International Institute of Information Technology, Hyderabad
School of Multi-disciplinary Computing

B.Tech in Computer Science and Master of Science in Computing & Human Sciences by Research

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<thead>
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<th>Item</th>
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</thead>
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<td>Vision and Mission Statements of the School of Multi-disciplinary Computing</td>
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1. Vision and Mission for the School of Multi-disciplinary Computing

Vision

To be recognized as a globally reputed school by offering innovative academic programs and specializations in core computing, computing technologies, and computing in association with multiple disciplines, at all levels (UG, PG, Ph.D.) with state-of-the-art curricula, by promoting quality research in thrust areas, and blending research outcomes into teaching programs.

Mission Statements

MS1: To produce competent next-generation technology leaders, who can apply the science and engineering of computing to add immense value to their profession.

MS2: To implement a state-of-the-art curriculum in all the academic programs in line with the multidisciplinary societal and technological needs and encourage students to imbibe creativity, research, problem-solving skills, professional ethics, and human values.

MS3: To design and execute innovative multidisciplinary academic programs, specializations, and courses that combine computing and other domains organically, by involving all the stakeholders such as students, teachers, research scholars, experts from industry, academia, and alumni.

MS4: To conduct quality research in fundamental, applied, multidisciplinary, and futuristic domains and become a key player in the educational ecosystem within the country and abroad.

MS5: To create and sustain a strong suite of academic outreach programs catering to varied segments such as industry professionals, external students, and early career researchers.

MS6: To collaborate with other reputed institutions in India and abroad and implement best practices to achieve excellence.
2. PEOs, POs, and PSOs for the Dual Degree programme in Computing and Human Sciences

PROGRAM EDUCATIONAL OUTCOMES:

PEO-1: Demonstrate competency and creativity in some sub-areas of computer science so as to facilitate our understanding and experience of the social world.

PEO-2: Demonstrate requisite breadth and depth of knowledge in some sub-areas of humanities and social sciences so as to excel in research and academic environments in these sub-areas.

PEO-3: Exhibit communication skills and collaborative skills required to plan, and participate effectively in multi-disciplinary teams.

PEO-4: Develop an aptitude for self-learning and life-long learning so as to keep abreast with rapid changes occurring at the confluence of computer science and the human sciences.

PEO-5: Practice ethics and human values in their profession.

Mapping between PEOs and Mission Statements

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<th>MS1</th>
<th>MS2</th>
<th>MS3</th>
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PROGRAM OBJECTIVES:

PO-1: Engineering Knowledge: Understand and use concepts from computing and human sciences to understand, analyse, engineer and develop systems of varying scale.

PO-2: Problem Analysis: Identify, formulate and analyze complex problems within computing and the human sciences, reaching substantial understanding and analysis using theories and concepts from across computing, human sciences, and allied disciplines.

PO-3: Design/ Development of Solutions: Identify and bring to fore the necessary concepts from computing and human sciences and arrive at creative ways to identify, understand, and address problems that take into account social, cultural and ethical considerations.
PO-4: Conduct investigations of complex problems: interpolate and extrapolate based on existing knowledge base and self-learning skills to investigate the dynamics of complex problems and find solutions.

PO-5: Modern Tool usage: Demonstrate requisite hands-on skills to work with variety of software packages, libraries, programming languages, as well as quantitative and qualitative research methods of the human sciences.

PO-6: The engineer and society: Make judicious use of resources and understand the impact of technology across the societal, ethical, environmental and economic aspects.

PO-7: Environment and sustainability: Find social, scientific, and technological policy solutions by considering the environmental impact for sustainable development.

PO-8: Ethics: Practice principles of professional ethics and make informed decisions after a due impact analysis.

PO-9: Individual and teamwork: Work efficiently in individual and team-oriented projects of varying size, cultural milieu, professional accomplishments, and technological backgrounds.

PO-10: Communication: Effectively communicate and exchange ideas and solutions to any individual including peers, end-users and stakeholders.

PO-11: Project management and Finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one’s own work, as a member and leader in a team, to manage projects in multidisciplinary environments.

PO-12: Life-long learning: Exhibit the aptitude for independent, continuous and life-long learning required to understand and intervene in a highly technological and complex world.

PROGRAM SPECIFIC OUTCOMES

PSO-1: Exhibit broad general knowledge in computer science and engineering and high competence in some sub-areas such as machine learning, artificial intelligence, spatial analysis, natural language processing, etc.

PSO-2: Exhibit broad general knowledge in the humanities and the social sciences, with high competence in one discipline such as history, sociology, philosophy, literature, economics, and political science.

PSO-3: Demonstrate research skills to identify problems that bring together computing and human sciences, and participate in cutting edge inter- and trans-disciplinary research at their confluence.

PSO-4: Demonstrate knowledge and skills of required depth in at least one area of the humanities and the social sciences and in computer sciences required to excel in post-graduate and research programs in an area of confluence research.
### Mapping between POs, PSOs and PEOs

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Curriculum

Computers and its various incarnations are transforming our world in ways that are unprecedented, and even unintended. Comparable historical parallels are, perhaps, the emergence of the printing press and, some centuries later, the spread of hydrocarbon fuels like coal and oil; but perhaps computers are changing the world at a much faster rate. The academic competencies required to comprehend such fundamental transformations will not be found either within standard science and technology departments, nor within those of the humanities and social sciences. Both of these focus on one side of this complex phenomenon.

Academic advances in the human sciences in the 21st century will depend on an ability to work with computers. Similarly, computer science will be impactful when it understands the society it works in. This programme is for intellectual pioneers who are keen to take on this inter-disciplinary challenge of understanding computers and society in a holistic manner.

Students will be expected to engage in research which pushes our knowledge in either or both directions within computer and human sciences. Students will participate in innovative and pioneering research projects where computer science tools and methods are used to ask questions in the social sciences; or which use social science methods to understand computer science. They will graduate with an ability to identify new research areas, use radically new academic methods, and ask questions which cannot be accommodated within the currently available academic formats.

Goals of curriculum design

- Build a pioneering teaching cum research curriculum which enriches both Computer as well as the Human sciences.
- Provide a platform for innovative, new research paradigms to emerge
- Encourage cross-disciplinary thinking and problem solving

Key Objectives

- Build competencies for Industry
- Build capabilities for further research in both Human and Computer Sciences
- Help students find confluence of Computer and Human Sciences.

Design Philosophy of the Curriculum

- Year One: Sow the Seeds
- Year Two: Strengthen Roots
- Year Three & Four: Deepen Roots, Branch Out
The CHD curriculum has a balanced mixture of courses from different fields (Computer Science, Maths, Humanities, Science etc). The total credit requirement is 201 of which 24 are to be from a research thesis. The broad structure of the programme is as shown below.

**Structure Of Programme**

1. **Maths requirement** (16 credits): 3 core +1 elective
   **Maths courses**
<table>
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<td>Linear algebra</td>
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2. **Science requirement** (8 credits): 2 core
   **Core Science courses**
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<tr>
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<tr>
<td>Science 1 - scientific method, the micro and the macro principles of Natural phenomena</td>
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</tr>
<tr>
<td>Science 2 - electromagnetism, applications of classical and quantum mechanics</td>
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</table>

3. **Institute core requirement** (12 credits): 4 credits each in Sports, Arts and Value education
<table>
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<th>Course</th>
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<tr>
<td>Value education (4 credits)</td>
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4. **Programme core requirement:** These are to be completed in the first 5 semesters. The list of programme core courses is as below.

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<th>Monsoon</th>
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<th>Spring</th>
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<td>Making of Contemporary India</td>
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<tr>
<td></td>
<td>Digital Systems and Microcontrollers</td>
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<td>Data structures and algorithms</td>
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<td>Computer Programming</td>
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<td>Thinking and Knowing in the Human Sciences - I</td>
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<td>Human Sciences Lab-1</td>
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<td>Design and Analysis of Software Systems</td>
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<td>Algorithm Analysis and Design</td>
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<td>Operating Systems and Networks</td>
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</table>

5. **Other programme requirements:** credits in electives 54 + 8 credits of Honours projects.

**Hons projects (8 credits):** This is to be done as 2-credit projects each in Semesters 6 and 7, 8 and 9 preferably on the same topic.

2 seminar credits in the 8th and 9th semesters.

1 unit (0 credits) of technical writing in the summer at the end of the 3rd year. This is to be registered in the 7th Semester.

1 unit (0 credits) of research proposal by the end of 4th year. Register in 8th semester.

Thesis (24 credits): This is to be done in the fifth year.
For the highly motivated students, the present curriculum continues to provide the Honors option which requires students to do additional credits including projects and advanced electives and work under the supervision of a faculty member.

### Computing and Human Sciences (Dual Degree) - Semester wise Plan (Subject to minor changes)

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<th>Year &amp; Sem</th>
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Graduation Requirements

Graduation Requirements for Dual Degree in Computing and Human Sciences

In order to graduate with B.Tech Honours in Computer Science and Master of Science in Computing and Human Sciences by Research, a student must successfully complete 177 course credits and 24 Thesis credits according to the requirements stated in the curriculum handbook and meet the following requirements. The minimum CGPA required to graduate is 7.00 for MS or entire programme. Guidelines for the Honours program are provided at [https://intranet.iiit.ac.in/offices/static/files/Honours-Guidelines-2022.pdf](https://intranet.iiit.ac.in/offices/static/files/Honours-Guidelines-2022.pdf).

Both the degrees (Bachelors and Master of Science by Research) are awarded together only after successful completion of the programme requirements.

- Must successfully complete SAVE (Sports, Arts, Value Education) credits in the 1st and 2nd years.
- Must successfully complete the programme Core.
- Must successfully complete **22 credits of HS electives** in the 4th semester and beyond.
- Must successfully complete **5 CS electives** in the 3rd and 4th years (not more than 1 in any semester).
- Must successfully complete **2 Science electives** in the 3rd and 4th years (not more than 1 in any semester).
- Must successfully complete **1 Maths elective** in the 3rd and 4th years.
- Must successfully complete **3 Open electives** in the 3rd and 4th years (at least 1 each in semester and not more than 2 in any semester).
- Must successfully complete **8 Honours credits via 2 credits each** in four 4 semesters (5-8 semester).
- Must successfully complete **2 seminar credits** in the 8th and 9th semesters.
• 1 unit (0 credits) of Technical writing workshop (OC4.101) in the summer at the end of the 3rd year. This is to be registered in the 7th Semester.

• 1 unit (0 credits) of Thesis proposal writing workshop (OC4.201) by the end of 4th year. Register in 8th semester.

• Must register for 24 Research thesis credits in the 9th and 10th semesters (at most 12 credits in a semester).

• Must successfully complete MS thesis evaluation process including a public presentation and a Defense.

Choice Based Credit System:

The curriculum aims to continue the implementation of Choice Based Credit System with a minimal core program followed by electives from across disciplines including mathematics, sciences, human sciences, engineering electives, and so on. The curriculum set aside close to 17% of the credits necessarily from courses outside of the program so as to allow scope for students to credit courses from the sciences, mathematics, human sciences, and engineering sciences. A total of 12% credits are set aside as open electives – student can use these credits to either go deeper in the program or to opt for courses outside of the program and broaden their outlook by opting for multi-disciplinary courses too.

All courses use a continuous evaluation model with a combination of homework assignments, quiz exams, mid-term, and final examinations. Students are required to stay clear of plagiarism in any of their work submitted for evaluation. Most elective courses include a course project or a term paper additionally. These course projects often require students to practice team-work, enhance their self-learning and communication skills, and impart essential project management skills. Some courses include a laboratory component with a scheduled laboratory session.
Course descriptions for Core Courses

Discrete Structures

Name of the Academic Program : B. Tech. in CSE
Course code : MA5.101
L-T-P : 3-1-0
Credits : 4
L= Lecture hours, T=Tutorial hours, P=Practical hours)

1. **Prerequisite Course / Knowledge:**
   Basic abstract algebra, High School Mathematics

2. **Course Outcomes (COs)**
   After completion of this course successfully, the students will be able to

   **CO-1**: Demonstrate critical thinking, analytical reasoning, and problem solving skills
   **CO-2**: Apply appropriate mathematical and probabilistic concepts and operations to interpret data and to solve problems
   **CO-3**: Identify a problem and analyze it in terms of its significant parts and the information needed to solve it
   **CO-4**: Formulate and evaluate possible solutions to problems, and select and defend the chosen solutions
   **CO-5**: Construct graphs and charts, interpret them, and draw appropriate conclusions
   **CO-6**: **Apply** the concepts of group theory, ring and field in various applications in computer science

3. **Mapping of Course Outcomes (COs) with Program Outcomes (POs) and Program Specific Outcomes (PSOs) – Course Articulation Matrix**

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4. Detailed Syllabus:

- **Unit 1:** Sets, relations, functions, permutations, combinations. Applications to relations.
  - Cardinality of sets, finite and infinite sets, countable and uncountable sets, Cantors numbering.

- **Unit 2:** Group, subgroup/normal subgroup, homorphism/automorphism/isomorphism/epimorphism, kernel, cosets, quotient group, product set in a group, center of a group, order/conjugate of an element, commutator.

- **Unit 4:** Recurrence relations, generating functions, numeric functions. Applications to recurrence relations.

- **Unit 5:** Basics of probability theory, birthday attacks. Applications on hash functions.

- **Unit 6:** Graphs, Adjacency, Special Graphs, Isomorphic Graphs, Paths, Cycles and Circuits, Connected Graphs, Eulerian Graphs, Hamiltonian Graphs and Planar Graphs.

Reference Books:


5. **Teaching-Learning Strategies in brief (4 to 5 sentences):**

This course supports the expected characteristics, capabilities and skills for computer science graduates in the following ways:

- Mastery of Computer Science technical foundations
- Recognition of common Computer Science themes and principles
- Recognition of interplay between theory and practice
Effective problem solving and critical thinking skills

6. **Assessment methods and weightages in brief (4 to 5 sentences):**

- Assignments: 10%
- In-Class Tests: 20%
- Mid Semester Examination: 30%
- End Semester Examination: 40%

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**Computer Programming**

**Name of the Academic Program**: B.Tech in Computer Science and Engineering  
**Course Code**: CS1.302  
**Title of the Course**: Computer Programming  
**L-T-P**: 3-1-3  
**Credits**: 5  
(L = Lecture Hours, T = Tutorial Hours, P = Practical Hours)

1. **Prerequisite Course / Knowledge:**

   Logical thinking and mathematical concepts at the level of a 10+2 standard student with a math major.

   No prior programming experience or computing background is required.

2. **Course Outcomes (COs)**

   After completion of this course successfully, the students will be able to:

   **CO-1**: Explain the syntax of programming language constructs and their semantics and describe a program structure and its execution model. (Cognitive Level: Understand)

   **CO-2**: Describe the steps in program editing, compilation and execution using tools such as Visual Studio Code, GCC compiler on a Linux/Windows/MAC operating system.

   **CO-3**: Choose appropriate primitive data types and design new composite data types to model the relevant data in a given computation problem and also discover the algorithmic logic required to solve well-defined computational problems. (Cognitive Levels: Apply and Analyze)

   **CO-4**: Compare and contrast the performance of different algorithmic approaches for simple computational problems with respect to time and memory. (Cognitive Levels: Analyze and Evaluate)
CO-5: Write programs involving basic dynamic data structures such as linked lists and use tools such as Valgrind to detect any memory leaks. (Cognitive Levels: Apply and Analyze)

CO-6: Use debugging tools such as GDB proficiently to rapidly isolate and remove subtle/complex bugs in programs. (Cognitive Levels: Apply and Analyze)

CO-7: Manage complex large projects using source code management tools such as GIT and build tools such as Make. (Cognitive Levels: Apply and Analyze)

CO-8: Assess and evaluate the solutions of their classmates through a peer review process (Cognitive Level: Evaluate)

3. Mapping of Course Outcomes (COs) with Program Outcomes (POs) and Program Specific Outcomes (PSOs) – Course Articulation Matrix

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4. Detailed Syllabus

- **Unit 1:**
  - Basic computer organization, Von Neumann architecture and stored program concept
  - High level programming languages, assemble code, binary instructions, compilers and assemblers
  - Programming editing, compilation and execution cycle

- **Unit 2:**
  - Use of variables as reference to memory locations
  - Basic data types and their representation
  - Operators and precedence levels, expressions
Writing straight-line sequence of code
- Standard I/O Libraries

**Unit 3:**
- Conditional Statements (if-then-else) and Loops (for, while, etc.)
- Arrays
- Functions and parameter passing mechanisms
- Standard libraries for string manipulation, disk file access etc.
- Structures, Unions and Enumerations

**Unit 4:**
- Recursion
- Program stack, scope and lifetime of variables
- Pointers, heap memory, dynamic memory management, linked lists and memory leaks

**Unit 5:**
- Preprocessor directives
- Source code management tools like GIT and use of GDB for program debugging
- Multi-file programming and Makefiles

**Reference Books:**


**5. Teaching-Learning Strategies in brief**

Lectures are conducted in a highly interactive fashion. Programming problems are solved in-class along with students in a collaborative fashion. Sometimes two-three students are given an opportunity to present their programs to the class. At the end of every class, a small homework problem which helps in enhancing the concepts discussed in the class will be released. Students need not submit this homework. Tutorial sessions are used to teach the utilization of tools such as Visual Studio Code, GCC, GDB, GIT, Makefiles, perf, valgrind etc. Lab sessions are used to solve programming assignments and teaching assistants help students in developing program logic, debugging etc. on an individual basis. Faculty conducts office hours once in week. On the rest of the days, teaching assistants conduct office hours. This ensures continuous support to students. Key milestones are defined. Feedback from the students at those milestones are taken. The provided feedback is taken to fine tune the course and provide special support to students who are lagging behind. Five to six programming assignments are designed which gives an in-depth understanding of various concepts discussed in the class and their application to new problem scenarios along with proper analysis. Some problems involve evaluating, comparing and contrasting multiple solution approaches.

**6. Assessment methods and weightages in brief**
1. Programming Assignments (5 to 6) : 50 percent
2. Best 2 out of 3 Programming Lab Exam: 2 x 15 = 30 percent
3. Best 2 out of 3 Theory Exams : 2 x 10 = 20 percent

For programming assignments and lab exams, online judges such as DMOJ are used to provide immediate feedback to students. While some test cases are revealed, others are hidden. Partial marks are allocated for code peer-reviewing in programming assignments.

