marks

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TITLE : Performance Evaluation of Computer Systems
Course Code :
CREDITS : 4
TYPE-WHEN : Monsoon-2017
FACULTY NAME : R Lavanya
PRE-REQUISITE : Willingness for analytical thinking
OBJECTIVE : measurement, mathematical modeling and computer performance evaluation
COURSE TOPICS :
(please list the order in which they will be covered)
1. capacity planning
2. computer performance metrics
3. computer performance workloads: selection and characterization.
4. performance counters, hardware software instrumentation and tracing.
5. introduction to queuing theory terms and definitions, operation analysis and analytic models
6. single queue analysis and queuing networks
7. performance analysis and scalability
8. case studies

PREFERRED TEXT BOOKS: The art of computer systems performance analysis – Techniques for experimental design, measurement, simulation and modeling, by Raj Jain, Wiley publishers
***REFERENCE BOOKS:** Quantitative system performance, http://homes.cs.washington.edu/~lazowska/qsp/
***PROJECT:** No project

GRADING PLAN: Type of Evaluation	**Weightage (in %)**
Mid Sem Exam	20
End Sem Exam	40
Assignment 1	5
Assignment 2	5
Assignment 3	5
Assignment 4	5
Assignment 5	5
Assignment 6	5
Assignment 7	5
Assignment 8	5

TITLE : Principles of Programming Languages

Course Code : CSE415

Credits : 3-1-0-4

Type-when : Monsoon 2017

Faculty Name : Rekha Singhal

Pre-Requisite : Discrete Mathematics (with some knowledge of sets and predicate logic). Programming in any programming language. Exposure to a strongly typed object-oriented programming language like Java would be useful, but not necessary.

OBJECTIVE:

This course is an introduction to the principles behind the design of programming languages, including object-oriented programming, and the use of formal methods in reasoning with programs. How does a program run? One way to answer this question is to understand that programs are translated (compiled) into another, lower-level language, which is executed by hardware. In this course, we take a different, but related approach. We build a series of interpreters, each a mini abstract or virtual machine for a specific language. Using this approach we study standard features of procedural languages like scoping, stack architectures, parameter passing, and also more advanced features like continuations, threads, and type reconstruction and generic types, and, finally, object oriented programming. However, this is not a course on object-oriented programming; we will, instead, learn how OO languages are implemented and designed.

All the interpreters we write in this course will be in the Scheme programming language, which will be covered at the beginning of the course. Ideally, programming in Scheme would have been a prerequisite. But the first week of the course is devoted to a quick introduction to it. Students should use the summer holidays to learn as much Scheme as they can, and also learn to use the text editor Emacs (which is, among other things, an integrated development environment for PVS), The second goal of this course is to introduce the mechanics of formal reasoning of models of data and programs (logics, sequents, skolemization, quantification, etc.). We will employ the Prototype Verification System (PVS) for expressing simple models and their verification. PVS is an industrial scale type checker and interactive theorem

prover with support for model checking (through the SAL library). The reason for employing PVS (as opposed to automated model checkers) is to give the student an opportunity to learn to write specifications, define putative theorems as a way of exercising the specifications, and then attempt to prove these theorems "by hand" and with some automated assistance from PVS.

COURSE TOPICS:

Introduction to Scheme

Introduction to Scheme programming: lists, functions, and recursion. Most material will be taken from the HtDP. Interpreter Models of programming languages Values, types and expressions. Abstract syntax. Backus-Naur form. Block structure and lexical environments. Scope and binding. Procedures and closures. Implementing recursion. Computational effects. Explicit and implicit references. Implementing mutation.Expressible and denotable values. Parameter passing. Tail recursion. Continuation-passing style (CPS). Converting to CPS. Continuation-passing interpreters. Trampolining. Imperative interpreters. Modeling exceptions and concurrency. Type checking. Type reconstruction. Term unification. Hindley-Milner polymorphism. Object Oriented Languages Interpreters for Object Oriented Programming. Dynamic Method Dispatch. Inheritance. Shallow embedding of an object oriented language in Scheme. Introduction to Formal Verification Formal Specification. Types, Predicates and Sets. Higher-order predicates. Introduction to Prototype Verification System. Sequent calculus. Skolemization. Axiomatization and Type correctness conditions. Dependent types. Proving theorems using the PVS theorem prover. Induction. Invariants. Theory interpretations. Simple model checking.

PREFERRED TEXT BOOKS:

.How to Design Programs (HtDP). Felleisen et al. Available online. http://www.htdp.org/ Also available in print from Prentice Hall India.

.Essentials of Programming Languages, (EoPL) 3rd Edition. Friedman and Wand. Available in Prentice Hall India edition. This is the main text book.

Software

.PLT Scheme http://www.plt-scheme.org

.Prototype Verification System

http://pvs.csl.sri.com .Emacs text editor

***REFERENCE BOOKS:**

.Prototype Verification System (PVS). Documentation available on the PVS website.

http://pvs.csl.sri.com

.Programming Languages: Applications and Interpretation. Shriram Krishnamurti. Available online http://www.cs.brown.edu/~sk/Publications/Books/ProgLangs/

.Programming Languages: Principles and Paradigms. Gabbrielli, Maurizio, Martini, Simone. Springer 2010. (Library, please purchase a few copies of this book to be kept on reserve, plus one copy for loan to the instructor.)

Class notes will supplement reading assignments from the text books.

*PROJECT:

GRADING:

.homework (will be assigned but not graded): 0%

.quizzes (6): 30%

.midterm exams (2): 30%

.final exam: 40%

OUTCOME:

A student completing this course should be able to

.apply the principles learnt in this course to gain a deep understanding of any programming language he/she learns in the future.

.apply the skills and the vocabulary to formally and informally reason with programs and data, specially during modeling, construction and testing of software.

Course title: Principles and Practices of Organic Farming

Credits: 4

Type/ When: Engineering Elective/ Monsoon 2017

Faculty name: G. Syamasundar Reddy

Prerequisite: Nil

About the Course: Organic farming is a sustainable and environmentally friendly production method. Organic management stresses on optimization of resource use and productivity, rather than maximization of productivity and over exploitation of resources on the cost of resources meant for future generations.

A healthy biologically active soil is the source of crop nutrition, on-farm biodiversity controls pests, crop rotation and multiple cropping maintains the systems health and on-farm resource management with integration of cattle ensure productivity and sustainability.

Objective: The course aims at providing the student a pragmatic approach in understanding the whole set of principles that govern organic farming while handling them in reality. The theory covers the principles and practices in detail while the lab actually gives them hands-on experience regarding what an organic farm is exactly about.

Theory: Tuesday – 8.30 AM to 10.00 AM

1. Elements of farming: Soil, water, plants, weather, humans and other animals.

2. Soil: formation, structure, texture, physical, chemical and biological properties of soil. Understanding soil as a living biological system, soil enrichment and soil conservation for sustainable productivity.

3. Irrigation Water: Plant-water relationship, water requirements of different crops, efficient water management techniques, moisture conservation methods, rain water harvesting, phytoremediation of waste water.

4. Climate: Elements of weather and their influence on crop growth and development, solar radiation, temperature, rainfall, relative humidity.

5. Nutrient management: Types of organic manures, bulky organic manures, concentrated organic manures, green manuring in-situ, green leaf manuring, crop rotations, bio-fertilizers, bio-dynamic preparations, liquid manures, sea weed extracts.

6. Weed management – types of weeds, crop-weed competition, methods of weed management,

options in organic farming.