**Real Analysis**

- **Course Code**: IMA.303
- **Title of the Course**: Real Analysis
- **L-T-P**: 3-1-0.
- **Credits**: 4
  
  (L= Lecture hours, T=Tutorial hours, P=Practical hours)

1. **Prerequisite Course / Knowledge:**
   Elementary knowledge of Calculus
   
   Much of mathematics relies on our ability to be able to solve equations, if not in explicit exact forms, then at least in being able to establish the existence of solutions. To do this requires a knowledge of so-called "analysis", which in many respects is just Calculus in very general settings. The foundations for this work are commenced in Real Analysis, a course that develops this basic material in a systematic and rigorous manner in the context of real-valued functions of a real variable.

2. **Course Outcomes (COs)**
   On successful completion of this course, students will be able to:
   
   CO1. describe the fundamental properties of the real numbers that underpin the formal development of real analysis;
   
   CO2. demonstrate the knowledge of an understanding of the theory of sequences and series
   
   CO3. demonstrate skills in constructing rigorous mathematical arguments;
   
   CO4. apply the theory in the course to solve a variety of problems at an appropriate level of difficulty;
   
   CO5. demonstrate skills in communicating mathematics.
   
   CO6: analyse how abstract ideas and regions methods in mathematical analysis can be applied to important practical problems.

3. **Mapping of Course Outcomes (COs) with Program Outcomes (POs) and Program Specific Outcomes (PSOs) – Course Articulation Matrix**
Unit 1 Sequence of real No, Bounded and Unbounded Sets, Supremum, Infimum, Limit points of a set, Closed Set, Countable and uncountable sets. Sequences, Limit points of a Sequence, Limits Inferior and Superior, Convergent sequence, Non convergent sequence, Cauchy General Principle of Convergence, bounded and monotone sequence, Infinite Series, Positive Term Series, Convergence of series of real numbers, Necessary condition, Absolute convergence and power series, Convergence tests for series.

(9 hours)

Unit 2 Mean value theorems (Rolle’s Theorem, Cauchy Mean Value Theorem, Lagrange’s Mean Value Theorem), Indeterminate forms, Taylors Series, Partial derivatives. Integration as a limit of a sum, Some integrable functions, Fundamental theorem of Calculus, Mean Value Theorems of Integral calculus, Integration by parts, Change of variable in an integral, Second Mean value theorem, Multiple integrals.

(9 hours)

Unit 3: Vector, Vector operations, Products, Areas and Determinants in 2D, Gradients, Curl and Divergence, Volumes and Determinants in space. Differential equations of first order and first degree. Linear ordinary differential equations of higher order with constant coefficients. Elements of Partial Differential Equation (PDE).

(7.5 hours)
Unit 4: Analytic function of complex variable, CR Equation, harmonic functions, Laplace equation, applications (7.5 hours);

Unit 5 Integration of a function of a complex variable, M-L inequalities. Cauchy’s Integral Theorem. Cauchy’s Integral formula. Taylor’s and Laurent Expansion, Poles and Essential Singularities, Residues, Cauchy’s residue theorem, Simple contour integrals. (9 hours)

- A project related to the above syllabus will be done by students to be submitted by the end of the semester.

References:


5. Teaching-Learning Strategies in brief:

Lectures in the classroom teaching, weekly tutorials involving problem solving and active learning by students and Project-based Learning
6. *Assessment methods and weightages in brief:*

Assignments in theory: 10 marks, Quizzes in theory: 10 marks, Mid Semester Examination in theory: 20 marks, End Semester Examination in Theory: 30 marks, Assessment project: 30 marks

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**Digital Systems and Microcontrollers**

**Name of the Academic Program:** B.Tech in ECE  
**Course Code:** S21EC2.101  
**Title of the Course:** Digital Systems and Microcontrollers (DSM)  
**L-T-P:** 3-1-3  
**Credits:** 5  
(L= Lecture hours, T= Tutorial hours, P= Practical hours)

1. **Prerequisite Course / Knowledge:**  
Understanding of basic algebra concepts taught up to the 10+2 level

2. **Course Outcomes (COs):**  
After completion of this course successfully, the students will be able to.  

CO-1: Solve problems pertaining to the application of Boolean algebra, number systems, and simplification of logic expressions using Karnaugh maps.

CO-2: Develop a simplified combinational circuit as a solution for a given problem.

CO-3: Analyze a real-world problem to develop a digital design solution using sequential circuits to solve the problem.

CO-4: Describe the working of a basic 8-bit von Neumann architecture processor.

CO-5: Develop skills for simulating circuits using basic components on online simulation tools (example, Tinker CAD).

CO-6: Design, implement and test a given logic circuit using basic electronic components such as breadboards, ICs etc.

3. **Mapping of Course Outcomes (COs) with Program Outcomes (POs) and Program Specific Outcomes (PSOs) – Course Articulation Matrix**

| CO  | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 | PO 11 | PO 12 | PS O1 | PS O2 | PS O3 | PS O4 |
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4. **Detailed Syllabus:**

Unit 1: Number systems and interconversions (binary, decimal, hexadecimal), postulates of Boolean algebra, binary logic gates, binary functions

Unit 2: Simplification of binary expressions using K-maps, logic function implementation, combinational circuits

Unit 3: Latches and flip-flops, types of flip-flops, internal circuit design and operation

Unit 4: Sequential circuits, state diagrams, state tables, state equations, applications of sequential circuits

Unit 5: Registers and counters, memory and processor architecture

**Reference Books:**

5. **Teaching-Learning Strategies in brief** *(4 to 5 sentences):*

The course instruction is delivered through lectures with examples of real-world application of electronic systems to foster student understanding and interest. The course is structured as a theory and laboratory course, such that the concepts and circuits introduced in the theory classes can be experimentally applied and understood by the students. Assignments are designed to encourage students to critically think about the concepts discussed in the class and to learn to independently solve problems.

6. **Assessment methods and weightages in brief** *(4 to 5 sentences):*

**Continuous evaluations:**
- Assignments – 10%
- MCQ Quizzes – 20%
- Lab reports – 20%

**Comprehensive evaluations:**
- Lab exam – 15%
- End semester exam in **Theory** – 35%

**Title**

: Introduction to Linguistics 1
COURSE OUTCOME:

CO-1: Students will have a good understanding of linguistic analysis

CO-2: Students will be introduced to different word and sentence level theories

CO-3: It will enable them in building text processing tools and systems

CO-4: They will explore different languages in class working in teams.

CO-5: Using real examples, they will analyselanguage data to understand the concepts.

COURSE TOPICS:


2. Study of Human language – the field of Linguistics

3. Looking at language from synchronic and diachronic points of view

4. Areas of Study from structural perspective
   a) Syntagmatic and paradigmatic aspects of language structure,
   b) Level of structural analysis: Phonetics: Place and manner of articulation of speech sounds, IPA.
   Phonology: Phone, phoneme, allophone; Distinctive features; Phonological rules; Syllable.
   Morphology: Units of word’s internal structure, word formation processes, inflectional and derivational morphology, compound words and how they are formed.
   Syntax: Types of sentences, Sentence structures, Phrase structure grammar.
   c) From evolution perspective: Historical Linguistics
   d) From usage perspective: Sociolinguistics
   e) From Psychological perspective: Mechanisms of language acquisition, knowing more than one language
f) Indian Grammatical Tradition: A communication model for language study. Paninian grammatical model.

g) Writing Systems: Representing language through graphic characters.

Mapping of Course Outcomes to Program Objectives

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GRADING:

Assignments: 15%,

Mid Sem: 30%, End Sem: 35% and Project: 20%

PROJECT: The students will work on a hands-on project on language analysis. In the project they are expected to work with real-time data and understand its nature.

PREFERRED TEXTBOOK:


REFERENCE BOOKS:
Value Education-1

Name of the Academic Program : B. Tech. in ECE, BTech in CSE
Course Code : OC3.101
Title of the Course : VALUE EDUCATION - I
L-T-P : 12-6-0 (Total number of hours)
Credits: 2
(L= Lecture hours, T=Tutorial hours, P=Practical hours)

1. Prerequisite Course / Knowledge: -NIL-

2. Course Outcomes (COs):

After completion of this course successfully, the students will be able to:

CO-1: Apply the basic framework of universal human values to the self.
CO-2: Look at larger issues that (for many reasons) most are not exposed to: social, political, community, family, individual, etc. in a sensitized way.
CO-3: Understand themselves and their own roles within the bigger context. What are really, truly important to them? What are made important by others?
CO-4: Engage and connect with others and nurture the relationships.
CO-5: Think to shape and change the world, and not be mere technologists or scientists.

3. Mapping of Course Outcomes (COs) with Program Outcomes (POs) and Program Specific Outcomes (PSOs) – Course Articulation Matrix

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4.Detailed Syllabus:

Unit 1: Goal in life - short term and long term goals; Basic aspirations - Happiness and Prosperity; Role of education and human conduct; Self-exploration; Developing a holistic view
Unit 2: Gratitude and the need to acknowledge one’s gratefulness; Understanding Self and Other;
Unit 3: Living in harmony at 4 levels: self-self, self-family, self-society, self-nature
Unit 4: Understanding needs of body and self; Right understanding of physical facilities and relationships; Understanding human relationships; Trust and Respect - the foundational values in relationships;
Unit 5: Harmony in Society; The sense of safety, justice and peace in society; Nature and Sustainability; Self-reliance and Gandhian thought

Reference Books:

5.Teaching-Learning Strategies in brief (4 to 5 sentences):

This is a discussed based course. The instructor shares information on a topic and guides the discussion in the class by asking the right questions. By keeping the objectives in mind, the instructor adopts different techniques including smaller group discussions, role-play/skit, use of video clips or images to analyse and some activities to keep the students engaged in class throughout. Talks by experts who made a difference are also organised for the batch. Field trips to farms, orphanages, old-age homes, villages and jails are arranged as part of the induction programme, in parallel to the classes in VE for the first year UG batch.

6.Assessment methods and weightages in brief (4 to 5 sentences):

This is a Pass/Fail course. The assessment methods include submissions of assignments and term papers. Critical thinking is expected from watching relevant short films or by reading assigned books. The classroom participation is also taken into consideration for evaluation.
There are a few community-based activities and projects also. Participation in them is also important. (weightage for each kind of assessment may be given.)

**Linear Algebra**

Name of the Academic Program: BTech in Computer Science  
Course Code:  
Title of the Course: Linear Algebra  
L-T-P: 3-1-0  
Credits: 4

**Prerequisite Course / Knowledge:**  
This is one of the first math courses and only assumes school knowledge of maths.

**Course Outcomes (COs):**

After completion of this course successfully, the students will be able to...

**CO-1:** Explain the basic mathematical concepts like vector space, Basis, Linear Transformation, Rank Nullity Theorem, Matrix Representation of Linear Transformations, System of Equations, Determinants.

**CO-2:** Demonstrate familiarity with Eigenvalues, Eigenvectors, Orthogonality and Matrix Decomposition theorems.

**CO-3:** Synthesize proofs of theorems related to Matrices and Vector Spaces using clear mathematical and logical arguments.

**CO-4:** Apply principles of Spectral Decomposition and Singular Value Decompositions to real world problems in Image Compression, Principal Component Analysis etc.

**CO-5:** Design dimension reduction techniques with approximation guarantees using Best Fit Subspaces.

**CO-6:** Create mathematical models using principles of Linear Algebra and analyze them.

**Mapping of Course Outcomes (COs) with Program Outcomes (POs) and Program Specific Outcomes (PSOs)**

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Detailed Syllabus:

**Unit 1:** Vector spaces, subspaces, Linear dependence, Span, Basis, Dimension, Finite dimension vector spaces Linear transformation, Range and Null space of linear transformation, Rank Nullity Theorem, Sylvester's Law, Matrix representation of a linear transformation for finite dimensional linear spaces, Matrix operations, change of basis, Rank of a Matrix, Range and Null Space of a matrix representing a linear transformation. Linear spaces with inner product [inner product example over space of functions: orthogonality and orthogonal functions in L₂.

**Unit 2:** System of Linear Equations, Row-echelon form, reduced row-echelon form. Gauss-Jordon elimination, Solution of linear systems using Gauss-Jordon elimination, matrix inversion by Gauss Jordon elimination, Understanding Range Space and Solution Space using Rank-Nullity Theorem.

**Unit 3:** Eigenvalues and Inner product: Eigenvalues & Eigenvectors, Norms, Inner Products and Projections, Applications like Analysis of Random Walks.

**Unit 4:** Advanced Topics: Spectral & Singular Value Decomposition Theorems, Applications of SVD and Best Fit Subspaces

**Reference Books:**
2. Finite Dimensional Vector Spaces, P. Halmos, , Publishers, Edition, Year
3. Introduction to Linear Algebra, Gilbert Strang, , Publishers, Edition, Year
4. Linear Algebra Done Wrong, Sergei Treil, , Publishers, Edition, Year

**Teaching-Learning Strategies in brief (4 to 5 sentences):**
Lectures will initially introduce the motivations, concepts, definitions along with simpler examples. This will be followed by assignments and quizzes that will make sure that the students have understood the concepts. These will be followed by deeper lectures and assignments which lead the students to the bigger questions in the area. These will also be supplemented with real world engineering problems so that they can apply the concepts learned by them.

**Assessment methods and weightages in brief (4 to 5 sentences):**
- In-class Quizes: 15%
- Assignments: 15%
- Class Test 1: 10%
- Class Test 2: 10%
- Mid Semester Exam: 20%
- End Semester Exam: 30%
Data Structures and Algorithms

Name of the Academic Program: B.Tech in Computer Science and Engineering
Title of the Course: Data Structures and Algorithms
L-T-P: 3-1.5-3.
Credits: 4
(L = Lecture Hours, T = Tutorial Hours, P = Practical Hours)

1. Prerequisite Course / Knowledge:
   CS1.302 - Computer Programming

2. Course Outcomes (COs)
After completion of this course successfully, the students will be able to:
CO-1: Explain the design and implementation details of fundamental data structures and sorting/searching algorithms. (Cognitive Level: Understand)
CO-2: Write programs involving fundamental data structures and sorting/searching algorithms (Cognitive Levels: Apply and Analyze)
CO-3: Compare and contrast the performance of different data structures and sorting/searching algorithms with respect to time and memory. (Cognitive Levels: Analyze and Evaluate)
CO-4: Discover the algorithmic logic and new composite data structures required to solve well-defined computational problems while following specified compute constraints. (Cognitive Levels: Apply and Analyze)

3. Mapping of Course Outcomes (COs) with Program Outcomes (POs) and Program Specific Outcomes (PSOs) – Course Articulation Matrix

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4. Detailed Syllabus
   - Unit-1
     o Recap: Array, Pointers, Structures, Asymptotic Complexity
     o Abstract Data Types
   - Unit-2: Linear Data Structures
     o Linked Lists
     o Stacks
     o Queues
   - Unit-3: Non-linear Data Structures
     o Binary Trees and Search Trees
     o Hash Tables, Sets, Maps
   - Unit-4: Sorting Algorithms
     o Sorting – Insertion
Reference Books:
1. Data Structures and Algorithm Analysis in C (M.A. Weiss), Pearson

5. Teaching-Learning Strategies in brief
Lectures are conducted in a highly interactive fashion. The design and implementation of data structures and sorting/searching algorithms is done as an in-class coding exercise. Tutorial sessions are used to teach the utilization of tools such as Visual Studio Code, Git etc. Lab sessions are used to solve programming assignments and teaching assistants help students in developing program logic, debugging etc. on an individual basis. Faculty conducts office hours once in week. Additionally, teaching assistants conduct office hours. This ensures continuous support to students. Five to six programming assignments are designed which gives an in-depth understanding of various concepts discussed in the class and their application to new problem scenarios along with proper analysis. Some problems involve evaluating, comparing multiple solution approaches.

6. Assessment methods and weightages in brief
1. Programming Assignments (5): 40%
2. Programming Lab Exam: 15%
3. Best 2 out of 3 Theory Exams: 30%
4. Mini Project (4 members per team): 15%

For programming assignments and lab exams, online judges such as DMOJ are used to provide immediate feedback to students. While some test cases are revealed, others are hidden. Partial marks are allocated for code peer-reviewing in programming assignments. For mini project, a presentation followed by a code-execution demonstration is used for evaluation.

Introduction to Software Systems

Name of the Academic Program: Bachelor of Technology in Computer Science and Engineering
Course Code: CSE
Title of the Course: Introduction to Software Systems
L-T-P: 1-0-3
Credits: 2

Prerequisite Course / Knowledge: Not applicable.
2. **Course Outcomes (COs)**:

After completion of this course successfully, the students will be able to…

**CO-1: Demonstrate** familiarity with various OS Concepts, Shell programming, Web Technologies, Database Systems, Python Programming, and software engineering principles.

**CO-2: Explain** the different types of tools and technologies that are suitable for solving different software problems

**CO-3:** Apply tools and technologies to implement simple software solutions

3. **Mapping of Course Outcomes (COs) with Program Outcomes (POs) and Program Specific Outcomes (PSOs) – Course Articulation Matrix**

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Note: Each Course Outcome (CO) may be mapped with one or more Program Outcomes (POs) and PSOs. Write ‘3’ in the box for ‘High-level’ mapping, 2 for ‘Medium-level mapping’, 1 for ‘Low’-level mapping.

4. **Detailed Syllabus**:

**Unit 1**: Software and Systems overview - SHELL: OS concepts, Kernel, Memory, Shell basics, Advance Linux commands including file management and schedulers, Control flows, Regex, Awk,

**Unit 2**: Developing web applications - Introduction to HTML, CSS, and Javascript concepts, Data types, variables, operators, conditions, loops, functions, function expressions, events, form controls, data structures, javascript libraries, AFrame, Three.js

**Unit 3**: Programming with Python – Functions, Exceptions, Error Handling, Sequences, scoping rules, closures, higher-order functions, mutability, object model and inheritance, modules and packages, variable args, decorators, usage of libraries including SOAP and REST API, Flask based server set up.

**Unit 4**: SDLC and Databases – SDL Concepts, Version Control Systems, Editors, Bugtrackers, Basics of SQL, CRUD;
Reference Material/Books:
4. Workbook/Gitbook created by the course instructors (https://serciiit.gitbook.io/introduction-to-software-systems/)

5. Teaching-Learning Strategies in brief (4 to 5 sentences):
The course is delivered using problem-based learning methodology. The major goal of the course is to introduce the students to various software and systems technologies and tools that can facilitate them to develop simple software systems. To achieve this goal, the course is delivered as a combination of lectures and tutorial sessions that provide students with hands-on experience in understanding the problem and implementing solutions using the corresponding software technologies and tools.

6. Assessment methods and weightages in brief (4 to 5 sentences):
   - Mid Semester Exam – 15%
   - End Semester Exam – 20%
   - Assignments (3) – 25%
   - Labs (4 tests) – 20%
   - Others (In-class Activities, Surprise quiz/test) – 20%

Computer Systems Organization

Name of the Academic Program: B.Tech in Computer Science and Engineering

Course Code: CS2.201

Title of the Course: Computer Systems Organization

L-T-P: 3-1-0. Credits: 4

1. Prerequisite Course / Knowledge:

2. Course Outcomes (COs)
After completion of this course successfully, the students will be able to:
CO-1: Explain the Von Neumann Model of Computing. Describe all the steps involved in the execution of a program: composition, compilation, assembly, linking, loading and hardware interpretation of the program instructions. (Cognitive Level: Understand)

CO-2: Describe the instruction set architecture design principles. Show how programming language constructs can be mapped to sequences of assembly language instructions. Analyze and assess any given ISA. (Cognitive Levels: Analyze and Evaluate)

CO-3: Describe processor design architectural approaches. Compare and contrast sequential designs with pipelined designs. Propose new architectural approaches to optimize on performance and hardware costs (Cognitive Levels: Apply, Analyze and Create)

CO-4: Describe the basic functionality of an operating system. Clearly explain the system call interface, its design and implementation. Build systems akin to a bash shell, file server etc. using system calls. (Cognitive Levels: Understand and Apply)

CO-5: Describe the basics of process control and management. (Cognitive Levels: Understand and Apply)

CO-6: Describe the principles of virtual memory management. Analyze various memory management schemes for process isolation and physical memory utilization across multiple processes (Cognitive Levels: Understand, Apply and Analyze)

3. Mapping of Course Outcomes (COs) with Program Outcomes (POs) and Program Specific Outcomes (PSOs) – Course Articulation Matrix

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4. Detailed Syllabus

- **Unit 1:**
  - Basic computer organization, Von Neumann architecture and stored program concept
  - High level programming languages, assemble code, binary instructions, compilers and assemblers
  - Programming editing, compilation and execution cycle

- **Unit 2:**
  - Instruction Set Architecture Design Principles
  - CISC vs RISC ISAs
  - Binary encoding of the instructions
  - Mapping language constructs such as expressions, if-then-else statements, loops, functions to assembly code
  - Machine representation of numbers

- **Unit 3:**
  - Processor design fundamentals
  - ALU Design
  - Single Cycle and Multi Cycle Processor Design
  - Pipelined Architectures
  - Hazards in Pipelined Architectures and approaches to resolve them.

- **Unit 4:**
  - Introduction to Operating Systems. Bootstrapping Process
  - System Calls, their design, implementation and application.

- **Unit 5:**
  - Process Control and Management
  - Scheduling multiple processes on multiple cores.
  - Basics of scheduling mechanisms and policies.

- **Unit 6:**
  - Physical vs Virtual Memory
  - Process and memory isolation/protection mechanisms
  - Virtual memory management
  - Page replacement algorithms

**Reference Books:**

5. Teaching-Learning Strategies in brief

Lectures are conducted in a highly interactive fashion. Use of various system tools such as compilers, assemblers, loaders, linkers, simulators etc. are demonstrated live in the class. Assignments include assembly language programming, digital system design exercises such as Arithmetic and Logic Unit Design, programming using system calls. Most of the ideas introduced in the class are emphasized through these assignments. Teaching Assistants and Faculty conduct office hours every day. Thus students have continuous access to resources to get their doubts clarified and seek any extra help that is required. Some times students are encouraged to come to the board and explain the novel design ideas they came up with while solving assignments or mini-projects.

6. Assessment methods and weightages in brief

1. Programming Assignments (5 to 6) : 25 percent
2. Two Quizes: 2 x 10 percent
3. Mid Term: 20 percent
4. Final Exam: 35 percent

Title: Introduction to Linguistics 2: Semantics, Pragmatics and Discourse
Credits: 3-0-1-4
Faculty name: Aditi Mukherjee
Type when: Spring 2022
Prerequisite: Introduction to Linguistics 1.

COURSE OUTCOME:

CO-1: Students will have a good understanding of semantic and contextual analysis of texts
CO-2: Students will be introduced to different semantic and pragmatic theories
CO-3: It will enable them in building text processing tools and systems
CO-4: Other than English, they will explore different languages in class working in teams.
CO-5: Using real examples, they will analyse conversational data to understand the concepts.

COURSE TOPICS:
SEMANTICS


PRAGMATICS


DISCOURSE


Mapping of Course Outcomes to Program Objectives: (1 – Lowest, 2—Medium, 3 – Highest, or a ‘-’ dash mark if not at all relevant). Program outcomes are posted at

https://iiitaphyd-my.sharepoint.com/:w:/r/personal(dyacad_iiit_ac_in/Documents/NBA-2020-21/Course%20Content/IIIT-CSE-ECE.docx?d=w111f0effcaea41b3a4d1e8a3fbc6332d&csf=1&web=1&e=z1Khby
SEMINARS: Students will be expected to read research papers on various topics and make presentations in the class.

TEXT BOOKS:
John Saeed (2009) *Semantics*
Geoffrey Leech (1983) *Semantics: the Study of Meaning*

SUGGESTED READINGS:

GRADING:
Assignments: 15%,
Mid Sem: 30%,
End Sem: 35%
Seminar: 20%

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<tr>
<td>Faculty Name</td>
<td>: Radhika Mamidi</td>
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<td>Name of the Academic Program</td>
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1. Prerequisite Course / Knowledge:
Introduction to Linguistics-1
2. Course Outcomes (COs) (5 to 8 for a 3 or 4 credit course):

After completion of this course successfully, the students will be able to:

CO-1 Use computational methods to analyse language at morpho-syntactic levels

CO-2 Develop requisite skills for text and speech problem solving

CO-3 Develop computational resources and tools for Indian languages with different language structures

CO-4 Perform theoretical research at phonology, morphology and syntax levels

CO-5 Apply CL/NLP techniques for real world applications by using real time data

3. Mapping of Course Outcomes (COs) with Program Outcomes (POs) and Program Specific Outcomes (PSOs) – Course Articulation Matrix

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Note: ‘3’ in the box for ‘High-level’ mapping, 2 for ‘Medium-level’ mapping, 1 for ‘Low’-level’ mapping

4. Detailed Syllabus:
Unit 1: What is CL and where does it apply? Issues and challenges; Language processing pipeline for text processing: Structural Analysis at various levels – word (POS, morphology), phrase (chunk), sentence (syntactic parsing). Word meaning: Lexical Semantics, Dealing with Ambiguities (WSD/WTD)

Unit 2: Morph analysis: Morph analysers and word generators; Recap of basic units in word formation: morphemes, allomorphs. Word formation: Affixation, suffixation, prefixation, infixation; Non-concatenative, Compounding, Morphotactics; Constraints on affixes; Morphophonology; Types of word formation processes (function based): inflectional, derivational; Developing morph analysers and generators: finite state automata, paradigmtables, add-delete rules; Word Meaning: Lexical semantics, Hypernymy, hyponymy, synonymy, antonymy, lexicon and lexicography; machine readable dictionaries, WordNet, ConceptNet, VerbNet etc.

Unit 3: Shallow parsing and sentence analysis: Words and their arrangements in a sentence. POS Tagging Word classes, Parts of Speech, POS tagging, Rule based parts of speech taggers, Statistical parts of speech taggers, Annotating POS tagged data, Issues in tagging, Defining tagset for your languages. Shallow parsing (arrangement of words in a sentence) Local Word Grouping (LWG) Grouping functional words such as prepositions/postpositions and auxiliaries with the content words (nouns, verbs); Chunking: Forming minimal phrases; Multi-Word Expressions (MWEs): Named entities (NEs), Idioms, compounds. Types of named entities; compositionality in MWEs.


Unit 5: Speech Processing: Introduction to speech processing: Speech production; Speech perception; Speech analysis; Speech Recognition; Speech Synthesis

Reference Books:

1. Jurafsky& Martin, 2000; Speech and Language Processing, Pearson Education
2. Bharati et al., 1995; Natural Language Processing: A Paninian Perspective
3. Fundamentals of Speech Recognition by Lawrence Rabiner, Biing-Hwang Juang

5. **Teaching-Learning Strategies in brief (4 to 5 sentences):**
This is a mix of theory and project based. The focus is on using the methods taught in class to extend to Indian languages.

6. **Assessment methods and weightages in brief (4 to 5 sentences):**
How the students are able to connect the linguistic concepts by using computational techniques to analyse and generate data at the level of sound, word and sentence. The course will have a project content where students will study and solve a problem using real language data. The focus is on individual as well as collaborative learning.

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**Probability and Statistics**

Name Of the Faculty: Pawan Kumar

Course: CSE

Name of the Academic Program: B.Tech. in Computer Science and Engineering

Course Code: MA6.101

Title of the Course: **Probability and Statistics**

L-T-P: 3-1-0. Credits: 4

(\(L\)= Lecture hours, \(T\)=Tutorial hours, \(P\)=Practical hours)

1. **Prerequisite Course / Knowledge:**
Linear Algebra, Real Analysis

2. Course Outcomes (COs)

After completion of this course successfully, the students will be able to –

CO-1. Explain the axioms of probability and rules, discrete and continuous random variables.

CO-2. Derive the density function of transformations of random variables and use these to generate data corresponding to various distributions.

CO-3: Derive marginal and conditional distributions of multivariate random variables and probability bounds.

CO-4. Discuss the classical and Bayesian inference theory and applications.

CO-5. Discuss the basic random processes and their applications.

CO-6. Outline a proof of stated theorem and write the logically derived proof.

3. Mapping of Course Outcomes (COs) with Program Outcomes (POs) and Program Specific Outcomes (PSOs) – Course Articulation Matrix

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‘3’ in the box denotes ‘High-level’ mapping, 2 for ‘Medium-level’ mapping, 1 for ‘Low’-level’ mapping

4. Detailed Syllabus:

Unit 2: Continuous Random Variable: Probability density function, cumulative distribution function, expectation, mean and variance. Moment generating functions and uniqueness theorem. Chebyshev’s inequality. The uniform distribution on \((a, b)\), the normal distribution. Mean and variance of the normal distribution. The Cauchy distribution. The exponential distribution, moments, memoryless property, hazard function. Gamma distribution, moments, Chi-square distribution. (9 hours)

Unit 3: Multivariate Distributions: Cumulative distribution function method for finding the distribution of a function of random variable. The transformation rules. Discrete bivariate distributions, marginal and conditional distributions, the trinomial distribution and multinomial distribution. Continuous bivariate distributions, marginal and conditional distributions, independence of random variables. Covariance and correlation. Mean and variance of linear combination of two random variables. The joint Moment generating function (MGF) and MGF of the sum. The bivariate normal distribution, marginal and conditional distributions, conditional expectation and variance, joint MGF and marginal MGF. Linear combinations of independent random variables. Means and variances. Sequences of independent random variables and the weak law of large numbers. The central limit theorem, normal approximation to the binomial distribution. (9 hours)


References:

- Online resource: [https://www.probabilitycourse.com/](https://www.probabilitycourse.com/)

5. Teaching-Learning Strategies in brief:

Lectures by integrating ICT into classroom teaching, weekly tutorials involving problem solving and active learning by students and Project-based Learning by doing one mini-project.
6. Assessment methods and weightages in brief:

Assignments in theory: 15 marks, Mid Semester Examination-1: 25 marks, Mid Semester Examination-2: 30 marks, End Semester Examination: 30 marks

Title of the Course: Language and Society
Faculty Name: Dipti Misra Sharma
Name of the Program: CLD
Course Code: CL2.203
Credits: 4
L - T - P : 2-1-0
(L - Lecture hours, T - Tutorial hours, P - Practical hours)
Semester, Year: Monsoon 2022
(Ex: Spring, 2022)
Pre-Requisites: None
Course Outcomes:

1. The course intends to familiarise students with the social dynamics of language in use.
2. After doing the course, the students should be able to identify and recognize various phenomena which are at play. They should develop an understanding of social behaviour such as identity assertion, attitudes in language use and choices that people make while using variants of linguistic items depending on social circumstances.
3. The students are expected to be able to classify these phenomena and explain some of their consequences. For example, code mixing and code switching are very common in multilingual societies such as India. How people use code mixing for better communication or how they use code switching for social reasons are some of the concepts the students should be able to explain given a social context.
4. At the end of the course, the students are expected to be able to analyse language data and employ basic concepts learned during the course for interpreting language data for computational models.
5. The course should give them the confidence to be able to design and develop computational models in real case scenario.
6. The students will be working on real data projects in teams which will give them an experience of working as teams to solve a real problem.

Course Topics:

2. Language Contact: Bilingualism/Multilingualism, borrowing, code mixing/switching, pigdinization and creolization, convergence, language maintenance/shift, language acquisition in a multilingual setting. Diglossia with or without bilingualism.


4. Language and Culture: Directions of influence. The Whorfian hypothesis


**Preferred Text Books**
- Ronald Wardaugh: *Introducing Sociolinguistics*
- R. A. Hudson: *Sociolinguistics*
- Suzanne Romaine: *Language in Society*

**Reference Books**
- J.B. Pride and J. Holmes (ed): Sociolinguistics
- Paolo Giglioli (ed): Language and Social Context
- Robert Bayley and Ceil Lucas (ed): Sociolinguistic Variation

**E-book Links**

**Grading Plan**
(The table is only indicative)

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Mapping of Course Outcomes to Program Objectives: (1 – Lowest, 2—Medium, 3 – Highest, or a ‘-‘ dash mark if not at all relevant). Program outcomes are posted at

https://iiitaphyd-my.sharepoint.com/:w:/r/personal/dyacad_iit_ac_in/Documents/NBA-2020-21/Course%20Content/IIT-CSE-ECE.docx?d=w111f0effcaea41b3a4d1e8a3fbc6332d&csf=1&web=1&e=z1Khby
Teaching-Learning Strategies in brief (4-5 sentences):

There will be regular classes with interactive sessions to cover the theory. Since actual learning happens through practical work, each student will take up a project which will involve some field work, literature survey and working with real data. Classic research papers will be distributed for the students to read critically and present them in class. So, the idea is that learning happens through listening and discussions (classes), reading (seminar papers) and working with data (project). For each topic some assignment will be given for the students to get a better grip on the topic.

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Note: This course description format comes into effect from Spring 2022.

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Title of the Course : Computational Linguistics 2
Faculty Name : Radhika Mamidi
Name of the Academic Program : CLD
Course Code : CL3.202
L-T-P : 3-1-0
Credits : 4
( L= Lecture hours, T=Tutorial hours, P=Practical hours)

1. Prerequisite Course / Knowledge:

Introduction to Linguistics-1 and 2; Computational Linguistics 1

2. Course Outcomes (COs) (5 to 8 for a 3 or 4 credit course):

After completion of this course successfully, the students will be able to:

CO-1 Use computational methods to analyse language at semantic and pragmatic levels
CO-2 Develop requisite skills for problem solving at discourse and conversation levels

CO-3 Develop computational resources and tools for handling text, contextual interpretation of text and representation of meaning in context.

CO-4 Perform theoretical research in computational semantics and computational discourse analysis

CO-5 Apply CL/NLP techniques for real world applications by using real time dialog and discourse data

3. Mapping of Course Outcomes (COs) with Program Outcomes (POs) and Program Specific Outcomes (PSOs) – Course Articulation Matrix

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Note: ‘3’ in the box for ‘High-level’ mapping, 2 for ‘Medium-level’ mapping, 1 for ‘Low’-level’ mapping

4. Detailed Syllabus:

Unit 1: Background for studying word meaning and sentence meaning, sentence meaning and propositional content; sense and reference; referent, extension, prototype, stereotype; deixis and definiteness; predicates, referring expressions, universe of discourse; properties of sentences - analytic, contradiction, entailment; properties of predicates - reflexive, symmetry, transitive. Word meaning and sentence meaning, content word and grammatical word, contextual variation; Speaker meaning vs Sentence meaning. Building resources using Lexical semantic relations - Synonymy, Antonymy, Hyponymy, Troponymy, Meronymy; Metaphor and Metonymy; Polysemy and Homonymy; Semantic fields; Lexical ambiguity; Building dictionaries; Ontologies.
Unit 2: Formal Semantics: Formal representation of natural language - semantic features, case frames, semantic primitives. Logic, notation for simple propositions; connectives – and, or, but, if etc.; Logical expressions for ambiguous sentences

Unit 3: Pragmatics and Discourse: Pragmatics and Discourse analysis as a study of context dependent aspects of meaning; text, co-text, context and relevance. Computational Discourse analysis: Studying Structure of text and coherence; exchange structure and conversational analysis; turn taking; adjacency pairs; preference organization; deixis; anaphora; ellipsis; discourse connectives and relations; Structural analysis of different kinds of texts;

Unit 4: Text classification and generation: Memory and knowledge representation as schemas - frames, scripts and story grammar; Generation and processing of texts: Sentiment Analysis. Humour Analysis.

Unit 5: Computational Pragmatics: Language Understanding; Meaning beyond textual context; speaker's intention and hearer's inference; inference - bridging inferences, causal and spatial inferences, elaborative and restrictive inferences; Application of pragmatic concepts in Dialogue Systems: conversational implicature, conventional implicature, entailment and presupposition; cooperative interaction and Gricean maxims; speech act theory; language as action, performatives, direct and indirect speech acts and felicity conditions; politeness maxims; Austin and Searle’s speech acts; Dialogue data annotation: Dialog Acts, Rhetorical Structure Theory

Reference Books:

1. Jurafsky & Martin, 2000; Speech and Language Processing, Pearson Education

5. Teaching-Learning Strategies in brief (4 to 5 sentences):
This is a mix of theory and project based. The focus is on using the methods taught in class to extend to real time situations and uses.