7. Pest management: Types of pests, insects, nematodes, rodents, birds, fungi, bacteria, viruses,

nutrient deficiencies, physiological disorders. Sustainable and eco-friendly ways of pest management.

8. Concepts of natural farming and permaculture.

9. Organic foods – production, certification and marketing.

Practice: (Sasya-Syamala Krishivanam); Friday – 7.15 AM to 8.45 AM

10. Sustainable Habitat

11. Multiple cropping & Crop rotation

12. Manuring & Soil enrichment

13. Soil and water conservation techniques

14. Seed treatment (bio-control agents, bio-fertilizers, pro-biotics etc.)

15. Preparation of liquid manures & Bio-dynamic preparations

16. Organic pest management (cultural, mechanical, biological and Botanical)

17. Preparation of botanical pesticides

18. General Composting & Vermi-Composting References:

1. Vrikshayurveda (1000 AD) – Sage Surapala (Asian Agri-History Foundation; 1996)

2. Farmers of Forty Centuries (1911)- F. H. King

3. An Agricultural Testament (1943)- Sir Albert Howard

4. The Living Soil (1943) – E. B. Balfour

5. One Straw Revolution (1978)– Masanobu Fukuoka

6. The Natural Way of Farming (1985)– Masanobu Fukuoka

7. Permaculture : A Designer's Manual (1988)– Bill Mollison

8. Organic Farming Source Book (1996)– Claude Alvares

9. A Hand Book of Organic Farming (2001): Arun K. Sharma

10. Philosophy of Spiritual Farming (2004)– Subhash Palekar

11. Trends in Organic Farming in India (2006): S. S. Purohit & Dushyent Gehlot (Eds.)

12. Encyclopedia of Organic Farming (2008) - Daniel Howard, Penelope de Boer, Ellen Eddy Shaw

13. Organic Farming Standards, Accreditation, Certification and Inspection (2009) - Dushyent Gehlot

14. ORGANIC FARMING IN INDIA (2014) - Dr. Ranjan Kumar Biswas

Grading:

A. Farm Project : 20%

B. Farming Assignments : 20%

C. Farm Work : 10%

D. Mid-Sem Exams : 20%

E. End-Sem Exam : 20%

F. Short Seminars : 10%

Outcome:

After completing the course the students will get a fair understanding of principles and practices of organic farming. They will also get a real time experience of doing organic farming.

Title : Research in Information security

Course Code : CSE540

Credits : 4

Type When : Monsoon 2017

Faculty Name : Ashok Kumar Das

PRE-REQUISITE: programming languages (C/C++, Python), operating systems, compilers, introduction to security.

OBJECTIVE: This course is intended to introduce students the exciting world of information security research. The main focus of this course would be on non-cryptographic security research i.e. topics related to software vulnerabilities, malware, intrusion detection/prevention systems. The renowned Cryptographer Dr. Bruce Schneier once said that ".. security is a chain and is as strong as its weakest link. Cryptography is already a string link, problem lies somewhere else- in networks and software …."

Following the aforementioned suggestion, the course is designed to introduce software

security issues and state-of-the-art in techniques to address those issues. At the end of the course, the students should:

1. understand the various issues in software security;
2. understand the techniques that are applied in order to address security issues;
3. understand the majority of the attacks that hamper the security of the networks, e.g. bug exploitation (aka hacking);
4. learn basics of malware analysis and defensive techniques;
5. learn basics of program analysis (static and dynamic program analysis) that are applied to analyze software for vulnerability detection;
6. get familiar with the state-of-the-art in security research to lay foundation for their advance research.

COURSE TOPICS: The entire course is divided into 3 modules:

A. Software vulnerability Analysis:

1. Non-web software vulnerabilities (low level bug, e.g., buffer overflow, use-after-free etc.)
2. Binary code analysis
3. Static program analysis
4. Dynamic program analysis (fuzzing)
5. Application of SAT/SMT solvers for security
6. Application of evolutionary computing/ machine learning for security program analysis
7. Web specific vulnerabilities and their analysis (e.g. XSS, CSRF, SQLinjection etc.)

B. Malware Analysis:

1. Introduction to reverse engineering (x86 code only)
2. Obfuscation techniques
3. Android malwares
4. Biologically inspired approaches to malware detection

C. Intrusion Detection System:

1. Machine learning approaches for IDS/IPS
2. Autonomic security
3. Critical infrastructure security approaches.

PREFERRED TEXT BOOKS:

The course is mainly based on research articles and notes given by the instructor.

***REFERENCE BOOKS:**

= Any compiler book for dataflow analysis

= Assembly book for x86

= Practical malware analysis, by Sikorski and Honig

*PROJECT: Student can choose some topic that can be extended to major project for the master degree or advance research. However, if student choose to work on the project during the course, they can do. So, this is optional.

GRADING:

20%: Mini Project

15%: In-class paper presentation

15%: Hands-on assignments (2)

15%: mid term

35%: End exam

OUTCOME: The students will be well aware of state-of-the-art in non-cryptographic security issues and their proposed solutions. The student will also get to know about the opportunities that exist in the research space. Some of the topics are very practical from industry point of view, especially when it comes to proactive approach to security i.e. security during development process.

REMARKS: The course is highly flexible in its contents and approach. Based on the student's participation and interest, the course may progress in a particular direction.

TITLE : RESEARCH METHODOLOGY

Course Code : CSE 991

CREDITS : 4

TYPE-WHEN : Monsoon 2017

FACULTY NAME : Vinoo Alluri

PRE-REQUISITE : Basic statistics, mathematics 12th standard

OBJECTIVE: This course will introduce students how to carry out research design and think like a researcher independently. More specifically they will get an introduction to research design, methods, analysis, interpretation and presentation of research outcomes. They will also be able to design their own experiments as a part of the course project/assignment to have hands on experience.

COURSE TOPICS : (please list the order in which they will be covered)

This is a course on research methodology specifically focusing on introduction to design of research, behavioral methods and acquisition, analysis of data using scientific methods. Following a brief overview, the course will broadly aim to cover key aspects in research methods from a scientific point of view. This will include the list of topics described below and in that order

1. Introduction
2. Defining and measuring variables, hypothesis and prediction
3. Ethics in research
4. Sampling methods
5. Research design and validity
6. Experimental research

1. General introduction
2. Within group design
3. Between group designs

4.Issues with Validity and Reliability

7. Non-experimental research
8. Factorial Design
9. Correlational research
10. Data coding and Analysis
11. Result Interpretation
12. Report Writing

PREFERRED TEXT BOOKS:

[1] Gravetter and Forzano (2011). Research Methods in Behavioural Sciences

[2] Stangor (2011). Research Methods for Behavioural Sciences

[3] Cozby and Bates (2011). Methods in Behavioural Research

***REFERENCE BOOKS:**

[1] Gravetter and Walnau (2008). Statistics in Behavioural Sciences

***PROJECT:**

Each project would be carried out in groups. Project would involve behavioral data acquisitions based on list of prepared questions. Projects would be evaluated on the basis of following criterions

Project evaluation

Organization

* Project summary/ Abstract

*Problem Statement

*Motivation and Hypothesis

* Methodology

* Results

* Discussion and Conclusion

* Future Direction

* Limitation and scope of the research / objective

Content

Impact

GRADING:

Exams (70%)

* Mid sem-I (20%)

* Mid sem –II (20%)

* Final Exam (30%)

Project (30%)

* Preliminary Design Presentation (10%)

*Final Presentation + VIVA (10%)

*Report (10%)

OUTCOME: Specific deliverables from this course are 1. Basic understanding of research methods 2. Construct, design study 3. Hands on experience on the following areas a) Data collection b) Data coding and analysis c) Result interpretation d) Report writing in APA format.

TITLE : Science Technology and Society

CREDITS : 4

TYPE-WHEN : General Elective Semester Monsoon

FACULTY NAME : Harjinder Singh

Rationale :

Evaluation of science as an outlook is a burning question. Comprehension of diverse aspects of science learning and developing competence to raise meaningful questions founded on critical thinking using tools of scientific epistemology are desirable. Science is not merely an episteme, its power comes to us in its ability to impact our world-view, and in applications of scientific principles in technology, that have grown from simple but revolutionary tools like the wheel to the overwhelming means of communication and control like the internet. The need to study impact of science on society is a corollary.

Objectives: Objectives for each section are itemized:

Sec. I: Preparing the platform on which scientific epistemology may be discussed.

Sec. II: Understanding how science is done – the nature and characteristics of science; distinguishing science from what is not science.

Sec. III and Sec. IV: Understanding the linkages between science and technology; Illustrative learning of the impact of science and technology on society and how these can become tools serving larger political structures.

Sec. V: A comparative understanding on distinct features of the human sciences.

Syllabus:

I. Review of theory of knowledge: 3-4 Hrs.

1. The problem of knowledge

2. Common sense – uncertain versus certain knowledge

3. Language, perception, reason and emotion; illustrations with limitations of each; the power and limitations of science emanating from the lack of emotion in scientific epistemology.

4. Generalisations and fallacies.

5. Beliefs versus Truth continuum – Justified True beliefs.

Required readings (Relevant chapters from):

1. Richard van de Lagemaat, Theory of Knowledge, Cambridge Univ Press

2. First chapter (Introduction) of Robert Audi's Epistemology: A Contemporary Introduction to the Theory of Knowledge

3. First chapter of Dunkan Pritchard What is this thing called knowledge

4. A chapter from Epistemology: the theory of knowledge, by Daniel Cardinal, Jeremy Hayward, and Jerald Jones, published by John Murray, London, 2004

II. Scientific epistemology: 10-11 hrs.

6. The world of science: Scales in Nature, Forms in Nature

7. Methods of Science – Deduction/Induction.

8. Methods of science – from hypothesis to law.

9. Methods of science –Modeling in sciences; (i) Geometry and linear algebra;

(ii) change and calculus; (iii) Chance and statistics

10. Measurement and the uncertainties – deterministic chaos, classical stochasticity and the quantum uncertainty

11. Characteristics of Science – controllability, reproducibility, verifiability and falsifiability

12. Scientific revolutions – the Copernican revolution; the atomic theory, the atomic structure, the 'quantum', The theory of evolution

13. Scientific theory versus pseudoscience

Required readings:

Notes provided by the instructor and relevant chapters from:

Samir Okasha, Philosophy of Science, OUP Monograph

Sundar Sarukkai, What is Science, NBT

Richard van de Lagemaat, Theory of Knowledge, Cambridge Univ Press

J D Bernal, Science in History, vols. 1-4, MIT press

III. Science, Technology and Society-I: theoretical issues: 7-8 hrs.

14. What is technology

15. Science- Technology interactions and linkages; Examples of how S & T mutually benefit each other; Variation of these linkages in time.

16. Social construction of technology; technology as a force that diffuses/enhances social contradictions

17. S & T and culture and politics

Required readings (Relevant chapters from):

David Bell, Science, Technology and Culture, Open University Press, McGraw-Hill Education

Rudi Volti, Society and Technological Change, Worth Publishers

Samir Okasha, Philosophy of Science, OUP Monograph

Sundar Sarukkai, What is Science, NBT

Richard van de Lagemaat, Theory of Knowledge, Cambridge Univ Press

J D Bernal, Science in History, vols. 1-4, MIT press

IV. Science, Technology and Society-II: A few burning issues of our times: 10-11 hrs.

18. Energy – the crisis and strategies

19. Nuclear energy – pros and cons

20. Renewable energy sources

21. Conflicts and the war industry - War as a Social Institution, technology and war, the technology of

war, resource based conflicts, the development debate and the internal conflicts.

22. Technology and genocide.

Required readings

Note provided by instructor and

relevant chapters from:

Edward O. Wilson, On Human Nature, Harvard University Press, 1994,

F.T. Marinetti, Critical Writings, trans. D. Thompson, Farrar, Straus & Giroux.

Achin Vanaik and Praful Bidwai, New Nukes: India, Pakistan and Global Nuclear Disarmament, Interlink.

Ethics and Weapons of Mass Destruction: Religious and Secular Perspectives, ed. Sohail H. Hashmi and Steven P. Lee, Cambridge University Press.

Margaret Mead, "Warfare Is Only an Invention, Not a Biological Necessity," Asia 40 (1940).

V. The Human sciences and Arts: 1-2 hrs.

Brief discussion on distinct features of the human sciences – the self-consciousness of the living being; the creative imagination in literature and arts as distinct from the scientific creativity.

Required reading (Relevant chapters from):

Richard van de Lagemaat, Theory of Knowledge, Cambridge Univ Press

VI. Conclusion: 1-2 hrs.

Review of Sections I-V; Questions for future and Discussions on the way forward.

Invited speakers: We will attempt to involve activists to talk to the students

Visits: Museums

Films:

Powers of Ten, Charles and Ray Eames

The day after, American made for TV documentary on post nuclear-war scenario

BBC documentaries on science and technology: The ghost in your genes, etc.

Assessment:

Assignments: 15%

2 mid sem exams: 25% (12? each)

End sem exam: 30%

Project (30%): focussed work on a select topic related to the course content; research work in teams (max of four students in a team) and independent individual write ups will be required. Presentations are encouraged but will not be mandatory.

TITLE : Spatial Informatics

Course Code : CSE591

Credits : 3-1-0-4

Type-When : Monsoon-2017

Faculty Name : KS Rajan

Pre-Requisite : Open to PG, UG-4 & UG-3

OBJECTIVE: Spatially explicit information like a map (e.g. Google Maps) informs us not just the geographical location but also the relationship between the objects in it, as the saying goes, A Picture is worth thousand words. This course gives an introduction to Remote Sensing and GIS, the science behind it and how this technology can benefit many disciplines, including navigation, environmental systems, disaster response, etc.

COURSE TOPICS: 1.Introduction. 2.Fundamentals of Remote Sensing. 3.Image Acquisition and Digital data. 4.Image Processing and Analysis. 5.Applications of Remote Sensing Land Use and Land Cover. 6.Geographical Information Systems (GIS) - Fundamental concepts. 7.Geospatial data and its Digital representation Vectors and Rasters. 8.Data structures in GIS and its Representation. 9.Projections and Georeferencing. 10.Spatial Data Query and Analysis. 11.Special Topics in Spatial Informatics. a.Web-GIS and GML. b.Open Source Initiatives in GIS/RS. c.3D GIS. d. Environmental and Health Informatics. e.Risk Mapping and Vulnerability Assessments

A few lectures, will be given by Invited Speakers in related areas during the course to provide the students a wider understanding of its relevance and application. In addition, there will be a hands-on (lab tutorials) introduction to some of the RS and GIS software and tools at relevant times during the course

PREFERRED TEXT BOOKS:

1 .Introduction to Remote Sensing by James B. Campbell

2.Geographic Information Systems by Paul A. Longley, Michael F. Goodchild, David J. Maguire, and David W. Rhind

3.Introduction To Geographic Information Systems by Kang-Tsung Chang

***REFERENCE BOOKS:**

GRADING:

1. Assignments (max. of 4) 15% 2. Project 10% 3. Mid-term Exams (2) 30% [15% + 15%] 4. End-Semester Exam (1) 45% Details of Assignments/Projects will be announced during the course

OUTCOME:

Students will learn the basic concepts of geospatial data representation, cartography, visualization, data manipulation and how to extract meaningful information from it. In addition, they will be exposed to the application potential of this fast developing domain cutting across disciplinary interests.