6. **Assessment methods and weightages in brief (4 to 5 sentences):**

How the students are able to connect the linguistic concepts by using computational techniques to analyse and generate data at the level of semantics and pragmatics. The course will have a project content where students will study and solve a problem using real language data. The focus is on individual as well as collaborative learning.

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**Data and Applications**

**Name of the Academic Program:** B.Tech. in Computer Science and Engineering  
**Course Code:** CS4.301  
**Title of the Course:** Data and Applications [Half]  
**L-T-P:** 3-1-0.  
**Credits:** 2  
( L= Lecture hours, T=Tutorial hours, P=Practical hours)

1. **Prerequisite Course / Knowledge:**

Data Structures

2. **Course Outcomes (COs)**

After completion of this course successfully, the students will be able to –
CO-1. State data requirements for an application.
CO-2. Develop a conceptual model (such as, Entity Relationship Model and Diagram) for a set of data requirements.
CO-3: Comprehend relational data model and integrity constraints, and relational database design with normalization.
CO-4. Map the conceptual model to a relational data model and create and populate its corresponding relational database
CO-5. Map user queries into correct relational algebra, Structured Query Language (SQL), and tuple relational calculus expressions/statements. And updates using SQL.
CO-6. Implement an application to access, query and update a relational database.

3. Mapping of Course Outcomes (COs) with Program Outcomes (POs) and Program Specific Outcomes (PSOs) – Course Articulation Matrix

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‘3’ in the box denotes ‘High-level’ mapping, 2 for ‘Medium-level’ mapping, 1 for ‘Low’-level’ mapping

4. Detailed Syllabus:

Unit 1: Data, Database, Database System (3 hours)

Unit 2: Data models, Conceptual Data Modeling, ER Models (5 hours)

Unit 3: Relational Data Model, Relational Algebra, Tuple Relational Calculus (6 hours)

Unit 4: SQL, Constraints, Triggers, Database Connectivity, Applications (3 hours)
Unit 5: Normalization, Relational Database Design (4 hours)

- Four mini projects related to the above syllabus will be done by students.

References:

**5. Teaching-Learning Strategies in brief:**

Lectures by integrating ICT into classroom teaching, weekly tutorials involving problem solving and active learning by students and Project-based Learning by doing four mini-projects.

**6. Assessment methods and weightages in brief:**

Assignments in theory: 10 marks, Quizzes in theory: 10 marks, Mid Semester Examination in theory: 20 marks, End Semester Examination in Theory: 30 marks, Assessment of four mini projects: 30 marks

---

**Automata Theory**

**Name of the Academic Program:** B.Tech. in Computer Science and Engineering  
**Course Code:** CS1.302  
**Title of the Course:** Automata Theory  
**L-T-P:** 3-1-0  
**Credits:** 2  
(L= Lecture hours, T=Tutorial hours, P=Practical hours)

**1. Prerequisite Course / Knowledge:** Data structures, Elementary Formal Logic  
**2. Course Outcomes (COs):**  
After completion of this course successfully, the students will be able to

**CO-1.** Develop an understanding of the core concepts of Automata theory such as Deterministic Finite Automata, Non-deterministic Finite Automata, Regular Languages, Context Free Languages, Push down Automata, the basics of Turing Machines  
**CO-2.** Design grammars and automata for different languages
CO-3. Identify formal language classes and prove language membership properties
CO-4. Describe the limitations of the different computational models

3. Mapping of Course Outcomes (COs) with Program Outcomes (POs) and Program Specific Outcomes (PSOs) – Course Articulation Matrix

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<th>PO 1</th>
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‘3’ in the box denotes ‘High-level’ mapping, 2 for ‘Medium-level’ mapping, 1 for ‘Low’-level’ mapping

4. Detailed Syllabus:

Unit 1: Introduction, Finite State Machines, Deterministic Finite Automata (DFA), Non deterministic Finite Automata (NFA), Equivalence of NFA and DFA, Regular Expressions, Regular Languages, Closure

properties of regular languages, Pumping Lemma, Grammars, Left and Right-linear grammars

Unit 2: Context Free Grammar (CFG), Chomsky Normal Form, Push Down Automata (PDA), Equivalence of CFG and PDA, Context Free Languages (CFL), Deterministic PDA and Deterministic CFL, Pumping Lemma for context free languages

Unit 3: Introduction to Turing machines, Total Turing Machines, Recursive languages, Recursively enumerable languages, The Halting problem.
References:

5. Teaching-Learning Strategies in brief:

The lectures will be arranged in a manner that facilitates inter-student and faculty-student discussions. Additionally, the lectures will have small exercises that will ensure that the students actively participate in the learning activity and think out of the box. There will be more emphasis on ideas and reproduction of textbook material. There will be small homework problems that would help the student to re-engage with the essential components of the lecture. Assignments will test the student’s ability to apply key concepts learnt, and also inform the faculty of the progress being made by the students in acquiring them.

6. Assessment methods and weightages in brief:

Homework: 25%
Quiz 1: 20%
Quiz 2: 20%
Final exam: 35%

Algorithm Analysis and Design

Title of the course : Algorithm Analysis and Design
Faculty Name : Suryajith Chillara
Course Code : CS1.301
Credits : 4
L - T - P : 3-0-0

(L - Lecture hours,
T - Tutorial hours, P - Practical hours)

Semester, Year: Monsoon 2022
(Ex: Spring, 2022)

Name of the Program : B.Tech
Pre-Requisites : Discrete Mathematics, and Data Structures and Algorithms
Course Outcomes :
After completion of this course successfully, the students will be able to...

CO-1: Demonstrate the ability to fully understand the analysis of various known algorithms.

CO-2: Identify problems where various algorithm design paradigms can possibly be applied.

CO-3: Understand the notions of computational intractability and learn how to cope with hardness.

CO-4: Understand the notion of approximation and randomized algorithms. If time permits, intro to quantum algorithms.

**Detailed syllabus:**

1. Basic graph algorithms
2. Greedy algorithms
3. Divide and Conquer
4. Dynamic Programming
5. Network flows
6. NP and computational intractibility
7. Intro to Approximation and Randomized algorithms
8. Intro to Quantum algorithms

**Assessment method and Grading scheme:**

- Deep quizzes 1 and 2: 10 + 10 = 20%
- Mid-semester exam = 20%
- End-semester exam = 30%
- In-class quizzes (unannounced) = 15%
- Assignments = 15%

Mapping of Course Outcomes (COs) with Program Outcomes (POs) and Program Specific Outcomes (PSOs)
Each Course Outcome (CO) may be mapped with one or more Program Outcomes (POs). Write ‘3’ in the box for ‘High-level’ mapping, 2 for ‘Medium-level’ mapping, 1 for ‘Low’-level’ mapping

**Teaching-Learning Strategies in brief (4-5 sentences) :**

The course lectures will include activities that promote the understanding of the lecture content by using small examples that students work out during the class itself and promote active and participatory learning. A good part of the lecture will involve problem solving and finding solutions to problems rather than expositing known material. In class tests that are held periodically are useful as summative assessments. Homework assignments are designed to reiterate the material covered in class lectures and also solve problems that are based on simple extensions of concepts described in the lectures.

**Design and Analysis of Software Systems**

**Name of the Academic Program:** Bachelor of Technology in Computer Science and Engineering  
**Course Code:** Title of the Course: Design & Analysis of Software Systems  
**L-T-P:** Credits: 4  
( L= Lecture hours, T=Tutorial hours, P=Practical hours)
1. **Prerequisite Course / Knowledge**: Intro to Software Systems

2. **Course Outcomes (COs) (5 to 8 for a 3 or 4 credit course)**:

   After completion of this course successfully, the students will be able to…

   CO-1: Understand the process of building software, through a live project
   CO-2: Inculcate software engineering knowledge, skills, and technologies needed to build software
   CO-3: Understand the structured approach and disciplined process (iterative) to develop software
   CO-4: Learn the steps in building a reasonably complex piece of usable that is maintainable
   CO-5: Enhance written and oral communication skills, needed for software engineering

3. **Mapping of Course Outcomes (COs) with Program Outcomes (POs) and Program Specific Outcomes (PSOs) – Course Articulation Matrix**

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</table>

   Note: Each Course Outcome (CO) may be mapped with one or more Program Outcomes (POs) and PSOs. Write ‘3’ in the box for ‘High-level’ mapping, 2 for ‘Medium-level’ mapping, 1 for ‘Low-level’ mapping

4. **Detailed Syllabus**:

   The course will be run as units, following typical agile development sprints

   1. Introduction
      a. Introduction to Software Engineering
c. Project and Team Management - Project organization concepts (roles, tasks, work products),

2. Requirements
   a. Analysis and Specification),
   b. Estimation, Release Planning, Organizational activities (communication, status meetings).

3. Design
   a. Modelling (UML), Architecture and Design,
   b. System Decomposition, Software Architectural styles, Documenting Architectures,

4. Testing
   a. Quality Assurance - Unit, Integration, System and Acceptance Testing, Introduction to various testing techniques (e.g. Stress testing)

5. Design Patterns
   a. Design patterns, UI design
   b. Software Development for startups

Reference Books:


5. Teaching-Learning Strategies in brief (4 to 5 sentences):

The proposed course provides an introduction to software engineering concepts and techniques to undergraduate students using project based methodology. Students work in a small teams to deliver a software system that are proposed by real industrial clients. The course content and project introduces various software technologies, process and project management skills that are needed for the delivery of software in a team setting.
6. Assessment methods and weightages in brief (4 to 5 sentences):

<table>
<thead>
<tr>
<th>Component</th>
<th>Percentage (%)</th>
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<tbody>
<tr>
<td>Project</td>
<td>40</td>
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<tr>
<td>Client Feedback (R1 1% + R2 3%)</td>
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<tr>
<td>Coding Assignments (4)</td>
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<tr>
<td>Quizzes (Q1 + Q2, no midterm)</td>
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<tr>
<td>Class submissions (3 Questions)</td>
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<td>Class Assignments</td>
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<tr>
<td>End Exam/Research Paper</td>
<td>12</td>
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<td><strong>TOTAL</strong></td>
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</table>

CS Program Outcomes (POs)

**PO1** Engineering knowledge: Use concepts from varied disciplines including Computer Science, Electronics, Mathematics, and the Sciences, to engineer and develop systems of varying scale.

**PO2** Problem analysis: Identify, formulate and analyze complex engineering problems reaching substantial conclusions using first principles of Mathematics, Natural Sciences and Engineering Sciences.

**PO3** Design/Development of solutions: Identify and bring to fore the necessary concepts from Computer Science and arrive at creative ways to solve problems that take into account the societal, cultural, and ethical considerations.

**PO4** Conduct investigations of complex problems: Interpolate and extrapolate based on existing knowledge base and self-learning skills to investigate the dynamics of complex problems and find solutions.
PO5 Modern tool usage: Demonstrate requisite hands-on skills to work with a variety of software packages, libraries, programming languages, and software development environment tools useful in engineering large scale systems

PO6 The engineer and society: Make judicious use of resources and understand the impact of technology across the societal, ethical, environmental, and economic aspects.

PO7 Environment and sustainability: Find technological solutions by considering the environmental impact for sustainable development

PO8 Ethics: Practice principles of professional ethics and make informed decisions after a due impact analysis.

PO9 Individual and team work: Work efficiently in individual and team-oriented projects of varying size, cultural milieu, professional accomplishments, and technological backgrounds.

PO10 Communication: Effectively communicate and exchange ideas and solutions to any individual including peers, end-users, and other stakeholders.

PO11 Project management and Finance: Apply the principles of project management in general and software project management in particular with focus on issues such as the life cycle, scoping, costing, and development.

PO12 Life-long learning: Exhibit the aptitude for independent, continuous, and life-long learning required to meet their professional and career goals.

Program Specific Outcomes (PSOs)
PSO1 Exhibit specialized knowledge in some sub-areas of Computer Science and Engineering such as Theoretical Computer Science, Computer Systems, Artificial Intelligence, Cyber-physical Systems, Cyber-security and use this specialized knowledge base to solve advanced problems

PSO2 Perform gap analysis in terms of systems and technologies and prepare roadmaps for incorporating state-of-the-art technology into system analysis, design, implementation, and performance.

PSO3 Demonstrate research and development skills needed to define, scope, develop, and market futuristic software systems and products

PSO4 Demonstrate knowledge and skills at the required depth and breadth to excel in post-graduate and research programs

Machine, Data and Learning

Name of the Academic Program : B.Tech. in Computer Science and Engineering
Course Code :
Title of the Course: Machine, Data and Learning
L-T-P: 3-1-0
Credits: 4
(L= Lecture hours, T=Tutorial hours, P=Practical hours)

1. Prerequisite Course / Knowledge:
Data Structures, Computer Programming

2. Course Outcomes (COs)

After completion of this course successfully, the students will be able to:

CO-1. Understand basic ML concepts such as Underfitting, Overfitting and Bias-Variance tradeoff
CO-2. Gain hands-on experience of applying these concepts to example problems
CO-3. Understand local search techniques with focus on Genetic algorithms
CO-4. Understand the basics of Probability and Utility theory
CO-5. Usage of these concepts in the context of formal models such as Decision theoretic models and Bayesian networks
CO-6. Understand Decision tree learning and notion of Information Gain

3. Mapping of Course Outcomes (COs) with Program Outcomes (POs) and Program Specific Outcomes (PSOs) – Course Articulation Matrix

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4. Detailed Syllabus:
Unit 1: Overview of AI and ML

Unit 2: Basic ML concepts including Data and generalization, Overfitting, Underfitting, Bias-variance tradeoff

Unit 3: Local Search Techniques, Genetic Algorithms
Unit 5: Basics of Probability and Utility Theory
Unit 6: Decision Theory, Markov Decision Process, Modeling observation errors

Unit 7: Decision Tree Learning, Construct decision trees from examples, Notion of information gain
Unit 8: Bayesian networks

References:
- Python ML by Example by Yuxi (Hayden) Liu, Packt Publishing, 2017
- Stuart Russell and Peter Norvig, Artificial Intelligence A Modern Approach, Pearson Education Inc., 2009

5. Teaching-Learning Strategies in brief:

The course lectures will cover the core concepts while assignments will provide ample scope to implement and understand many of the concepts in more detail. Learning of theoretical concepts and problem solving will be enabled via quizzes, mid and final exams.

6. Assessment methods and weightages in brief:

<table>
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<tr>
<th>Assignments</th>
<th>35 marks</th>
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<tr>
<td>Quizzes</td>
<td>15 marks</td>
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<td>Mid Exam</td>
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<td>End Exam</td>
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Title of the Course: Digital Signal Analysis
Course Code: 
Faculty Name: Anil Kumar Vuppala
Name of the Academic Program: B. Tech. in CSE
L-T-P: 2-1-0
Credits: 2

Prerequisite Course / Knowledge:

No prerequisite as it is a core course for CLD program.

Course Outcomes (COs):

After completion of this course successfully, the students will be able to..

CO-1: Introduce the fundamentals of digital signal representation and processing to undergraduate students of CLD/CS/CSD.

CO-2: Introduce the advantage of a transformed domain representation.

CO-3: Application of basic signal processing to speech signals.
Mapping of Course Outcomes (COs) with Program Outcomes (POs) and Program Specific Outcomes (PSOs)

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Each Course Outcome (CO) may be mapped with one or more Program Outcomes (POs). Write ‘3’ in the box for ‘High-level’ mapping, 2 for ‘Medium-level’ mapping, 1 for ‘Low’-level’ mapping

Mapping with PSOs, where applicable.

Detailed Syllabus:

Unit 1: Basics of Fourier series and transform, sampling and quantisation, different types of signals and systems.

Unit 2: Z-transform, FIR and IIR systems. Introduction to digital filter design.

Unit 3: Application of concepts using speech signals.

Reference Books:

1. Digital signal processing by John G. Proakis and Dimitris K Manolakis.
2. Digital signal processing by Alan V. Oppenheim and Ronald W. Schafer.
3. Introduction to Digital Speech Processing by Lawrence R. Rabiner and Ronald W. Schafer, now Publishers Inc. Hanover, USA, 2007

Teaching-Learning Strategies in brief (4 to 5 sentences):

It is a mathematical oriented signal processing course, so regular problem solving assignments are given to understand the concepts. Surprise class tests are conducted based on assignments to test
the seriousness in assignment solving. As a part of teaching practical examples like speech signal is used for demonstration of mathematical concepts learned.

**Assessment methods and weightages in brief (4 to 5 sentences):**
Assignments -- 20%
Quiz-- 30%
End exam -- 50%

<table>
<thead>
<tr>
<th>Title of the Course</th>
<th>Language Typology and Universals</th>
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<tbody>
<tr>
<td>Faculty Name</td>
<td>Radhika Mamidi</td>
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<tr>
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(L= Lecture hours, T=Tutorial hours, P=Practical hours)

**1. Prerequisite Course / Knowledge:**
Introduction to Linguistics-1 and 2

**2. Course Outcomes (COs) (5 to 8 for a 3 or 4 credit course):**
After completion of this course successfully, the students will be able to:

CO-1 Analyse language at morpho-syntactic and semantic levels
CO-2 Discuss the similarities and differences between languages
CO-3 Demonstrate understanding of language development and language loss in humans
CO-4 Demonstrate understanding of different language families
CO-5 Build knowledge and do research and be able to build NLP applications in mother tongue

**3. Mapping of Course Outcomes (COs) with Program Outcomes (POs) and Program Specific Outcomes (PSOs) – Course Articulation Matrix**

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Note: ‘3’ in the box for ‘High-level’ mapping, 2 for ‘Medium-level’ mapping, 1 for ‘Low’-level’ mapping

4.**Detailed Syllabus:**

Unit 1: **INTRODUCTION:** Nature of human language and its design features and comparison with animal communication systems - Duality of patterning, creativity, displacement etc; Levels of language organization- Phonological, Morphological; Grammatical and Discourse; LANGUAGE CHANGE: Concepts from Historical linguistics; language families and subfamilies; Comparative methods: spelling changes, types of sound changes, morphological changes, syntactic and semantic changes; Analogical change; Borrowing; the Great Vowel Shift; Grimm's law; Lexical comparisons

Unit 2: **COMPARISION AND CLASSIFICATION OF UNIVERSALS:** Historic-generic method and typological method; Language contact and convergence and areal typological study; South Asian language area and common areal features – experience subject, echo-formation, reduplication, retroflexion; Approaches to language universals: structural approach and generative approach – their assumptions about sampling, methodology and nature of linguistic elements.

Unit 3: **GREENBERG’S BASIC WORD ORDER TYPOLOGY:** Implicational universals and their role in restricting possible language types; absolute universals and tendencies; Post-Greenbergian research and reformulation of word order typology. **CHOMSKYAN APPROACH TO LANGUAGE UNIVERSALS:** Language learnability,
poverty of stimulus and innateness hypothesis; Concepts of universal grammar; Principles and parameters –
head parameter, pro-drop parameter and X-bar theory of phrase structure.

**Unit 3: PHONOLOGICAL STRUCTURE: Vowels and Consonants across languages; Distinctive features and**
phonological oppositions; Syllable types; Phonotactic constraints; Phonological Processes; Language
acquisition and dissolution. Phonological universals. MORPHOLOGICAL STRUCTURE:
Language types-
Analytic, Agglutinative, Synthetic and Polysynthetic: derivational and inflectional categories and
types of
affixes; Morphological encoding of number, person, gender, tense, aspect and modal features,
agreement
and case marking; Parts of speech categories.

**Unit 4: CLAUSE STRUCTURE: Grammatical relations – Nominative-Accusative and
ergative-Absolutive**
language types; Dative and other Nominative subjects; Relative clause types; Causative
construction;
Complement structure; Conjunctive Participles. SEMANTIC STRUCTURE: Case Grammar;
Predicate argument
structure and thematic roles and their realization; Paninian grammar and Karaka relations.

**Reference Books:**
Blackwell.
Press. Chapters 1,2,5,6 and 8.


5. **Teaching-Learning Strategies in brief (4 to 5 sentences):**

The teaching process is a mix of theory and activity based. The focus is on using the concepts taught in class to extend to mother tongue. Translation method to compare the languages they know will be done individually, as pairwork and in groups.

6. **Assessment methods and weightages in brief (4 to 5 sentences):**

<table>
<thead>
<tr>
<th>Type of Evaluation</th>
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**Title of the Course**: Introduction to NLP  
**Faculty Name**: Manish Shrivastava  
**Name of the Program**: B.Tech. in Computer Science and Engineering  
**Course Code**: CS7.401  
**Credits**: 4  
**L - T - P**: 3-1-0  
(L - Lecture hours, T - Tutorial hours, P - Practical hours)  
**Semester, Year**: Spring, 2022 (Ex: Spring, 2022)  
**Pre-Requisites**: None  
**Course Outcomes**
After completion of this course successfully, the students will be able to –

I. Demonstrate the knowledge of stages and fundamental building blocks of NLP
II. Apply NLP machine learning algorithms for classification, representation, and parsing
III. Demonstrate the knowledge of Dense vector representation for NLP
IV. Explain the concepts behind distributed semantics
V. Discuss the approaches to global and contextual semantic representation
VI. Apply the above concepts for fundamental NLP tasks.

Course Topics:

Unit 1: Stages of NLP: from lexical to semantic. Fundamental Language processing: Tokenization, Language modeling, Text classification,

Unit 2: Morphology, POS Tagging, Chunking, Discriminative vs generative modes, HMM and CRF

Unit 3: Syntax parsing: Constituency and Dependency, PCFG, projectivity Arc-eager

Unit 4: Distributed semantics: SVD, Word2Vec, RNN, LSTM,

Unit 5: Contextual Distributed semantics: ElMO, BERT

Preferred Text Books: Christopher D. Manning and Hinrich Schütze. 1999. Foundations of Statistical Natural Language Processing. MITPress.

Reference Books:

E-book Links:

Grading Plan:

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Mapping of Course Outcomes to Program Objectives: (1 – Lowest, 2—Medium, 3 – Highest, or a ‘-’ dash mark if not at all relevant). Program outcomes are posted at

https://iiitaphyd-my.sharepoint.com/:w:/r/personal/dyacad_iiit_ac_in/Documents/NBA-2020-21/Course%20Content/IIIT-CSE-ECE.docx?d=w11f0effcaea41b3a4d1e8a3fbc6332d&csf=1&web=1&e=z1Khby

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Teaching-Learning Strategies in brief (4-5 sentences) :
Lectures by integrating ICT into classroom teaching, weekly tutorials involving problem solving and active learning by students and Project-based Learning by doing four assignments and a project. Evaluation based on personal viva to judge deeper understanding.

==============
Note: This course description format comes into effect from Spring 2022.

Intro to Human Sciences

Name of the Academic Programs : B.Tech. in CSE, B.Tech in ECE
Title of the Course : Introduction to Human Sciences
Course code : HS8.102
L-T-P : 3-1-0
Credits : 4

1. Prerequisite Course / Knowledge: Nil

2. Course Outcomes (COs)

After completion of this course successfully students will be able to:

CO1: Discuss the origin and development of key disciplines in the human sciences
CO2: Identify some of the fundamental questions that shape and drive inquiry in human sciences
CO3: Demonstrate knowledge of concepts related to theorizing about reflection, society, and culture
CO4: Analyze crucial normative elements and descriptive frameworks in human sciences inquiry
CO5: Develop skills to formulate nuances involved in problems concerning humans and societies
CO6: Write clear and well thought out short essays on topics in humanities and social sciences

3. Mapping of Course Outcomes (COs) with Program Outcomes (POs) and Program Specific Outcomes (PSOs) – Course Articulation Matrix
4. Syllabus:

The course will be divided into four modules, each of which will introduce students to a particular discipline in the human sciences. The various disciplines that constitute human sciences are:

1. Philosophy
2. Psychology
3. Literature
4. History
5. Sociology
6. Anthropology

Each module will offer a systematic worldview, tools of enquiry to study and analytical frameworks to make sense of topics taken up for discussion. Detailed list of topics under a module will be provided by the faculty teaching that module when the lectures begin. The overarching theme for the topics are the fundamentals of human sciences so that students grasp what humans sciences are all about.

Reference books:
Readings for each of the modules will be given with the commencement of the lectures. There is no single textbook as such for all four modules.

5. Teaching-Learning Strategies in brief:

Each module will have one faculty giving six lectures of 90 mins each. Through discipline specific modes of understanding and everyday examples, class lectures will enable students to connect and ponder about themselves, the society and cultures that surrounds them. The teaching-learning strategy emphasises the merits of avoiding simplistic solutions to complex problems and instead ask meaningful questions that enrich debates about how we produce, distribute, consume, reflect, represent, and govern ourselves. Lectures impress upon students the need to critically reflect on issues that are impacted by technology, the historical and social context of the world they live in, the literary and philosophical ideas that permeate human thought and psychological principles of human behaviour.
6. Assessment methods and weightages in brief:

This is mainly a writing-driven course, and the evaluation questions are carefully designed to make students think independently. Students are assessed for abilities like critically assessing issues, questioning assumptions, clarifying distinctions, and bringing out nuances. In assignments and exams, students are expected to demonstrate these abilities by presenting their views clearly and systematically. Students will be evaluated for each of the four modules and the pattern of evaluation will be decided by the respective faculty.

Evaluation pattern can include weekly assignments, quizzes and term papers. Each module will carry 25% of total marks. The End Semester exam carries 25% of marks.

******************************************************************************

Value Education-2

Name of the Academic Program : B. Tech. in ECE, BTech in CSE
Course Code : OC3.101
Title of the Course : VALUE EDUCATION - 2
L-T-P : 12-6-0 (Total hours)
Credits : 2
(L= Lecture hours, T=Tutorial hours, P=Practical hours)

1. Prerequisite Course / Knowledge: -NIL-

2. Course Outcomes (COs):

After completion of this course successfully, the students will be able to:
CO-1: Apply the basic framework of universal human values to understand oneself
CO-2: Explain the relation of self with family, society and nature
CO-3: Explain the concept of living in harmony at all the levels
CO-4: Demonstrate the right understanding of relationships and Right utilization of physical facilities
CO-5: Realise the long-term goal of being happy and prosperous

3. Mapping of Course Outcomes (COs) with Program Outcomes (POs) and Program Specific Outcomes (PSOs) – Course Articulation Matrix

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4. Detailed Syllabus:

Unit 1: Revisiting goal in life - short term and long term goals; Basic aspirations - Happiness and Prosperity; Role of education and human conduct; Self-exploration; Developing a holistic view

Unit 2: Self-reflection and reflecting on relationships; understanding value-based life

Unit 3: Living in harmony at 4 levels: self-self, self-family, self-society, self-nature

Unit 4: Harmony in Society; Broadening one’s perceptions;

Unit 5: Nature and Sustainability; Our role in protecting Nature;

Reference Books:


5. Teaching-Learning Strategies in brief (4 to 5 sentences):

This is a discussed based course. The instructor shares information on a topic and guides the discussion in the class by asking the right questions. By keeping the objectives in mind, the instructor adopts different techniques including smaller group discussions, role-play/skit, use of video clips/films or images to analyse and some activities to keep the students engaged in class throughout. Talks by experts who made a difference are also organised for the batch.

6. Assessment methods and weightages in brief (4 to 5 sentences):

| CO1 | - | - | - | - | - | 3 | 2 | 3 | 2 | - | - | - | - | - | - |
| CO2 | - | - | - | - | - | 3 | 3 | 3 | 3 | - | - | - | - | - | - |
| CO3 | - | - | - | - | - | 3 | 3 | 3 | 2 | - | - | - | - | - | - |
| CO4 | - | - | - | - | - | 2 | 3 | 3 | 3 | - | - | - | - | - | - |
| CO5 | - | - | - | - | - | 3 | 3 | 3 | 2 | - | - | - | - | - | - |

Note: ‘3’ in the box for ‘High-level’ mapping, 2 for ‘Medium-level’ mapping, 1 for ‘Low’-level’ mapping
This is a Pass/Fail course. The assessment methods include submissions of assignments and term papers. Critical thinking is expected from watching relevant short films or by reading assigned books. The classroom participation is also taken into consideration for evaluation. There are a few community-based activities and projects also. Participation in them is also important.

Weightage for each kind of assessment may be given

| Title of the Course | : Advanced Natural Language Processing |
| Faculty Name       | : Manish Shrivastava |
| Name of the Program | : BTech III year, Computational Linguistics Dual Degree III year |
| Course Code        | : CS7.501 |
| Credits            | : 4 |
| L - T - P           | : 3-1-0 |
| (L - Lecture hours, T-Tutorial hours, P - Practical hours) |
| Semester, Year     | : Monsoon, 2022 |
| (Ex: Spring, 2022) |
| Pre-Requisites     | : None |
| Course Outcomes    | |

After completion of this course successfully, the students will be able to –

I. Demonstrate the knowledge of Advanced building blocks of NLP
II. Apply NLP machine learning algorithms for Machine Translation, Summarization
III. Demonstrate the knowledge of Dense and contextual representation for NLP
IV. Explain the concepts behind Deep Learning models
V. Discuss the approaches to global and contextual semantic representation
VI. Apply the above concepts for fundamental NLP tasks.

Course Topics :

A. Distributed Semantics
   o Contextual Distributed Semantics
B. Models such as ELMO, BERT, ERNIE and their derivatives
C. Statistical Machine Translation methods
   o Early Neural Machine Translation models
D. Extractive and Abstractive Summarization
   o Neural Summarization Methods
E. Reinforcement learning for NLP

Preferred Text Books : None. Mostly research papers.

Reference Books:

Statistical Machine Translation by Philip Koehn
Deep Learning by Ian Goodfellow

E-book Links:
1. https://www.deeplearningbook.org/

Grading Plan:
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Mapping of Course Outcomes to Program Objectives:

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Teaching-Learning Strategies in brief (4-5 sentences):

Lectures by integrating ICT into classroom teaching, weekly tutorials involving problem solving and active learning by students and Project-based Learning by doing four assignments and a project. Evaluation based on personal viva to judge deeper understanding.

Note: This course description format comes into effect from Spring 2022.

Operating Systems and Networks

Name of the Academic Program: B.Tech. in CSE
Course Code: CS3.301
Title of the Course: Operating Systems and Networks
L-T-P: 3-1-1
Credits: 4
(L= Lecture hours, T=Tutorial hours, P=Practical hours)

1. Prerequisite Course / Knowledge:

Programming languages, Digital Logic Design, Computer Organization

2. Course Outcomes (COs)

After completion of this course successfully, the students will be able to,

CO-1. Extend the concepts of layering and modularity to build new software systems

CO-2. Develop appropriate scheduling/synchronization/memory management/virtual memory/protection module for a new task-specific operating system.

CO-3: Implement an application on the top of given operating system in an efficient manner based on process and thread framework available in the given operating system.

CO-4. Architect the given system on the top of operating systems by exploiting the system calls of the given operating system services as far as possible.

CO-5. Develop a network-based application by exploiting networking related system calls.

3. Mapping of Course Outcomes (COs) with Program Outcomes (POs) and Program Specific Outcomes (PSOs) – Course Articulation Matrix
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Note ‘3’ in the box for ‘High-level’ mapping, 2 for ‘Medium-level’ mapping, 1 for ‘Low-level’ mapping

4. Detailed Syllabus:

Unit 1: Introduction, Process and thread management (9 hours);
Unit 2: CPU scheduling, Process Synchronization, Deadlocks (12 hours);
Unit 3: Memory management, Virtual memory (9 hours);
Unit 4: File systems, Protection and Security (6 hours);
Unit 5: Networking (9 hours);

- Five mini projects related to the above syllabus will be done by students in the laboratory

Reference Books:
1. Silberschatz, A, Galvin, P, Gagne, G. Operating system concepts, Addison-Wesley, 2018

5. Teaching-Learning Strategies in brief

Lectures by integrating ICT into classroom teaching, weekly tutorials involving problem solving and active learning by students and Project-based Learning by doing 5 mini-projects in laboratory by the students

6. Assessment methods and weightages in brief

Two Class Room tests: 10 marks; Mid Semester Examination in theory: 20 marks, End Semester Examination in Theory: 40 marks, Assessment of 5 mini projects in Laboratory: 30 marks

Science-1

Name of the Academic Program: B. Tech. (CSE)
Course Code:
Title of the Course : Science I
L-T-P : 3-1-0
(L= Lecture hours, T=Tutorial hours, P=Practical hours)
Credits : 4

1. Prerequisite Course / Knowledge: NA
2. Course Outcomes (COs) (5 to 8 for a 3 or 4 credit course): Outcomes of the Second Half (Introduction to Biology):
After completion of this course successfully, the students will be able to

CO-1: Analyse the aims, methodology of science and technology, and their impact on society
CO-2: Explain Special Theory of Relativity and compute its consequences for typical scenarios of relevance
CO-3: Demonstrate familiarity with Lagrangian and Hamiltonian formulations of mechanics, by formulating the equations of motion from basic principles for mechanical systems
CO-4: Explain connections between thermodynamics and statistical mechanics and their use in modern chemical computations
CO-5: Infer the stability of molecules using the concepts of hybridization and molecular orbital theory
CO-6: Recognize the role of symmetry in nature
CO-7: Demonstrate problem solving skills upto a level that allows application to research topic of their interest
3. Mapping of Course Outcomes (COs) with Program Outcomes (POs) and Program Specific Outcomes (PSOs) – Course Articulation Matrix

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Note: Each Course Outcome (CO) may be mapped with one or more Program Outcomes (POs) and PSOs. Write ‘3’ in the box for ‘High-level’ mapping, 2 for ‘Medium-level’ mapping, 1 for ‘Low-level’ mapping.

4. Detailed Syllabus:

**Unit 1:** Mathematical modeling in sciences, (i) geometry and linear algebra, (ii) change and calculus and (iii) chance and probability. Simple models can have complicated behavior: logistic map demonstrates deterministic chaos

**Unit 2:** Forms in nature. Scales of length, time and energy in nature.

**Unit 2:** Special theory of relativity: postulates, Lorentz Transformation, Length Contraction, Time dilation, Doppler effect, relative velocity determination, twin paradox, relativistic momentum and energy. Space time graphs, and relativity of simultaneity.

**Unit 3:** Review of Newtonian Mechanics and its difficulties / failures. Introduction to Lagranian and Hamiltonian formulations, and application to mechanical problems.
Unit 5: Need for Quantum Mechanics. Schrodinger equation for time-dependent and time-independent scenarios. Application to atoms and molecules; provide qualitative picture of orbital hybridization to explain the molecular structures.


Reference Books:
2. “Classical dynamics of particles and systems” by Stephan Thornton and Jerry Marion (5th edition)

5. Teaching-Learning Strategies in brief (4 to 5 sentences):
The objective of the course is to give the CSE/ECE students a good understanding of the concepts in Modern Physics and modern chemistry. To familiarize the students with available web-based resources, and problem solving (whenever possible with scientific programming).