T ITLE: Speech Signal Processing

Course Code: ECE448

Credits: 3-1-0-4

Type-when: Monsoon-2017

Faculty Name: Anil Kumar V

Pre-Requisite: (PG, research and BTech students from 3rd year onwards will be permitted) Signal and systems Digital signal processing.

COURSE TOPICS: Background and need for speech processing, Speech production mechanism, Nature of speech signal, Basics of digital signal processing, Equivalent representations of signal and systems, Speech signal processing methods, Linear prediction analysis, Basics of speech recognition.

PREFERRED TEXT BOOKS: 1. L.R.Rabiner and B.H Juang, Fundamentals of speech recognition, Pearson LPE (1993). 2. L.R.Rabiner and R.W.Schafer, Digital processing of speech signals, Pearson LPE (1993).

GRADING: Based on lab reports, midsem exams and final exam. Weightage depends on the number of registrants.

Title: Speech Technology

Course Code: CSE971

Credits: 3-1-0-4

Type When: Monsoon-2016

Faculty Name: Suryakanth V gangashetty

Pre-Requisite : Speech Signal Processing

Objective: This is an advance course whose objective is to discuss and provide hands-on experiance on implementstion of algorithms, models used in feature extraction and in building speech systems.

COURSE TOPICS :

1. Introduction to speech technology
2. Feature extraction from speech signal
3. Algorithms for speech recognition
4. Methods for speech synthesis
5. Approaches for speech enhancement
6. Approaches for speaker recognition

PREFERRED TEXT BOOKS: Fundamentals of Speech Recognition (Prentics Hall Signal Processing Series) (Paperback) by Lawrence Rabiner and Biing-Hwang Juang

***REFERENCE BOOKS:** Spoken Language Processing: A Guide to Theory, Algorithm and System Development by Xeudong Huang, Alex Acero, and Hsiao-Wuen Hon

***PROJECT:** Mini projects on each topic

GRADING: 20% - Laboratory Assignments 20% - Review papers reading and presentation 20% - Midterm-1 20% - Midterm-2 20% - Final Examination

OUTCOME: At the end of the course, the students are expected to attain the theoretical and practical knowledge of the different algorithms used in speech technology.

TITLE : Social Science Perspective on HCI

CREDITS : 4

TYPE-WHEN : Monsoon 2017

FACULTY NAME : Nimmi Rangaswamy

PRE-REQUISITE : U3 and above

OBJECTIVE :

To introduce Human-Computer Interaction as an inter-disciplinary domain of study to students of Engineering and the Social Sciences

To bring a social perspective and the importance of lived contexts in the framing and understanding of man-machine interaction

To get a grasp of the theoretical and applied frameworks supporting the domain of HCI

Importantly, to introduce the idea of cross-fertilisation of academic domains, especially computer sciences and humanities to originate Human-Computer Interaction as a fertile research and academic science

COURSE TOPICS/OUTLINE/CONTENT

Overview of Course

Quote: “A sushi restaurant puts sensors on its plates to assess, in real time, what’s being eaten so it can adjust its food offerings” [Goodman, The Atomic Age of Data, 2015]” End Quote.

Radically different ways of interacting with computationally based systems are possible, ranging from the visual [surfaces, input devices] to the invisible [sensor technologies, back end processors] and importantly social [which means non-technological] affectations triggering diverse ways of interfacing with technology. Human-Computer Interaction [HCI] is a vision for a world of interconnected devices, that have acquired smartness due to computing power. As computational technologies continue to ‘disappear’ and merge with the physical world, becoming increasingly tangible, embedded and embodied in a range of environments, architectures and artifacts, new research agendas and design approaches are called for [Nansen et al, 2014].

This course is an introduction to the field of Human-Computer interaction research with a focus on 'human' and how the HCI domain interfaces with the social sciences. The course begins with a selection of seminal work that establish the HCI domain: interactive systems/techniques, design and user interfaces. We will then move on to topics including social and context aware computing, design research and evaluation methods.

The course will also present a perspective based on the importance and role of objects in social relations. We situate this work in relation to a conceptual understanding of objects and social relations, suggest effective methodological and theoretical tools to study of a more object-centered sociality and suggest design opportunities to make better products.

The course will center on the processes and challenges of ideating, designing and evaluating technologies as products, their usability and immersion into the social contexts of users. We will study contextual design as a field that emerged in response to the challenges of designing for context and usability. Another important strand in this course will dwell on the sociological aspects of HCI and explore the 'mediation' of technology use by a range of contextual situations: socio-cultural obligations, habits, values, infrastructure, material objects and not in the least family, kinship and human bonds. Some examples of the above are:

Understanding social interactions with a webcam as an important new development in communication interfaces and its widespread adoption in the real world supporting family relationships, business work flows and social networking.

A deep look at social networking as everyday HCI- Facebook; Twitter; Messaging applications.

Another example will be looking at technologies driven by data science, like mobile marketing analytics, and their consequences for society.

A third example will be studying real world application of big data to social situations: real time traffic; real world geographic navigation; geo-location based services [food delivery; friendship; dating]; Consumer-centric health care services [monitoring parameters; precision medicine; Health care platforms]

A close look at the impacts of peer to peer sharing platforms [Uber, AirBnB]

This class has no pre-requisite requirements and open to students from any background. Students are expected to do all of the readings. Students will be evaluated with a quiz or a test and a presentation that will gauge student ability in engaging with and comprehending the course readings and class room discussions. The class test and the presentation will be based on the class lectures and readings assigned for the course

PREFERRED TEXT BOOKS:

***REFERENCE BOOKS:**

Norman, D. A. (1990). *The design of everyday things*. New York: Doubleday.

Miller, D and Sinanan, J, *Webcam*, Polity Press, 2014

Sterling, B. *The Epic Struggle Of The Internet Of Things*, Moscow: Strelka Press, 2014.

Rogers, Y. *HCI Theory: Classical, Modern, and Contemporary*. [San Rafael, Calif.], Morgan & Claypool, 2012

Blomberg, J., Burrell, M., and Guest, G. *An Ethnographic Approach to Design,* Human-Computer Interaction Handbook, L. Erlbaum Associates Inc. Hillsdale, NJ, USA,2003

***REFERENCE ARTICLES:**

Bell, G., Blythe, M., and Sengers, P. 2005. Making by Making Strange: Defamiliarization and the Design of Domestic Technology. *ACM Trans. Computer-Human Interaction*, 12(2), 149-173.

Dourish, P. 2006. Implications for Design. *Proc. ACM Conf. Human Factors in Computing Systems CHI 2006* (Montreal, Canada), 541-550.

O'Brien, J., Rodden, T., Rouncefield, M., and Hughes, J. 1999. At Home with the Technology: An Ethnographic Study of a Set-Top Box Trial. ACM Trans. Computer-Human Interaction, 6(3), 282-308.

Kelson, J.A.S. (1982). The process approach to understanding human motor behavior: An introduction. In J.A.S. Kelso (Ed.), Human Motor Behavior: An Introduction, 3-19, Hillsdale, N.J.: Lawrence Erlbaum Associates.