6. Assessment methods and weightages in brief (4 to 5 sentences):
Assignments – (20%),
Class notes (10%)
Preannounced and surprise In-class quizzes (25%),
End semester exam (35%)

Science-2

NAME OF FACULTY: Marimuthu Krishnan + Nita Parekh
Name of the Academic Program: B. Tech. (CSE)
Course Code: SC1.111
Title of the Course: Science II
L-T-P: 3-1-0
(L= Lecture hours, T=Tutorial hours, P=Practical hours)
Credits: 4

1. Prerequisite Course / Knowledge: NA

2. Course Outcomes (COs) (5 to 8 for a 3 or 4 credit course):
The course is divided into two halves:
First Half: Computing in Sciences
Second Half: Introduction to Biology
Outcomes of the First Half (Computing in Sciences):

After completion of the first half of this course successfully, the students will be able to

CO-1: Outline the uses of Monte Carlo to evaluate multidimensional integrals that appear in theoretical natural sciences

CO-2: Describe numerical algorithms and pseudocodes to solve ordinary and partial differential equations that appear in theoretical natural sciences

CO-3: Apply computational methods to find numerical solutions to scientific problems

Outcomes of the Second Half (Introduction to Biology):

After completion of this course successfully, the students will be able to

CO-1: Familiarize themselves with basic terms and terminology in biology, various biological entities and their function, DNA, RNA, proteins, and enzymes, cell and its functionality,

CO-2: appreciate that biology is very quantitative and how sequence analysis using algorithms can help in understanding the evolution, function of genes and proteins

CO-3: carry out a mini-project to learn how to go from sequence to structure, function and disease association

3. Mapping of Course Outcomes (COs) with Program Outcomes (POs) and Program Specific Outcomes (PSOs) – Course Articulation Matrix

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4. Detailed Syllabus:

**Syllabus of the First Half (Computing in Sciences):**

**Unit 1:** Monte Carlo method: Its application in solving large dimensional integrals seen in statistical mechanics and quantum mechanics

Unit 2: Solving linear systems: Huckel molecular orbital approximation for band structure in metallic bonding

Unit 3: Algebra of matrices: Singular-Value Decomposition (SVD), Hessian matrix in normal mode analysis, and spectral decomposition

Unit 4: Differential equations in sciences: Prey predator model, dynamics from Newton Laws, molecular dynamics simulation

Unit 5: Stochastic differential equations: Diffusion, bistability of cellular processes

Unit 6: Partial Differential equations in sciences: Heat equation and wave equation

**Syllabus of the Second Half (Introduction to Biology):**

**Unit 1:** Introduction: Classification of Living Organisms, Origin of Life and Evolution, Biomolecules – Nucleotides, Amino Acids, Proteins, Enzymes

Unit 2: Cell Biology: Structure and Function - Prokaryotic and Eukaryotic Cells, Cell Cycle – Cell division – Mitosis, Meiosis, DNA Replication, Transition, Translation – Central dogma, DNA amplification, sequencing, cloning, restriction enzymes

Unit 3: Genetics: Mendelian Genetics – Genetic Disorders, Mendelian Inheritance Principles, Non-Mendelian Inheritance, Clinical Perspective

Unit 4: Macromolecules: DNA, Proteins – Structure, Function, Analysis, Carbohydrates – Features, Structure, Metabolism, Kreb cycle
Unit 5: Biological data analysis: Biological Data – sequence, structure, expression, etc., Sequence Data Analysis – alignment, database search, phylogeny, Applications

Reference Books:
2. Lehninger Principles of Biochemistry by David L. Nelson and Michael M. Cox
3. Reading the Story in DNA: A Beginners Guide to Molecular Evolution by Lindell Bromham
4. An Introduction to Computational Physics by Tao Pang
5. Molecular Modelling – Principles and Applications by A. R. Leach

5. Teaching-Learning Strategies in brief (4 to 5 sentences):

The objective of the course is to give the CSE students a flavour of biological sciences and scientific computing. To familiarize the students with available web-based resources (databases and tools) for biological sequence analysis and extract meaningful information. Whenever possible, after a theory lecture to follow up with analysis of real sequence data. Give the student small programming tasks in biological data analysis to be able to appreciate the role of computing in biological data analysis. Applications of computational and mathematical models in natural sciences are also discussed.

6. Assessment methods and weightages in brief (4 to 5 sentences):

Assignments – (10%), Class Quizzes + Mid-term evaluation (20%), Final exam (20%)

Basics of Ethics

Name of the Academic Programs : B.Tech. in CSE, B.Tech in ECE
Title of the Course : Basics of Ethics
Course code : HS0.203
L-T-P : 3-1-0
Credits : 2

1. Prerequisite Course / Knowledge: Nil

2. Course Outcomes (COs)

After completion of this course successfully students will be able to:

CO1: Explain the philosophical nature of the basic concepts and principles of ethics
CO2: Analyze ethical arguments for logical validity, soundness, and informal fallacies
CO3: Demonstrate the knowledge of conceptual challenges involved in normative inquiry in the ethical domain
CO4: Develop skills to formulate fundamental nuances in ethical justification and explanations
CO5. Identify the various kinds of normative elements that constitute ethical frameworks
CO6. Discuss the major tenets of normative ethical theories and their scope of application

3. Mapping of Course Outcomes (COs) with Program Outcomes (POs) and Program Specific Outcomes (PSOs) – Course Articulation Matrix

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‘3’ in the box denotes ‘High-level’ mapping, 2 for ‘Medium-level’ mapping, 1 for ‘Low’-level’ mapping

4. Detailed Syllabus:

Unit I – Introduction (3 hours): Distinction between conventional and critical ethics, philosophical tools for argument analysis, intuition, evidence, justification, and explanation.

Unit II – Skepticism (4.5 hours): Intrinsic vs Instrumental value, challenge of egoism, problem of cultural relativity and subjectivism, error theory and nihilism, distinction between being ethical and seeming ethical.

Unit III – Goodness (3.5 hours): the problem of defining ‘good’, naturalistic fallacy and the open question argument, implications of the experience machine thought experiment.

Unit IV – Responsibility (3.5 hours): challenge of attributing moral responsibility to agents, the control, competence and epistemic conditions of responsibility, moral luck.

Unit V – Normative theories (5 hours): Consequentialism, deontology, and virtue ethics

Reference books:
5. Teaching-Learning Strategies in brief:

The general teaching strategy employed is the use of moral dilemmas and conceptual puzzles to introduce course topics. Lectures make use of this strategy to impress upon students the need to critically reflect on ethical issues and the relevance of doing a careful, philosophical investigation of those issues. Student interaction at this stage is aimed at bringing out conflicting ethical intuitions. This is followed up by introducing proper vocabulary to map out the problems involved in normative moral assessment. Using case studies and toy examples, ethical principles and methods of inquiry are taught so that students develop effective reasoning skills to engage with any real-world ethical matter. Student interaction and discussion at this stage is aimed to give flesh to the intuitions identified in the previous stage. The teaching-learning strategy emphasises the merits of avoiding simplistic solutions to complex ethical problems and instead ask meaningful questions that enrich moral debates.

6. Assessment methods and weightages in brief:

This is mainly a writing-driven course, and the exercise questions are carefully designed to make students think independently in ethical contexts. Students are assessed for abilities like logically dissecting issues, questioning assumptions, clarifying distinctions, and bringing out nuances. In assignments and exams, students are expected to demonstrate these abilities by presenting their views clearly, assessing competing positions systematically, anticipating possible objections to a reasoned conclusion and composing cogent responses to those objections. The assessment components and their weightages are as follows. Assignments: 60 marks, class participation: 10 marks, Mid semester exam: 10 marks, End semester exam: 20 marks.

Course descriptions of Elective Courses

Course Title-Introduction to a Social Science Perspective on Human-Computer Interaction

Name of faculty: Nimmi Rangaswamy

Name of the Academic Program: B. Tech. in CSE

Course Code : CS9.425

L-T-P: 4-0-0

Credits: 4

(L= Lecture hours, T=Tutorial hours,
P=Practical hours)

Prerequisite Course / Knowledge: UG3 and above – no other prerequisite knowledge

2. Course Outcomes (COs)- After completion of this course successfully, the students will be able to do the following”

CO-1. Develop understanding of the fundamentals of Human Computer Interaction [HCI] and Human sciences

CO-2. Understand and apply main theoretical foundations of HCI from a human centric perspective

CO-3: Grasping concepts and application of Design in HCI systems

CO-4. Deep analysis of case studies of HCI systems

CO-5. Develop a research project around a HCI platform, system or theory

3. Mapping of Course Outcomes (COs) with Program Outcomes (POs) and Program Specific Outcomes (PSOs) – Course Articulation Matrix

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‘3’ in the box denotes ‘High-level’ mapping, 2 for ‘Medium-level’ mapping, 1 for ‘Low’-level’ mapping

Course Structure in Detail
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] Radically different ways of interacting with computationally based systems are possible, ranging from the visual [surfaces, input devices] to the invisible [sensor technologies, backend 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].

Broad Objectives:

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

Introducing seminal topics and key concepts: 10 Hours

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.

Role of Objects in the Social sciences: 4 Hours
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.

**Idea and application of Design in HCI: 6 Hours**

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.

**Context and Mediation in HCI systems- 6 Hours**

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:

**Case Studies- 14 Hours**

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 the readings. Students will be evaluated with a quizzes, research project design, research report, and 2 class presentations. The students will also be evaluated on the ability in engaging with and comprehending the course readings in classroom discussions. The quiz/test and the research projects will be based on the class lectures and readings assigned for the course.

**PREFERRED TEXTBOOKS:**

**REFERENCE BOOKS:**

Lucy Suchman Human-machine reconfigurations, Cambridge University Press


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

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

Rogers, Y. *HCI Theory: Classical, Modern, and Contemporary.* Morgan & Claypool


**REFERENCE ARTICLES:**


GRADING PLAN:

<table>
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<th>Type of Evaluation</th>
<th>Weightage (in %)</th>
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<tr>
<td>Quizzes/exam</td>
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<td>Individual Research Project</td>
<td>50%</td>
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<td>Class participation</td>
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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.

Course Title- ICTs for Development [ ICT4D]
Course Code: CS9.431
Faculty Name: Nimmi Rangaswamy
L-T-P: 4-0-0
Credits: 4

(L= Lecture hours, T= Tutorial hours, P= Practical hours)

Prerequisite Course / Knowledge: UG3 and above – no other prerequisite knowledge

2. Course Outcomes (COs)- After completion of this course successfully, the students will be able to dop the following:

CO-1. Develop a holistic definition and the role of information and communication technology [ ICTS] in socio-economic development

CO-2. Learn critical theoretical theories of development and ICTD from a global perspective

CO-3: Grasping context aware concepts and application of ICTD in India

CO-4. Deep analysis of ICTD case studies in India and the global South

CO-5. Develop a research project applying foundational learnings from the course

3. Mapping of Course Outcomes (COs) with Program Outcomes (POs) and Program Specific Outcomes (PSOs) – Course Articulation Matrix
Course Structure in Detail

Overview of Course

OBJECTIVES

To introduce the idea of channeling the potential of Information and Communication Technology [ICTs] for socio-economic development to students of Engineering and Computational Humanities

To debate the notion of development as a sociological concept, with a particular focus on India, and discuss impacts of the development process on society as a multi-faceted phenomenon

To focus upon and formulate the idea of social media, as a component of ICTs, and the role they play in shaping the contours of social and everyday life

COURSE TOPICS/CONTENT/OUTLINE

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‘3’ in the box denotes ‘High-level’ mapping, 2 for ‘Medium-level’ mapping, 1 for ‘Low’-level’ mapping
Information and Communications Technology for Development is a growing area of research and community of scholars studying the role of technology in international development. Students in this course will study contemporary debates, issues and field projects that engage with information and communication technologies [ICTs] in the service of socio-economic progress and human development. This means a range of things: it could refer to the scope of technology in alleviating poverty, in impacting low-resource settings, in designing and engineering relevant technologies to close digital literacy gaps in specific populations.

Topics that will be covered as part of the course are the following. These are broad umbrella categories which contain sub-topics

Introduction to the idea of Development:

Studying development is essentially a multidisciplinary exercise rooted in a range of technical and social-science research. By combining a variety of subject areas, the course will engage deeply with some of the complex problems associated with developing economies especially unstable infrastructures, scarce resources, and social disadvantages. We will discuss A Sen, K Galbraith among others

Globalization and Development

The course will specifically look at globalization as a socio-economic disruptor having far-fetched implications for not only wealth generation for a country but also bringing cultural transformations. We will disuses several historical trajectories of globalization in specific country contexts. We will include works of J Sachs, W Easterly

Technology and Development

The course will introduce a variety of social environments across resource and economic constraints that are targets for socio-economic development either through a top down model of deploying ICTs or through a more market driven and organic social processes. These can range from building low-cost technologies to studying user-driven innovations of ICTs to fit contexts of use. We will cover certain domain areas, using relevant theoretical models and practical outcomes, within ICTs and Development, like, education, healthcare, livelihoods, entertainment, and governance. Students will develop a critical lens to evaluate the processes and impacts and gain a well-rounded and practical perspective on issues of assessment and successes of development projects

Introducing Information and communication technologies as harbingers of social change

Under this topic we will debate and discuss the nature and contours of new channels of information, social networking the rise of social media and online content generation. Questions posed by these digital artifacts evaluate the inherently democratizing, process of owning, using, and networking with new media technologies. With the help of case studies, with a focus on India, we will articulate the implications of new and digital media in everyday life. We will focus on the sociology of new media technologies, with a specific aim to anchor them within select theoretical debates and in specific geographic contexts.

Social Media as a Developmental tool
Research had pointed to the rich field of utilization of new media tools for leisure and social networking as well as the unique affordances they spawn in the arena of self-expression and acquiring socio-digital identities. For example, the pre-pay mobile internet made web surfing an affordable and engaging activity even in the down markets and resource poor social ecologies of urban India. The course will critically evaluate the impacts of media technologies in the development discourse of a nation. The topic will include case-studies from the global North and South centering on social segments in resource-poor and emerging market settings

This class has no pre-requisite requirements and open to students from any background.

Students will be continuously evaluated with periodic quizzes/short tests and a course end assignment that will gauge student ability in engaging with and comprehending the course readings and classroom discussions.

**PREFERRED TEXT BOOKS:**


**REFERENCE BOOKS:**


GRADING PLAN:

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<td>Project Oral Presentation</td>
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<td>Class Participation &amp; Attendance</td>
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OUTCOME:

Students will be able to identify and apply a developmental lens in a variety of and diverse socio-economic contexts. The course will provide a strong grounding in developing a sociological perspective of digital media and their impact in the evolution of a digital society as a part of parcel of socio-economic development. One of the critical question the course will attempt to unpack is how technology seeks to address the needs and aspirations of people who increasingly consuming technologies and services despite are living in low resourced eco systems.

Title of the Course: Music, Mind, and Technology

Faculty: Vinoo Alluri

Course Code: CS9.434

L-T-P: 3-1-0 Credits: 4

Name of the Academic Program: Open Elective

( L= Lecture hours, T=Tutorial hours,
P=Practical hours)

1. Prerequisite Course / Knowledge: None 2. Course Outcomes (COs):
After completion of this course successfully, the students will be able to

CO-1 appreciate the fundamental concepts of the field of Music Cognition and Technology CO-2 understand the role of the individual in musical experiences in relation to music experience including music consumption, music industry, mental well-being, and critically think about the relationship between diverse fields that comprise music cognition such as psychology, music information retrieval, and neuroscience.

CO-3 understand the relation between physical aspects of sound and perceptual processes including sensation and perception

CO-4 understand sound synthesis and analysis in addition to application of machine learning to various music information retrieval tasks (eg: music genre classification, mood detection, recommendation)

CO-5 understand music processing in the brain, and effect of individual differences thereof (eg: musical expertise, empathy, gender). Analyze brain responses to music which includes an interdisciplinary approach combining sound- and brain-signal processing, statistical methods, and perceptual experimentation to analyze experimental data from human neurological experiments

CO-6 combine knowledge gained from CO-1-4 to formulate own research idea and go about solving it.

3. Mapping of Course Outcomes (COs) with Program Outcomes (POs) and Program Specific Outcomes (PSOs) – Course Articulation Matrix

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Note: Each Course Outcome (CO) may be mapped with one or more Program Outcomes (POs) and PSOs. Write ‘3’ in the box for ‘High-level’ mapping, 2 for ‘Medium-level’ mapping, 1 for ‘Low’-level’ mapping.

### 4. Detailed Syllabus:

Unit 1: Introduction to Music cognition, Evolutionary and Biological significance of music, Embodied music cognition, evolution of the field of psychology of music

Unit 2: Music experience and Individual differences, Music Emotion

Unit 3: Auditory Processing, Sensation, Perception, Auditory stream segregation

Unit 4: Sound synthesis and analysis

Unit 5: Music information retrieval

Unit 6: Neuromusicology

Reference Material:

Lecture slides and supplementary reading materials (journal articles, review articles) will be uploaded on the course page on Moodle.

5. Teaching-Learning Strategies in brief:

Students will be introduced to the broad field of music cognition. The objective of the course is to give an appreciation of the main concepts of the field of Music Cognition and Technology. Students will learn about topics in music psychology (from perception to cognition), familiarize yourselves with music signal analysis and music information retrieval (MIR), ending with the interdisciplinary field of cognitive neurosciences of music (with a focus on functional magnetic resonance imaging (fMRI) studies). Apart from this, the course provides an overview of main
areas of contemporary research of music perception and cognition such as musical preferences and personality, music and movement, music and emotion, music and mental well-being, and music processing in the brain.

By attending lectures, in addition to a few guest lectures by leading music researchers from around the world, students will be exposed to this interdisciplinary field and open questions. Students learn by working in groups to solve existing open problems in addition to creating their own research problem and addressing it to the best of their abilities.

Lectures are highly interactive as the course requires a student to actively participate and think and be creative. Students learn by doing assignments designed to achieve course outcomes and collaboratively working on a final project. The final project wherein students learn by working in teams, especially to devise a research question, identify hypotheses, operationalize it, deploy it, collect (if necessary) and analyze data and present the results thereby promoting collaboration, which is very much needed in interdisciplinary research.

6. Assessment methods and weightages in brief:

Quiz 1 = 10%
Quiz 2 = 10%
Assignments = 30% Final Project = 40%
Class participation = 10%

Title of the Course: Introduction to Philosophy of Technology
Faculty Name: Ashwin Jayanti
Name of the Academic Programs: B.Tech. in CSE, B.Tech in ECE

Course Code: HS0.204
L-T-P: 3-0-0 (pl. verify 3-1-0?)
CREDITS 4

(L = Lecture hours, T = Tutorial hours, P = Practical hours)

1. Prerequisite Course /Knowledge:
None

2. Course Outcomes (COs):
After completion of this course successfully, the students will be able to:
CO-1: Identify and recognize various conceptions of technology implicit in arguments for/against technology

CO-2: Classify and describe various theories and interpretations of technological change through history

CO-3: Compare analytical and continental approaches to technology and its relation to science and examine the limitations and advantages of both the approaches

CO-4: Assess the moral significance of technical artefacts within particular social contexts

CO-5: Develop philosophical frameworks in order to understand and assess the impact of contemporary technologies to society at large

3. Mapping of Course Outcomes (COs) with Program Outcomes (POs) and Program Specific Outcomes (PSOs) – Course Articulation Matrix

| CO  | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PS  | P  | S  | S  |
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| 5   | 1   | 1   | 3   | 3   | -   | 3   | 3   | 3   | 1   | 2   | -   | 3   | --- | -   |

3 in the table denotes high level mapping, 2 denotes moderate level and 1 denotes low level
3. Detailed Syllabus:

Unit I – Introduction: What is Philosophy of Technology? Engineering and Humanities Philosophies of Technology; Classical and Contemporary Philosophy of Technology

Unit II: Encountering Technological Artefacts – Conceptual history of ‘technology’; What is ‘technology’? Continental and Analytic Perspectives

Unit III: Epistemological Aspects to Technologies – Science, Technology, and Engineering; Philosophy of science and philosophy of technology; Knowing-how and knowing-that

Unit IV: Moral Status of Technologies – Norms, Values, and Technologies; Debates Concerning Moral Significance of Artefacts; Role of Design in Moral Status

Unit V: Philosophical Debates in Artificial Intelligence – Philosophical background to Artificial Intelligence; Philosophical and ethical issues within Artificial Intelligence

REFERENCE BOOKS:


5. Teaching-Learning Strategies in Brief

This course aims at reading, critically evaluating, and thinking through contemporary debates in philosophy of technology. For this purposes, the main strategy is to share the readings and resource material beforehand for the students to acquaint themselves with the topics and use the class time to discuss and evaluate the implications of the various positions respective to each topic.
Continuous assessment methods will be employed to make sure the students have acquired the requisite conceptual understanding to explicate and argue for their position with greater nuance and logical rigor.