Bell, G., Blythe, M., Gaver, B., Sengers, P., and Wright, P. Designing culturally situated technologies for the home. *Ext. Abstracts CHI 2003.* ACM Press (2003), 1062-1063.

***PROJECT:**

GRADING PLAN:

Type of Evaluation	Weightage (in %)
Mid Sem-1 Exam	**25%**
Mid Sem-2 Exam	**25%**
End Sem Exam	
Assignments	**50%**
Project	
Term Paper (In Lieu of Mid Sem-1)	
Other Evaluation (Term Paper and Presentation)	

OUTCOME:

Students will be able to identify and apply a sociological lens to a human-computer interaction context. This will mean applying informed ways to draw boundaries to an HCI context, use the right theoretical tools of study and processing appropriate data to conduct an independent academic study of selective HCI situations in the real world

REMARKS:

TITLE : Software Quality Engineering

Course Code : CSE861

Credits : 3

Type-when : Monsoon -2017

Faculty Name : Raghu Reddy

Pre-Requisite : SSAD & Project or Software Engineering. If neither course is taken, the student should get permission from the Instructor.

OBJECTIVE: The course will impart quality analyze software systems. Topics include verification software quality assurance, standards, etc. concepts and skills necessary to design and and validation, metrics and measurements,

COURSE TOPICS:

 Software process models and relation to quality

o Traditional models *

o Agile models

 Quality Assessment Standards and Models

o CMMI

o ISO 9000

o Software Productivity research assessment

o Malcolm Baldridge assessment

 Quality at various levels of SDLC

o Requirements and formalization of requirements

o Architecture and Qualities

o Design Reviews

o Code Reviews/inspections

 Software Testing and Quality

o Unit, Integration, System, Acceptance, Regression

o Blackbox Testing

 Equivalence

 Boundry value

 Decision table

 Pairwise

 State-transition

 Use case based

o White box

 Control flow

 Data flow

 Mutation

 Measurement and Metrics

o Complexity

o Reliability

o Availability

 Risk Management

 Defect Removal

 In-process quality assessment

PREFERRED TEXT BOOKS:

***REFERENCE BOOKS:**

 Metrics and Models in Software Quality Engineering by Stephen H. Kan

 Software Metrics: A rigorous and practical approach by Fenton and Pfleeger.

 A practioner's guide to Software Test Design by Lee Copeland

*PROJECT: No project. Students will be assessed using activities and exams. If the class is not large, we may require a term paper submission.

GRADING: Traditional grading. Consists of 2 mid-terms, 1 final, set of activities and term paper.

OUTCOME: The course begins with an exploration of the concepts underlying quality systems and the use of metrics. Students are encouraged to discuss the advantages as well as the limitations of systems and quantitative approaches, with a view to understanding the importance of interpretation in metrics usage and of matching quality systems choices to organizational objectives and culture. They learn the use of modern measurements and metrics through exercises. By the end of the course students should be able to design/evaluate a software system from a quality perspective.

REMARKS: Ideally we could like the class strength to not exceed 50 students.

TITLE : Statistical Methods in AI

CREDITS : 3-1-0-4

Course Code : CSE471

TYPE-WHEN : Monsoon - 2017

FACULTY NAME : Vineet Gandhi

COURSE TOPICS : Introduction, Linear Discriminant Functions, Perceptron Learning, Minimum Squared Error Procedures, Linear Classifiers: Class Test, Neural Networks: Nonlinearity, Neural Networks: Backpropagation, Improving NN Training, Random Variable, Probability Densities, Multivariate Densities, Bayesian Decision Theory, Maximum Likelihood Estimation (MLE), Principal Component Analysis (PCA), Eigen Faces, Linear Discriminant Analysis & Fischer Faces, Max-Margin Classification (SVM), SVM variants, Kernalization, Data Clustering, Kmeans (EM) and variants, Spectral Clustering, Decision Trees, Graphical
Models, Combining Classifiers.

PREFERRED TEXT BOOKS: "Pattern Classification" by Duda, Hart & Stork

***REFERENCE BOOKS:** "Machine Learning - A Probabilistic Perspective" by Kevin Murphy (free ebook available online),

Other Material: Online Courses/Tutorials and Research Papers

Pre-requisite : Basics of Linear Algebra, Probability Theory and Statistics.
Programming in Matlab and C/C++.

Course Website : http://courses.iiit.ac.in

GRADING: 27% Project + 18% Assignments + 30% Midsem + 25% Final Exam

OUTCOME: This course will enable students to understand pattern recognition techniques namely, classification and clustering in detail including both theoretical and practical aspects.

Technology Product Entrepreneurship- Tools & Techniques

Faculty: Ramesh Loganathan.

Description:

This course introduces the fundamentals of technology product entrepreneurship. In a workshop format, you will learn the process of building a technology enterprise. Starting from a technology idea, mapping the idea to a high-potential commercial opportunity, defining/designing/validating the product, figuring out the market avenues & how to sell the product, and planning/managing rapid growth. Class will apply the learning on their tech product ideas and create a venturable product & plan; in a workshop mode thru extensive hands on assignments concurrent with course modules.

Aim: The aim of this course is to introduce students to the process to take technology from research labs towards the market as a end product. As a venturable business.

Key Takeaways:

Pedagogy Format

• Classroom sessions, guest lectures (from serial tech entrepreneurs/investors) and case study discussions in class

• Assignments applied on tech product ideas from the class

Prerequisites:

• A technology product idea that has come out of an internship, research work or honors work in

one of IIIT-H research centers

• Students register for class as teams (2-4 students) with a tech product idea

• Basic knowledge of cloud computing and mobile appls is preferred

Outline (Tentative):

Sl No	Topics	Week
1	Introduction • Technology Product innovation. • Successful products cases review	1
2	Creativity & Innovation • Stretch the idea. Idea Hexagon framework applied	

3	Frameworks & Models	2
	• Product & Market first	
	• Vision first (Vision/Strategy/Execution)	
	• Large opportunity (Big untapped market/ Much better product/ Much better team)	
	• Lean Startup models	
	• Crossing the chasm"	
4	Customer Discovery/Opportunity mapping	
	• LEAN Startup methodology	
	• Business Model canvass Tool	2
5	Design Thinking	
	_ Design thinking process: understand, observe, define, ideate, prototype, test	2
6	Customer Development	
	• Models: through trial and error, hiring and firing, successful startups all invent a new, parallel process to product development for sales, marketing and business development	
	• Market & Competitive Positioning	2
7	Sales & Market Strategy	
	• Go to Market avenues, and projections	
	• GTM Planning	1
8	Business Plans	
	• Creating, developing and evaluating the Technology Product's "concept of a business"	
	• innovation? Is it a business or a product or both? Sizing the market? The technology, market and competitive risks? Competitive proposition	2
9	Technical Architecture considerations	
	_ Leveraging Mobile and Cloud	1
10	Corporate Technology Innovation	1

	_ Applying research technology in corporate environments	
11	Tech Product Pitch/Plan presentations	
	_ What makes a good product pitch and demo	1
12	Final Demo and presentations	1
TOTAL		**17 classes**

Evaluation (tentative)

4 quizzes (20%), 4 labs (20%), Tech Product Biz plan (20%), Demo & Presentation (10%), Final Exam (30%)

Assignments:

Students will apply the learning on your tech product idea and create a venturable product and plan; in a workshop mode thru extensive hands on assignments concurrent with course modules. Submissions each week.