6. Assessment Methods and Weightages in Brief

Continuous assessment in the form of written assignments will carry the major weightage of the evaluation, with the rest of the weightage assigned to class participation in the ensuing discussions.

The assigned weightage is as follows: Assignments: 40 marks, class participation: 10 marks, Mid semester exam: 20 marks, End semester exam: 30 marks.

Comment: Mid semester exam weightage and end semester exam weightage must be reasonable and higher than the weightage for assignments. Hence modification is suggested.

Title of the Course: Minds, Machines, and Intelligence
Name of the faculty: Don Dcruz
Course type: Humanities elective for UG3/UG4
Name of the Academic Programs: B.Tech CSE/ECE, CSD, ECD, CND, CLD, CHD
Course code: HS0.205
L-T-P: 3-1-0
Credits: 4

1. Prerequisite Course / Knowledge: Nil

2. Course Outcomes (COs)

After completion of this course successfully students will be able to:

CO1: Explain the philosophical nature of notions related to intelligence, cognition, and rationality

CO2: Demonstrate knowledge of conceptual challenges involved in evaluating artificial intelligence

CO3: Analyze philosophical arguments about the nature of thinking and modes of understanding

CO4: Develop skills to formulate fundamental nuances about inductive knowledge and justification

CO5: Identify epistemological differences between prediction and explanation by examining models
CO6: Discuss the major tenets of ethical reasoning, moral agency and responsibility

3. Mapping of Course Outcomes (COs) with Program Outcomes (POs) and Program Specific Outcomes (PSOs) – Course Articulation Matrix

‘3’ in the box denotes ‘High-level’ mapping, 2 for ‘Medium-level’ mapping, 1 for ‘Low’-level’ mapping

4. Detailed Syllabus:

Unit I – Philosophical preliminaries (6 hours): Conceptual distinctions, argument analysis, intuition, thought experiment, evidence, belief, knowledge, justification, confirmation, and inference to best explanation.

Unit II – Thinking (9 hours): Turing’s ‘Computing Machinery and Intelligence’, Searle’s ‘Minds, Brains and Programs’, and contemporary debates on the nature of cognition.

Unit III – Knowing (7.5 hours): Hume’s problem of induction, contemporary version of the rationalist vs empiricist debate in the context of deep learning, adversarial examples, and knowledge.

Unit IV – Explanation (7.5 hours): epistemic opacity of deep learning models, XAI and interpretability, explanation vs prediction, and counterfactual explanations.

Unit V – Morality (6 hours): The nature of machine ethics, value alignment and embedding, artificial moral agents, and conditions for responsibility.

Reference books:


5. Teaching-Learning Strategies in brief:

The general teaching strategy employed is the use of conceptual puzzles to introduce course topics. Lectures make use of this strategy to impress upon students the need to critically reflect on
problems and the relevance of doing a careful, philosophical investigation of those issues. Student interaction at this stage is aimed at bringing out conflicting intuitions. This is followed up by introducing proper vocabulary to map out detailed problems involved in philosophical ideas. Using case studies and toy examples, epistemic principles and methods of inquiry are taught so that students develop effective reasoning skills to engage with issues related to cognition and AI.

Student interaction and discussion at this stage is aimed to give flesh to the intuitions identified in the previous stage. The teaching-learning strategy emphasises the merits of avoiding simplistic solutions to complex problems and instead ask meaningful questions that enrich foundational debates about intelligence and rationality.

6. Assessment methods and weightages in brief:

This is mainly a writing-driven course, and the exercise questions are carefully designed to make students think independently and critically. Students are assessed for abilities like logically dissecting issues, questioning assumptions, clarifying distinctions, and bringing out nuances. In assignments and exams, students are expected to demonstrate these abilities by presenting their views clearly, assessing competing positions systematically, anticipating possible objections to a reasoned conclusion and composing cogent responses to those objections.

The assessment components and their weightages are as follows. Assignments: 60%, Term paper 30%, and class participation: 10% (it is difficult to quantify class participation).

Comment:

(Please revisit the assessment components such that the end semester exam has a weightage of a minimum of 30%. The suggested weightages are:

Assignments: 30%
Term Paper 20%
Mid semester exam: 20%
End semester Exam: 30%)

Title of the Course: Readings in Indian Literatures
Faculty Name: Sushmita Banerji
Course Code: HS1.202
Name of the Academic Program: Open Elective for which academic programs?
Course Code: Pl. mention
L-T-P: 3-0-0
Credits: 4
(Pl. revisit credits to be in agreement with L-T-P)

1. Prerequisite Course / Knowledge:
None

2. Course Outcomes (COs):

After completion of this course successfully, the students will be able to
CO-1: Engage in the pleasure and challenge of the close reading of literary texts
CO-2: Look at modern Indian literatures in translation to see how individuals imagine their own, particular lives and create a sense of a shared past and a shared culture
CO-3: Explore, among other issues, how the self is constructed through reading and writing, the relationship between memory and identity,
CO-4: Interrogate claims of authenticity or truth
CO-5: Study the oscillation between interior and exterior life, and the peculiarities of individual voice.

3. Mapping of Course Outcomes (COs) with Program Outcomes (POs) and Program Specific Outcomes (PSOs) – Course Articulation Matrix

<table>
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<tr>
<th>P O 1</th>
<th>P O 2</th>
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</table>
4. Detailed Syllabus:

Unit 1: Individual and Society

Unit 2: Histories in the making

Unit 3: Troubled corners of our making

Reference Books:


Tiwari, Shubha. Ed. *Indian Fiction in English Translation*. New Delhi, Atlantic, 2005

Text Books:
5. Teaching-Learning Strategies:

Students are expected to read up to 8 books in the course of the semester, watch any video lectures made available, and view films when required. This class is based on close reading of the texts prescribed and relies heavily on student participation and discussion.

This class shall deal with material students might disagree with. All informed disagreements, opinions, and discussions are encouraged. It shall however be the instructor’s right to shut down any disrespectful behaviour.

6. Assessment methods and weightages:

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<tr>
<th>Type of Evaluation</th>
<th>Weightage (in %)</th>
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<tbody>
<tr>
<td>In-class Quiz x 2</td>
<td>10% x 2 = 20%</td>
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<tr>
<td>Term Paper 1</td>
<td>20%</td>
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<tr>
<td>Term Paper 2</td>
<td>20%</td>
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<tr>
<td>Term Paper 3</td>
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</table>
End semester exam | 20%

(comment: If possible instead of term paper 3, end semester exam may be given a weightage of 40%. End semester exam is comprehensive to assess the attainment of all the course outcomes)

Title of the Course: Literature, History, and Belonging in Hyderabad
Faculty Name: Nazia Akhtar
Course Code: HS1.203
Name of the Program: Humanities Elective

Course Code : -
Credits : 4
L - T - P : 36 hours (24 classes)
Semester, Year : Spring 2022
Pre-Requisites : Introduction to Human Sciences

Course Outcomes :

On successful completion of this course, students will be able to

1. discuss Hyderabad’s literary history and understand the role of literature in studying and knowing history;
2. explain the complexities of Hyderabad’s history and society and larger questions of identity and belonging;
3. apply important techniques of textual analysis and their experience in writing an argumentative essay in other academic and professional contexts; and
4. devise a thoughtful and informed critical voice that will enable them to meaningfully situate culture and cultural productions in the world around them.

Course Topics :

1. (i) Introduction: Historical and Socio-Political Context
   (ii) The People’s Poetry: Dakhni poetry and culture
2. Ghazal Poetry at the Asaf Jahi Court
3. Progressive Writing: Poetry and Novels
4. Women’s Writing: Prose and Poetry
5. Writing from the Margins: Contemporary Contexts
6. “Every City is a Story”: New Narratives of Globalization

Preferred Text Books: Chapters and excerpts from the following books will form the textbook for this course.

3. Ian Bedford – The Last Candles of the Night (2014; novel)
6. Mercy Margaret, Shahjahana – selected poetry
7. G. Shyamala – selections from Father May Be an Elephant and Mother Only a Small Basket But ... (2012; short stories)
8. Sarojini Naidu – The Bird of Time (1912; poems); Hoshang Merchant, “Secunderabad Sans Light.”

Reference Books:


E-book Links:

**Grading Plan**

<table>
<thead>
<tr>
<th>Type of Evaluation</th>
<th>Weightage (in %)</th>
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<tr>
<td>Short Assignments (500-600 words; 5 best out of 6 will count)</td>
<td>5 x 6% = 30%</td>
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<td>Assignment (1000-1200 words)</td>
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<td>Participation</td>
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<td>Project</td>
<td>(50%)</td>
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Mapping of Course Outcomes to Program Objectives:
Teaching-Learning Strategies in brief:

The teaching-learning strategy in this course will consist of lectures based on set readings, which students are expected to complete in advance of the class. These lectures will incorporate prompts for classroom discussion and activities based on the readings to enable active learning and critical thinking. This learning will be further consolidated through assessments that will be designed to test and develop the student’s knowledge and skills, especially interpretative reading and writing.

Course Name: Introduction to Literature

Name of the Program: Humanities Elective
Course Code: HS1.204
Credits: 4 credits
L - T - P: Pl.fill these: 36 hours (24 classes)
Semester, Year: Monsoon 2021
Pre-Requisites: Introduction to Human Sciences

Course Outcomes:

On successful completion of this course, students will be able to

1. critically interpret, analyze, and appreciate literature and, by extension, other kinds of texts and narratives too;
2. apply this basic foundation in the study of creative writing to conduct computational research on topics associated with it;
3. examine and discuss the literary merit of creative texts beyond casual impressions or value judgements, acquiring – in the process – fundamental skills in oral and written communication; and
4. connect human, creative expression to the issues that make up and are made by the world in which we live.
Course Topics:
1. Defining Literature and Its Place in the World;
2. The “Literariness” of Literature; Representation and Reality;
3. Major Genres of Literature;
4. Major Concepts, Methods, and Theories of Literature; and
5. Literature in the Digital Age

Preferred Text Books:

Ali, AghaShahid. “In Arabic” and other poems (various years; poetry)
Baldwin, Shauna Singh. What the Body Remembers (1999; novel)
Hyder, Qurratulain. “A Night on Pali Hills” (1995; play)
Margaret, Mercy. “Prega News” and other poems (various years; poetry)
Merchant, Hoshang. “Secunderabad Sans Light” and other poems (various years; poetry)
Nongkynrih, Kynpham Sing. Selections from Time’s Barter: Haiku and Senryu (2015; poetry)
Pritam, Amrita. “Today I Say UntoWaris Shah” and other poems (various years; poetry)
Tendulkar, Vijay. Silence! The Court is in Session (1967; play)

Reference Books:

Woolf, Virginia. “How Should One Read a Book” (1925)
Eagleton, Terry. How to Read Literature (2013)
Abrams, M.H. A Glossary of Literary Terms (1957)
Moretti, Franco. *Distant Reading* (2013)

**E-book Links**

**Grading Plan**

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<th>Type of Evaluation</th>
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<td>Short Writing Assignments</td>
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<td>Project <strong>(comprehensive evaluation)</strong></td>
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<tr>
<td>1. Literary Analysis</td>
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<td>2. Analysis of Secondary Sources</td>
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<td>3. Final Project Submission</td>
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**Mapping of Course Outcomes to Program Objectives:**

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You have to map CO4 also with POs and PSOs

Note: 3 in the table denotes high level mapping, 2 denotes moderate level and 1 low level

Teaching-Learning Strategies in brief:

The teaching-learning strategy in this course will consist of lectures based on set readings, which students are expected to complete in advance of the class. These lectures will incorporate prompts for classroom discussion and activities based on the readings to enable active learning and critical thinking. This learning will be further consolidated through assessments that will be designed to test and develop the student’s knowledge and skills, especially interpretative reading and writing.

Title of the Course: Understanding Raga-Semicalssical forms of Indian Music

Course Code: HS1.205

L-T-P…3-0-1

Credits:4

( L= Lecture hours, T=Tutorial hours, P=Practical hours)

1.Prerequisite Course / Knowledge:

…Faculty Consent

?Nil……………………………………………………………………………………………………………………………………………..

…………………………

2.Course Outcomes (COs) :

After completion of this course successfully, the students will be able to..

CO-1 Recognize some ragas with their basic characteristics

CO-2 Identify, sing or play different semi classical compositions like Bhajan, Ghazal, Annamayya composition, Qawwali, Abhangetc

CO-3 Explain the importance of raga in Indian music.

CO-4 Discuss the importance and role of the composers in bringing out variety in music and universal ideas and values.
Demonstrate the knowledge of different rhythmic structures that play a major role in the compositions. This gives the understanding of rhythm as a universal idea.

3. Mapping of Course Outcomes (COs) with Program Outcomes (POs) and Program Specific Outcomes (PSOs) – Course Articulation Matrix

(1 – Lowest, 2—Medium, 3 – Highest, or a ‘-’ dash mark if not at all relevant). Program outcomes are posted at

https://iiitaphyd-my.sharepoint.com/:w/r/personal/dyacad_iit_ac_in/Documents/NBA-2020-21/Course%20Content/IIIT-CSE-ECE.docx?d=w11f0effcaea41b3a4d1e8a3fbc6332d&csf=1&web=1&e=z1Khby

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Note: ‘3’ in the box for ‘High-level’ mapping, 2 for ‘Medium-level’ mapping, 1 for ‘Low’-level’ mapping

4. Detailed Syllabus:

Unit 1: Basic concepts of Indian Music like sruthi, swara, swarasthana, raga, laya, tala, sthayi, musical forms. Practice of different rhythmic patterns with exercises.
Unit 2: Conceptual study of raga by introducing around ten ragas in both North and South Indian music systems. (Raga pairs Carnatic- Hindustani like Kalyani-Yaman, Kapi, Pilu, Chakravakam- Ahirohbhairav, Sindhubhairavi- Bhairavi, ragas common to both the systems like Shivranjani, Desh)

Unit 3: Introduction and practice of Semi classical forms like Bhajan, Quawwali, Ghazal, Kirtana, Abhang.

Unit 4: Introduction to the composing style of different Vaggeyakaras (composers)

Unit 5: Importance of language, ideas, expressions in different compositions, introduction of musical instruments.

Reference Books:


2. A Southern Music (The karnatic story) by T.M. Krishna, Published by Harper Collins, January 2013


5. Videos and audios on the Youtube and other platforms.

5. Teaching-Learning Strategies in brief (4 to 5 sentences):

The students would be taught line by line all the compositions, the different semi classical forms. The basic structure of ragas would be taught to them by playing audios and videos of different genre songs in the specific ragas.

Students would be made to identify and practice different music patterns through various exercises and examples from songs of different genres of music.

The students would be made to sing repeatedly all the songs taught.

Attempt to bring one expert to deliver guest lecture on the practical aspects of musical instruments and their significance.

6. Assessment methods and weightages in brief (4 to 5 sentences):

…Assignments: 20%
Mid Semester exams: 20%

Quizzes: 20%

End Semester Project: 40%

Title of the Course: A linguistic introduction to Sanskrit

Faculty Name: Peter M. Scharf

Name of the Program:

HSS Course Code: HS1.207

Credits: 4

L - T - P: L2, P1

(L - Lecture hours, T - Tutorial hours, P - Practical hours)

Semester, Year: Spring, 2022

(Ex: Spring, 2022)

Pre-Requisites: None

Course Outcomes:

Read simple Sanskrit containing the common grammatical forms covered, with the help of a dictionary.

Understand the difference between script and phonetics. Understand sound change laws.

Understand morphological analysis and synthesis. Understand syntactic structures.

https://iiitaphyd-my.sharepoint.com/:b:/r/personal/dyacad_iiit_ac_in/Documents/NBA-2020-21/Reference%20Documents/Curriculum%20Design%20in%20NBA%20Framework%20and%20Course%20Design%20for%20All%20Faculty%20IIIT%20Hyderabad%202021.pdf?csf=1&web=1&e=387W1k

Course Topics:

The course surveys basic Sanskrit grammar in a linguistically explicit manner accompanied by traditional oral practice and exercises consisting of readings adapted from ancient Indian narratives.

Week Topic
Week 1  Ch. 1, Introduction to Sanskrit language and literature; Ch. 2, The Sounds of Sanskrit, and
Ch. 3, Devanagari script

Week 2  Ch. 4, Sandhi

Week 3  Ch. 5, Verbs: present and past indicative active and middle of verbs of classes 1, 4, 6, and 10

Week 4  Ch. 6, Nouns: masculine and neuter a-stem

Week 5  Ch. 7, Nouns: feminine long a-stem; a-stem adjectives Week 6  Ch. 8, Imperative and optative moods a-stem verbs

Week 7  Ch. 9, Mono and polysyllabic fem. long i/u-stem nominals Week 8  Ch. 10, Present stem of verbs of classes 5, 8, and 9

Week 9  Ch. 11, i/u-stem nominals

Week 10  Ch. 12, Vocalic-r-stem nominals

Week 11  Ch. 12, Present stem of verbs of classes 2, 3, and 7

Week 12  Ch. 12, continued

Week 13  Ch. 13, Consonant stem nominals

Preferred Text Books  : शब्दब्रह्मन  सabdabrahaman: a linguistic introduction to Sanskrit

Reference Books  : None E-book Links  : None

Grading Plan  :

<table>
<thead>
<tr>
<th>Type of Evaluation</th>
<th>Weightage (in %)</th>
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<tbody>
<tr>
<td>Weekly homework</td>
<td>75%</td>
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<tr>
<td>Quizes</td>
<td>25%</td>
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<tr>
<td>End Sem Exam</td>
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</table>

Mapping of Course Outcomes to Program Objectives: (1 – Lowest, 2—Medium, 3 – Highest, or a ‘-’ dash mark if not at all relevant). Program outcomes are posted at
Teaching-Learning Strategies in brief (4-5 sentences):

Lectures introduce new material for intellectual understanding. Memorization internalizes basic information so that it is easily available for application. Exercises apply intellectual understanding and basic information and solidify understanding.
I will introduce new concepts and material once a week and engage students in oral/aural practice in a second meeting. Each meeting will include time to answer questions. Students will regularly do homework using an on-line interactive intelligent exercise platform that provides immediate feedback and supplies links to information to assist students in learning.