• Introduction : Assignment: Create startup website; Vision; Basic Positioning statement;

• Creativity & Innovation: Assignment: Based on team's tech idea considered, list 3 product possibilities, applying Idea hexagon framework.

• Frameworks & Models: Assignment: Assess opportunity for the ideas. And pick the "venturable business."

• Customer Discovery/Opportunity mapping: Assignment: Apply Lean Startup Methodology, and Validate customer interest, need & … ; Assignment: First cut of Musiness Model Canvass filled in

• Design Thinking: Assignment: Rapidly create and refine the product functionality for the teams

product using design thinking process

• Customer Development: Assignment: Competitive Positioning; Assignment: Update Product functionality capturing the competitive proposition

• Sales & Market Strategy: Assignment: Evolve the GTM plans

• Business Plans: Assignment: Completed, defensible, business model canvass; Assignment: Product roadmap- market & technical, GTM plans, revenue projections

• Technical Architecture considerations: Assignment: Study 2 similar solutions in market and

compare/contrast tech architecture used by your product

• Corporate Technology Innovation : TBD

• Tech Product Pitch/Plan presentations

References

Required Readings:

1. The Startup Owner's Manual: The Step-By-Step Guide for Building a Great Company

2. by Steve Blank and Bob Dorf

Reference papers

3. Technology Entrepreneurship: Overview, Definition, and Distinctive Aspects

4. http://timreview.ca/sites/default/files/article_PDF/Bailetti_TIMReview_February2012.pdf

5. Toward a General Modular Systems Theory and Its Application to Interfirm Product Modularity

6. http://amr.aom.org/content/25/2/312.abstract

7. Harvard: Why Lean Startup Changes everything

8. http://host.uniroma3.it/facolta/economia/db/materiali/insegnamenti/611_8959.pdf

9. The Power of Integrality: Linkages between Product Architecture, Innovation, and Industry Structure

10. http://www.sciencedirect.com/science/article/pii/S0048733308001091

Suggested Reading:

1. High Tech Start Up, Revised and Updated: The Complete Handbook For Creating Successful New High Tech Companies by John L. Nesheim

2. The Lean Startup: How Today's Entrepreneurs Use Continuous Innovation to Create Radically Successful Businesses by Eric Ries

Additional Reference

1. The Art of the Start by Guy Kawasaki

2. Demand: Creating What People Love Before They Know They Want It by Adrian J. Slywotzky with Karl Weber

3. The Innovator's Dilemma: The Revolutionary Book That Will Change the Way You Do Business by Clayton M. Christensen

4. Running Lean: Iterate From Plan A to a Plan That Works by Ash Maurya

5. Positioning: The Battle for Your Mind by Al Ries and Jack Trout

6. Venture Deals by Brad Feld and Jason Mendelson

7. Lean Analytics by Alistair Croll and Benjamin Yoskovitz

8. Crossing the Chasm by Geoffrey A. Moore

TITLE **: The society of Spectacle in the Ancient World**

CREDITS **:** 3-0-0-4 each semester.

TYPE-WHEN **:** Humanities Elective

FACULTY NAME **:** Juan Pablo Sánchez

PRE-REQUISITE **:** NONE

OBJECTIVE **:**

Guy Debord stated in his classical work *The society of the Spectacle* (originally published in French in 1967) stated that in modern societies "life is presented as an immense accumulation of *spectacles*. Everything that was directly lived has receded into a *representation,* in which fragmented views of reality regroup themselves into a new unity as a *separate pseudo-world*". Guy Debord referred here to the central importance of the image in contemporary society and to the way it has supplanted genuine human interaction and reality.

This course will explore how in the Ancient World the notion of *spectacle* - in a time without TVs and internet (youtube, facebook instragram) and other IT tools- has also a relevance, being conceived not only as an orderly representation of the society, but also as a means of unification of the masses. For example, we will see, in the case of Ancient Greece, how the Athenian theatre was presented as a pure democratic spectacle, financed by the community, performed by community and presented for enjoyment of community, while exploring the conflict of the individual character and the city in dance and drama. In contrast, in the case of the Roman Empire, we will see how the bloody spectacles sponsored by the emperors, such as the actual killing of people and exotic animals in the amphitheatre, were

used to advertise recent military conquests or the (alleged) expansion of Roman political influence, demonstrating how unchallengeable and extremely wealthy was Rome.

COURSE TOPICS :

The course will combine lectures on the selected topics and introductions to some Greek and Latin authors and main literary genres (namely, Greek & Roman Theatre), with supervised reading sessions of Ancient texts in translation. Topics and texts to be discussed are the following:

- **Theatre in Ancient Greece.**

Athenian festivals and Ancient Greek playwrights in Athens

a) Greek tragedy (Sophocles)

b) Greek comedy (Aristophanes)

-**Sports & Spectacle in Ancient Greece**:

a) Sport and Education
b) The Olympic Games & other festivals

- Theatre in Ancient Rome (Republican era):

Ancient Roman playwrights in Rome
a) Roman comedy (Plautus)
b) Roman tragedy (Seneca)
c) Roman popular theare: mime, pantomime, farce, etc.

- Sports & Spectacle in Ancient Rome (Imperial era)

The Roman amphitheatre & the Circus
a) gladiators & gladiatorial shows
b) animal hunting shows
c) Chariot races

-

REFERENCE BOOKS:

Basic books (AVAILABLE ON THE COURSE WEBSITE):

Paul Christesen and Donald G. Kyle (eds.) *A companion to sport and spectacle in Greek and Roman antiquity* (Blackwell companions to the ancient world), Oxford-Malden/MA, 2014.

Marianne McDonald and J. Michael Walton (eds.), *The Cambridge Companion to Greek and Roman Theatre*, Cambridge 2007.

PPT presentations of the lessons will be regularly posted on the course website and texts with translations will be made available in soft form and in printed form well in advance. Further bibliographical references and online resources will be provided on a regular basis on the course website, as well as general advice and guidance for the presentations and written essays. However, students should be ultimately responsible for their own work.

GRADING PLAN:

T**e**xts for discussion in their assignments will be made available in advance in translation (English). Students should prepare the text of the assignments*;* and then, check other related texts (at least in summary) and also reference books and on-line resources (when available). Depending on the number of students, they might be asked to prepare a short presentation of 10-15 minutes with all type of supporting materials, such as handouts and/or Power Point presentations. Other related texts will be mostly discussed in class with occasional reference to the original version of the text (in Ancient Greek/Latin), in comments that will cover the linguistic/literary and historical/cultural aspects of the selected reading.

Following these discussions in class and one-to-one tutorials, students will be then required to submit a short written essay/report. Brevity, concision and clarity of exposition will be highly regarded.

Editorial conventions (essays)

You are kindly suggested to include in-text quotations of modern authors with the AUTHOR (YEAR, PAGE) method.

For example:

The ethnologist M. Peissel (1984) claims to have discovered …

M. Simons (1996) says in his newspaper article that…

Takuji Abe (2011, 6-8) argues that…

And then include the bibliographical reference at the end as follows:

BOOK: Michel Peissel, 1984: *The Ant's Gold, discovering the Greek Eldorado*. (London)

ARTICLE: Takuji Abe 2011: "The two Orients of the Greek Writers" *Acta academiae antiquitatis Kiotoensis* 11, pp. 1-14

LINK: Marlise Simons, 1996: Himalayas Offer Clue to Legend of Gold-Digging 'Ants' NEW YORK TIMES (25. November) http://www.nytimes.com/1996/11/25/world/himalayas-offer-clue-to-legend-of-gold-digging-ants.html (Last viewed: 21/January 2015)

You can learn more about writing skills at University level (i.e. what it is expected of every students) at practically every university or college website! You may find below some useful links with general guidance:

https://student.unsw.edu.au/essay-writing-basics

http://www.monash.edu.au/lls/llonline/writing/general/essay/index.xml

http://www.reading.ac.uk/internal/studyadvice/StudyResources/Essays/sta-developessay.aspx

http://library.bcu.ac.uk/learner/writingguides/1.01%20Essays.htm

http://www.writing.utoronto.ca/advice/general/general-advice

http://www.newcastle.edu.au/current-students/learning/study-skills/develop-your-skills/essay-writing

IMPORTANT NOTE

In your essays, copy-pasted paragraphs from online resources and books without acknowledgement should be mostly avoided, as they are easily detected by a simple Google search (that's called **plagiarism**!!!; **AVOID IT**!!!).

Type of Evaluation	Weightage (in %)
Assignment -1 Essay	**10 %**
Assignment -2 Essay	**15 %**
Assignment -3 Essay	**25 %**

End Sem Exam	**50 %**
Project	**N/A**
Term Paper	**N/A**
Other Evaluation (Attendance)	**Please note that attendance is compulsory**

OUTCOME:

Students will discover the relation of what mattered to the Greeks and Romans with what matters to us today, by the means of dealing with current issues such as class alienation, consumer culture, and mass media, as applied to the study of the Ancient World. Students should, therefore, establish a connection between the notions of spectacle and society, consumerism and power, appearance and reality through the appreciation of these issues in the ancient sources.

TITLE : **Theory and Practice of Nationalism**

Course Code :

Note: Please use course code for previously existing course

CREDITS : Four

TYPE-WHEN :

FACULTY NAME: Aniket Alam

PRE-REQUISITE :

OBJECTIVE :This course intends to introduce students to the manner in which nationalism has been conceptualised by nationalists in India and also to the academic theories of nation-states and nationalism. It will provide a perspective to understand the dynamics and complexities of nationalism in our world today and appreciate its salience.

COURSE TOPICS :

(1) Academic theories of Nationalism
   a) Imagined Communities
   b) Industrialised Societies
   c) Colonial and Post-Colonial

(2) Brief history of the nation-state in the world
   a) Latin America
   b) Europe
   c) Japan, China, Arab

(3) Nationalism in India
   a) Cultural Nationalism
   b) Anti-Colonial Nationalism

(4) Theories of Nationalism in India
   a) Gandhi
   b) Bankim
   c) Nehru
   d) Tagore
   e) Savarkar, Golwalkar

PREFERRED TEXT BOOKS:

Ernest Gellner: *Nations and Nationalisms*.
Benedict Anderson: *Imagined Communities*.
Partha Chatterjee: *Nationalist Thought and the Colonial World*
Javeed Alam: *India- Living With Modernity*
Sumit Sarkar: *Modern India*.
Bipan Chandra: *India's Struggle for Independence*.

***REFERENCE BOOKS:**

M.K. Gandhi: *Hind Swaraj*.
V. D. Savarkar: *Hindutva*.

Rabindranath Tagore: *Nationalism*.
M. S. Golwalkar: *We or Our Nationhood Defined*.
Jawaharlal Nehru: *Discovery of India*.
Bankim Chandra Chattopadhyay: *Anandamath.*
Rabindranath Tagore: *Gora*.

GRADING PLAN:

Type of Evaluation	Weightage (in %)
Mid Sem-1 Exam	**0**
Mid Sem-2 Exam	**20%**
End Sem Exam	**40%**
Class Assignments (TWO)	**10% (5 + 5)**
Term Paper (In Lieu of Mid Sem-1)	**20%**
Other Evaluation (Book Review)	**10%**

OUTCOME: The student will get an overview of the history of nationalism and will be introduced to how it has been theorized over the past century and more. S/he will also be able to trace nationalism's trajectories in India, recognize its main debates and understand its historical role in constituting our present day conditions.

REMARKS: The course will be based on lectures and the students will be expected to read all the books given in the reading list.

TITLE : Topics in Machine Learning

Course Code :

CREDITS : 4

TYPE-WHEN : Monsoon2017

FACULTY NAME : Naresh Manwani

PRE-REQUISITE : SMAI

OBJECTIVE : Covering important topics in online learning and reinforcement

learning

COURSE TOPICS :

1. **Online Learning**: Online classification/regression, Online learning from experts, Online- to-batch conversions

2. **Reinforcement Learning**: Multi-arm Bandits, The exploration-exploitation dilemma,

Markov Decision Processes, Dynamic Programming, Monte Carlo Methods, Temporal-

Difference Learning, Sarsa: On-Policy TD Control, Q-learning, Value-function Approximation,

Policy gradient methods

3. **Deep Reinforcement Learning**: Back-propagation, Recurrent Neural Networks, Deep Q-Networks, Variational Auto-encoders, Importance Weighted Auto-encoders

PREFERRED TEXT BOOKS:

1. Reinforcement Learning: An Introduction, Second Edition", Sutton & Barto. 2012. The

MIT Press

***REFERENCE BOOKS:**

1. Mehryar Mohri, Afshin Rostamizadeh, and Ameet Talwalkar. 2012. *Foundations of*

Machine Learning. The MIT Press

2. Goodfellow, Bengio & Courville, *Deep Learning*

3. Research Papers

GRADING PLAN:

Type of Evaluation	**Approximate Weightage (in %)**
Mid Sem-1 Exam	**15**

Mid Sem-2 Exam	**15**
End Sem	**20**
Assignments	**20**
Scribing of Lecture Notes	**10**
Project	**20**

TITLE : Topics in Physics

Course Code : SCI751

CREDITS : 4

TYPE-WHEN : Monsoon 2016

FACULTY NAME : Chandrasekher Mukku

PRE-REQUISITE : An open and inquiring mind.

OBJECTIVE : knowledge of relativistic physics.

COURSE TOPICS :Newton's laws of motion, Galilean transformations, conservation laws, need for change, transition from Galilean to Lorentz transformations, Lorentz transformations as symmetries of space-time, Minkowski space-time, special relativity and relativistic mechanics, tensors, metrics and manifolds, equivalence principle, principle of general relativity, connections and geodesics, Christoffel symbols, Riemann curvature, Einstein's equations for gravity, Newtonian gravity as a limit, spherically symmetric solutions, planetary motions.

PREFERRED TEXT BOOKS: Students are encouraged to visit the library (or the Internet) and search for resources they are comfortable with and if necessary bring questions to the class.

GRADING PLAN:

Type of Evaluation	Weightage (in %)
Mid Sem-1 Exam	**30**
Mid Sem-2 Exam	**30**
End Sem Exam	**40**
Assignments	**None.**
Project	**None.**
Term Paper	**None.**
Other Evaluation _____	

OUTCOME: A little more awareness about the workings of our Universe qualitatively if not quantitatively.

TITLE : Wireless Communications

Course Code : ECE 438

CREDITS : 4

TYPE-WHEN : Monsoon 2017

FACULTY NAME : Ubaidulla

PRE-REQUISITE **:** Basics of random variables (Gaussian RVs, and random vectors and functions of Gaussians), Digital Communication (Comm. Theory 1)

OBJECTIVE **:** Learn fundamentals of wireless communications with focus on mobile technologies, and understand the current frontiers of research

COURSE TOPICS **:** (Note : More time will be spent on the fundamentals, and more complex topics (even those not listed) will be optionally taken up based on time available)

1. Wireless channel modelling (Single-input single output): Time and frequency coherence, fading
2. Probability of error vs SNR: exploiting channel diversity.
3. Cellular systems: Frequency reuse, GSM, CDMA.
4. Capacity considerations
5. Beamforming
6. MIMO Channel model, transmission schemes and receivers.
7. Multiuser MIMO.
8. 5G physical channel models, transmission techniques.
9. Interference channel, Interference alignment, topological interference alignment.

PREFERRED TEXT BOOKS: Fundamentals of Wireless Communication by David Tse and Pramod Vishwanath

***REFERENCE BOOKS**: Wireless Communications- Principles & Practice (Rappaport).

***PROJECT:** (List of topics will be mentioned later)

GRADING PLAN:

Type of Evaluation	Weightage (in %)
Mid Sem-1 Exam	**25**
Mid Sem-2 Exam	**25**
End Sem Exam	**-**
Assignments	
Project	**25**
Term Paper	

Other Evaluation: _Quizes_	**25**

OUTCOME:

REMARKS:

TITLE : **WIRELESS SENSOR NETWORKS**

Course Code : **ECE536**

CREDITS :

TYPE-WHEN : **Monsoon 2017**

FACULTY NAME : Dr. G. Rama Murthy

PRE-REQUISITE : **No prerequisite**

OBJECTIVE :

Cellular Telephone network deployment proliferated across the world. It is a commercially successful Wireless Sensor Network (WSN). Wireless sensors are constrained with respect to the resources such as energy, storage and computation. Such constraints impose restrictions on the design of various protocols (unlike other wireless networks). This course provides a converage of various challenges and the design / Management of WSNs.

COURSE TOPICS :

(please list the order in which they will be covered)

1. Basics of Wireless Communication and Wireless Networks

- Basics of Communication theory and Wireless Communication
- Basics of Wireless Communication Networks: OSI Layering Approach
- Recent ideas in networking e.g Cross Layer protocols

2. Wireless Sensor Design and Applications

- Currently available wireless sensors
- Innovative Sensor Design: IoT
- Sample Applications e.g. Cellular Networks
- Design Challenges
- Network Architecture
- Performance Metrics
- Commercial Sensors and Software (e.g. TinyOS)

3. Wireless Sensor Network Design:

- Networking Deployment Strategies: Random and Planned
- Coverage Optimization
- Node Discovery
- Hierarchical Network Implementation

4. Data Collection, Dissemination and Routing in WSNs:

- Network Clustering, Query Propagation
- Proactive and Reactive Routing Protocols
- Data Centric Routing
- Energy Awareness: Leveling and Sectoring Algorithm

5. Data Fusion: Distributed Computation

- In- Network Data Aggregation
- Grid based Network Architecture: Distributed Computation

6. Physical and Link Layer Issues

- Channel Models: Fading
- Radio Energy Consumption Issues
- Power Control
- MAC Protocols in WSNs

7. Localization

- Received Signal Strength based Localization
- Hopcount based Localization
- Indoor and Outdoor Localization and other issues

8. Mobile Wireless Sensor Networks

- Various Paradigms of Mobile WSNs : Applications
- Protocols in Mobile WSNs
- Network Security Issues in Static and Mobile WSNs

9. Cyber Physical Systems (CPS)

- Design Issues
- Examples of Cyber Physical Systems
- Wireless Body Area Networks: Design Issues

10. Internet of Things (IoT):

- Vision of IoT
- Challenges in design of IoT
- Fog Computing and Mist Computing: IoT

PREFERRED TEXT BOOKS:

(1) Anurag Kumar et.al, "Wireless Networks" Morgan Kaufmann Publishers

***REFERENCE BOOKS:**

(2) Wireless Sensor Networks by C.S.Raghavendra et.al

(3) Dharma Prakash Agarwal, "Introduction to Wireless and Mobile Systems," Cengage Learning

***PROJECT:** Setting up a WSN using Commercial MEMSIC motes (available in our Lab); TinyOS based programming of the Motes in a real application.

GRADING PLAN:

Type of Evaluation	Weightage (in %)

Mid Sem-1 Exam	**20%**
Mid Sem-2 Exam	**20%**
End Sem Exam	**40%**
Assignments	**10%**
Project	10%
Term Paper	
Other Evaluation _____	

OUTCOME: Students will have a comprehensive understanding of an example of Cyber Physical Systems: WSNs. The objective is to discuss state of the art protocol and design issues related to one type of CYBER PHYSICAL SYSTEM, namely WIRELESS SENSOR NETWORKS

REMARKS: The presentation takes the students from basic background to the state of the art issues in Wireless Sensor Networks

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TITLE **: Understanding Raga: Semi Classical forms of Indian Music**

Course Code **: HSS338**

CREDITS **: 4**

TYPE-WHEN **: Open Elective- Monsoon 2017**

FACULTY NAME **: TK.SAROJA**

PRE-REQUISITE **: Instructors consent**
OBJECTIVE **:**

1. Conceptual study of raga by introducing around ten ragas in both North and South Indian music systems.

2. Practice of different Semi classical forms including some folk forms of Indian music.

3. Understanding the importance of Semi classical genre in Indian music.

4. Role of music in bringing out the rich ideas and expressions in the compositions….inter relationship of the musical and linguistic expressions.

5. Introducing different composers whose musical experiences and ideas resulted in the existing semi classical forms.

6. Experiencing the techniques of composing and learn to compose some simple songs.

COURSE TOPICS :
(please list the order in which they will be covered)

Lesson 1,2, 3 : Introduction to ragas. Basic exercises in different ragas.

Lesson 4,5: Introduction of various semi classical forms of Indian music

Lesson 6, 7: Bhajans

Lesson 8, 9,10: Annamayya compositions

Lesson 11, 12, 13: Contribution of some Composers whose compositions are identified as separate genres in Indian music.

Lesson 14, 15: Ghazals

Lesson 16, 17: Techniques of composing

Lesson 18: Qawwali

Lesson 19, 20: Abhang and Purandara dasa compositions

Lesson 21, 22: Contribution of some more composers.

Lesson 23: Comparitive study of Semi classical forms and Folk forms of music.

Lesson 24: Study of the inter relationship of musical and lyrical expressions in bringing out the beauty of the compositions.

Lesson 25, 26: Practical exercises of all the concepts.

PREFERRED TEXT BOOKS:

***REFERENCE BOOKS:**

1. The Hindu Speaks on Music - compilation of 232 selective music articles by The Hindu.

2 . A Southern Music (The karnatic story) by T.M. Krishna

3. Videos and audios to demonstrate different concepts.

***PROJECT:** Practical oriented project

GRADING PLAN:

Type of Evaluation	Weightage (in %)
Mid Sem-1 Exam	**20**
Mid Sem-2 Exam	**20**
End Sem Exam	**----**
Assignments	**20**
Project	**40**
Term Paper	**-----**
Other Evaluation _____	**For all the exams Practicals 60% and Theory 40%**

OUTCOME:

1. Ability to recognize some ragas with their very characteristics.

2. Ability to identify, sing or play different semi classical compositions like Bhajan, Ghazal, Annamayya composition, Qawwali, Abhang etc

3. Understand the importance of raga in Indian music.

4. Know the importance and role of the composers in bringing out

variety in music.

5. Basic attempt to compose simple songs.

6. Knowledge of different rhythmic structures that play a major role

in the compositions.

7. Ability to sing or play compositions in atleast 10 ragas.

8. Videos and audios to demonstrate different concepts.

REMARKS: Students with minimum of vocal or instrumental experience are encouraged.

Sd/-

Dean (Academics)