Because learning a language involves the cumulative acquisition of knowledge and skills, regular attendance and keeping up with assignments will be essential.

Note: This course description format comes into effect from Spring 2022.

Title of the Course: Critical Viewing and Reading: Readings in Partition Literature

Faculty Name: Sushmita Banerji

Name of the Academic Program: Elective for which academic programs?

Course Code: HS1.301

L-T-P: 3-0-0

Credits: 4 (Pl. relook into number of credits matching with L-T-P)

(L= Lecture hours, T=Tutorial hours, P=Practical hours)

1. Prerequisite Course / Knowledge:

None

2. Course Outcomes (COs):

After completion of this course successfully, the students will be able to.

CO-1: Discuss the information in the texts – literary and cinematic – that engage with the Partition of British India into present day India and Pakistan

CO-2: Explain the key historical moments to contextualize the texts they read

CO-3: Discuss the key historical moments to contextualize the films they view

CO-4: Interpret cultural expression in light of ethical, cultural, and historical trauma
3. Mapping of Course Outcomes (COs) with Program Outcomes (POs) and Program Specific Outcomes (PSOs) – Course Articulation Matrix

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</tbody>
</table>

Note: 3 in the box for high level mapping, 2 for medium level mapping and 1 for low level mapping)

4. Detailed Syllabus:

**Unit 1:** History and its ghosts – Political moves, Gandhi, Nehru and the INC; Jinnah and the Muslim League, the state of the people and the State and its people

**Unit 2:** What were people writing – short stories from Urdu, Hindi and Bangla

**Unit 3:** Cinema – Popular cinema and its tendencies, the new Nation in the popular imagination, the Partition’s afterlives on celluloid.

**Reference Books:**


5. **Teaching-Learning Strategies**

Students are expected to read up to 30 pages a week, watch any video lectures made available, and view films and read literature when required. Lectures will be based on class readings and will assume that students will have read the required materials. Discussions in class, on chat and via emails shall be encouraged. Students are expected to write at least two, perhaps three papers that will be designed to encourage interpretative and creative writing.

This class shall deal with material students might disagree with. All informed disagreements, opinions, and discussions are encouraged. It shall however be the instructor’s right to shut down any disrespectful behaviour.

6. **Assessment methods and weightages:**

<table>
<thead>
<tr>
<th></th>
<th>Percentage of Grade</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Mid semester Quiz 1</strong></td>
<td>10%</td>
</tr>
<tr>
<td><strong>Mid semester Quiz 2</strong></td>
<td>10%</td>
</tr>
</tbody>
</table>
Title of the Course: Introduction to Sociology

L-T-P: 3-0-0

Name of the Academic Program: Humanities Elective offered to UG3/UG4.

Course Code: HS2.201

( L= Lecture hours, T=Tutorial hours, P=Practical hours)

Credits: 4

Prerequisite Course / Knowledge: Introduction to Human Sciences (Core course for UG2).

Course Outcomes (COs) (5 to 8 for a 3 or 4 credit course):

After completion of this course successfully, the students will be able to.

CO-1:
Students will have a sense of how the discipline of Sociology developed; its colonial roots, its core concerns and the impact of its roots and concerns on its methodologies.

CO-2:
Students will have an understanding of core conceptual frameworks and debates in Sociology.

CO-3:
Students will have a sense of major theoretical frameworks in Sociology. They will be introduced to the Durkheimian, Marxist and Weberian frameworks and methodologies, as well as to later theorists.

CO-4:
Students will be able to employ a sociological approach to the study of social institutions in India, such as caste, class, gender and tribe.

CO-5:

Students will be able to employ a sociological approach to the study of social, political and economic processes in India, such as development, industrialization, urbanization and migration.

3. Mapping of Course Outcomes (COs) with Program Outcomes (POs) and Program Specific Outcomes (PSOs) – Course Articulation Matrix

### Matrix for CSE

<table>
<thead>
<tr>
<th>CO</th>
<th>PO 1</th>
<th>PO 2</th>
<th>PO 3</th>
<th>PO 4</th>
<th>PO 5</th>
<th>PO 6</th>
<th>PO 7</th>
<th>PO 8</th>
<th>PO 9</th>
<th>PO 10</th>
<th>PO 11</th>
<th>PO 12</th>
<th>PS O1</th>
<th>PS O2</th>
<th>PS O3</th>
<th>PS O4</th>
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<tbody>
<tr>
<td>CO 1</td>
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<td>CO 3</td>
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</tbody>
</table>

Note: Each Course Outcome (CO) may be mapped with one or more Program Outcomes (POs) and PSOs. Write ‘3’ in the box for ‘High-level’ mapping, 2 for ‘Medium-level’ mapping, 1 for ‘Low’-level’ mapping

### Matrix for ECE

---

Page 124 of 160
Note: Each Course Outcome (CO) may be mapped with one or more Program Outcomes (POs) and PSOs. Write ‘3’ in the box for ‘High-level’ mapping, 2 for ‘Medium-level’ mapping, 1 for ‘Low’-level’ mapping

4. Detailed Syllabus:

Unit 1:

Development of Sociology as a Discipline: Sociology’s emergence in Europe, its roots and causes. The connection between anthropology and colonialism. Enduring influences in the practice of sociology.

Unit 2:


Unit 3:

Sociological Frameworks and Theories: Understanding social stratification through the structural functionalist, Marxist and the Weberian methods. Introduction to key ideas of Emile Durkheim, Karl Marx and Max Weber.

Unit 4:

Study of Social Institutions in India: Caste, Class, Tribe and Gender

Unit 5:
Political Sociology: Introduction to methods in Political sociology. Case studies from Indian politics to understand and identify shifting sociological and political narratives, political formations and political cultures. Introduction to concepts of power elites and ruling class.

Unit 6:
Study of Social Processes: Development, Industrialisation, Urbanisation and Migration

Reference Books:


5. Teaching-Learning Strategies in brief (4 to 5 sentences):

Students are introduced to theories and concepts through lectures. Relevant photographs, short 4-5 minutes videos, short films and clips from films are used during the lectures. Discussions and interventions in the classroom are highly encouraged. Students are given 3-4 reading-based assignments through the course, which will help them to firstly understand the concepts in some depth and secondly apply the concepts in specific situations. Each assignment involves 30-40 pages of intense reading.

6. Assessment methods and weightages in brief (4 to 5 sentences):

<table>
<thead>
<tr>
<th>Type of Evaluation</th>
<th>Weightage (in %)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mid Sem- Exam</td>
<td>20%. Questions designed to evaluate understanding of basic concepts.</td>
</tr>
</tbody>
</table>
End Sem Exam | 30%. Questions designed to evaluate understanding of basic concepts. One long question which involves application of concepts discussed in the course.
---|---
Assignment 1 | 12.5%. Related to Units I/II
Assignment 2 | 12.5%. Related to Unit III
Assignment 3 | 12.5%. Related Unit IV
Assignment 4 | 12.5%. Related to Units V/VI

Name of the Academic Program | Humanities Electives (UG3 and UG4)
Course Code | HS2.202
Title of the Course | Introduction to Psychology
L-T-P | 3-0-1 (L= Lecture hours, T= Tutorial hours, P= Practical hours)
Credit | 4

Course Instructor and Co-ordinator | Priyanka Srivastava
Email id | priyanka.srivastava@iiit.ac.in

Course co-instructor Email id | Vishnu Sreekumar vishnu.sreekumar@iiit.ac.in

Teaching Assistant1 | Sanskar Tiberwal (sanskar.tibrewal@research.iiit.ac.in)
Panyam Naga Sasidhar Reddy (p.reddy@students.iiit.ac.in)

Teaching Assistant2

1. Prerequisite Course / Knowledge: None
2. **Course Outcomes (COs) (5 to 8 for a 3 or 4 credit course):**

After completion of this course successfully, the students will be able to.. 

**CO-1: apply psychology knowledge base –**

- describe and discuss major concepts, theories, models and overarching themes in psychology
- describe applications of psychology
- analyze the major goal of psychological science, and utilize different research methods used by psychological research.
- Evaluate the challenges and merits of psychological observations and assess the brain and behavior research complexity.
- explain the major historical landmarks in psychological science and their links to contemporary research.

**CO-2: apply scientific inquiry and critical thinking –**

- apply major perspectives of Psychology and levels of analyses to explain psychological phenomenon, e.g., cognitive, biological, social, health, behavioral, and cultural etc.
- analyze and evaluate the difference between the personal anecdotal incidences and scientific inquiry to our everyday psychological experiences. Students will be able to use different levels of complexity to interpret psychological behavior.
- compare common fallacies like confirmation bias, causation to correlation etc.
- Design, conduct, analyze, evaluate and interpret the results of basic psychological research.
- analyze, interpret, and evaluate the individual experience and socio-cultural perspectives to explain psychological phenomenon

**CO-3: apply research ethics of human/ behavioral sciences**

- analyze and compare the benefits and risk of given psychological research
- apply key principles of APA Ethics guidelines for participants’ right protection

**CO-4: demonstrate effective communication skills**

**CO-5: demonstrate personal and professional development**

- apply psychological learning to their personal and professional development, self-regulation, project management, coordinate team work, and develop life directions

3. **Mapping of Course Outcomes (COs) with Program Outcomes (POs) and Program Specific Outcomes (PSOs) – Course Articulation Matrix**
Note: ‘3’ in the box for ‘High-level’ mapping, 2 for ‘Medium-level’ mapping, 1 for ‘Low’-level’ mapping

4. Detailed Syllabus:

<table>
<thead>
<tr>
<th>Unit 1</th>
<th>Unit 2</th>
<th>Unit 3</th>
<th>Unit 4</th>
<th>Unit 5</th>
<th>Unit 6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Introduction</td>
<td>Methods</td>
<td>Health &amp; Psychology</td>
<td>Social &amp; Personality</td>
<td>Cognitive</td>
<td>Learning &amp; Development</td>
</tr>
<tr>
<td>Psychology as a Science</td>
<td>Research methods for psychological observations</td>
<td>Psychological health and disorders</td>
<td>Social</td>
<td>Attention</td>
<td>Learning</td>
</tr>
</tbody>
</table>
### Reference Books:


### Journal Articles:
Will be announced before a few key topics.

5. **Teaching-Learning Strategies in brief (4 to 5 sentences):**
The psychology course in monsoon 2021 will be primarily lecture and project-based learning course. Students will be required to make presentations for one of the assigned reading materials and project. Students will be introduced to undergraduate-level introductory topics and issues in
psychology. Reading material will be assigned. Students will be required to engage in discussions, and to present topics based on the assigned reading topics. Each student will be required to do at least two presentations, one reading materials and another accounted for their project. Students will be encouraged to take assignments inspired from their everyday experiences and will be asked to evaluate the event/phenomenon/processes critically and scientifically using psychological methods. They will be asked to perform some of the activities in team and demonstrate the individual contribution to the team activities. Students may be asked to perform peer review as well.

6. Assessment methods and weightages in brief (4 to 5 sentences): Assessment Scheme:

<table>
<thead>
<tr>
<th>No.</th>
<th>Activity</th>
<th>N</th>
<th>Weightage</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Assignment</td>
<td>2</td>
<td>10%</td>
</tr>
<tr>
<td>2.</td>
<td>Home and Class Activities (Student presentation)</td>
<td>2</td>
<td>5%</td>
</tr>
<tr>
<td>3.</td>
<td>Mid Semester Exams</td>
<td>2</td>
<td>20%</td>
</tr>
<tr>
<td>4.</td>
<td>Project in Group – with 2-3 students</td>
<td>1</td>
<td>30%</td>
</tr>
<tr>
<td>5.</td>
<td>End Semester Exam</td>
<td>1</td>
<td>30%</td>
</tr>
<tr>
<td>6.</td>
<td>Experiment participation based on credits</td>
<td>2</td>
<td>5%</td>
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<tr>
<td></td>
<td>TOTAL</td>
<td></td>
<td>100%</td>
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</table>

Project Evaluation Breakdown:

<table>
<thead>
<tr>
<th>No.</th>
<th>Description</th>
<th>Weightage</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Idea presentation / Proposal</td>
<td>4%</td>
</tr>
<tr>
<td>2.</td>
<td>Progress Report 1: with hypothesis, experiment design, paradigms, tasks, measures, prediction, and statistical analyses to use</td>
<td>8%</td>
</tr>
<tr>
<td>3.</td>
<td>Progress Report 2: with pilot data and preliminary analysis</td>
<td>8%</td>
</tr>
<tr>
<td>4.</td>
<td>Final Presentation + Peer evaluation (should be based on critical feedback)</td>
<td>8% + 2%</td>
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<tr>
<td></td>
<td>TOTAL</td>
<td>30%</td>
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</table>
Grading Policy: Absolute grading policy scheme

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<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>F</th>
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<tbody>
<tr>
<td>&gt;=85</td>
<td>&gt;=70</td>
<td>&gt;=55</td>
<td>&gt;=45</td>
<td>&lt;45</td>
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</tbody>
</table>

Academic Honesty: Do’s: Discussion on meaning and interpretation of assignments, general approaches and strategies with other students in the course.

Don’ts: No sharing/copying of assignment with any student who is not in your group for any reason; not asking another student for help debugging your assignment code, method, or topics; no copying of code or document or assignment from any other sources (including internet).

The course will use plagiarism-detection software to check your assignments/ projects/ codes/ exam/ quiz responses. Copying from another student will be treated equally to plagiarism. Violation of any of the above policies, whether you are the giver or receiver of help, will result in zero on the assignment or the respective assessment components and fail the course in case of repetition.

**Project Evaluation – Rubric (100)**

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Topic Description</th>
<th>Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Clarity in Problem Statement, Method, Result, and Discussion</td>
<td>20</td>
</tr>
<tr>
<td>2.</td>
<td>Critical understanding of Literature – motivation for your research project</td>
<td>20</td>
</tr>
<tr>
<td>3.</td>
<td>Method: Participants, material, stimuli, procedure, task, measure of performance, sampling</td>
<td>20</td>
</tr>
</tbody>
</table>
4. Results (Statistics), and Discussion and conclusion | 20

5. Future direction: Limitation and Scope of the current research/ objective, and Impact | 10

6. Citations and Reference (APA style) | 5

7. Organization | 5

Assignment/ Term Paper Evaluation – Rubric (50 marks each)

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Topic Description</th>
<th>Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Clarity and coherence in describing topic</td>
<td>10</td>
</tr>
<tr>
<td>2.</td>
<td>Summary and Critical Evaluation to find the gaps in the given literature</td>
<td>15</td>
</tr>
<tr>
<td>3.</td>
<td>Future direction: Limitation and Scope of the current research/ objective, and Impact</td>
<td>15</td>
</tr>
<tr>
<td>4.</td>
<td>Citations and Reference (APA style)</td>
<td>5</td>
</tr>
<tr>
<td>5.</td>
<td>Organization</td>
<td>5</td>
</tr>
</tbody>
</table>
Title of the Course: Introduction to History

Faculty Name: Aniket Alam

Course Code: HS3.201

Name of the Program: B.Tech in Computer Science and Engineering

Credits: 4

L - T - P : (L - Lecture hours, T - Tutorial hours, P - Practical hours)

Semester, Year : Monsoon 2022
(Ex: Spring, 2022)

Pre-Requisites : Introduction to Human Sciences, HS8.102

Course Outcomes :

After completion of this course successfully students will be able to:

CO1: Define the concept of History, and Describe the development of the discipline.

CO2: Explain range of academic theories relating to the discipline of History.

CO3: Analyze features of historical writings and Appreciate the importance of the past.

CO4: Evaluate the different methods of historical analysis.

CO5: Assess primary evidence, including through computational tools.

CO6: Develop their own understanding about History and the Past.

Course Topics :

(1) Historical Time and Space: In this module students will be introduced to how historians have understood the flow of time and periodised time into historical ages. They will also appreciate how historians define regions and territory. Apart from this the module will also
teach about the development of the ideas of time, and of space; and how the modern map and watches came to define society in new ways.

(2) Historical Fact and Objectivity: This module will define the historical fact, the different interpretations of what a fact is, and the debate among historians relating to historical objectivity: its possibility and desirability.

(3) The Main Theories of History: In this module students will be exposed to the main theoretical models of historical interpretation. These will include, but not be limited to, Rankean and Whig history, Annales history, Marxist history, Structuralist and Post-Structuralist history, etc. Students will also be introduced to the newer theories like ecological history, black history, herstory, etc.

(4) The Main Methods of Historical Analysis: This module will focus on source criticism, the advantages and limitations of the inductive and deductive methods, oral history, qualitative and quantitative methods, etc. that historians deploy in their identification of facts and their interpretations.

(5) Computational Tools for Studying History: In this module students will be shown how in recent times historians have used programming tools to identify new sources, ask new questions, proffer new interpretations, and build new narratives.

Preferred Text Books:

- Marc Bloch: The Historian’s Craft
- Umberto Eco: This is not the end of the Book;

Reference Books:

- Romila Thapar: From Lineage to State.
- Sumit Sarkar: Modern Times.
- Richard Eaton: India in the Persianate Age.
- Michael Mann: South Asia’s Modern History.
• R. C. Majumdar: *An Advanced History of India*.
• Alfred Crosby: *The Measure of Reality*.
• Fernand Braudel: *A History of Civilization*.
• James C. Scott; *Against the Grain*.
• Ibn-e-Khaldun: *Muqadimah*.
• Barbara Freese: *Coal – A Human History*.
• Sidney W. Mintz: *Sweetness and Power – The Place of Sugar in Modern History*.
• Douglas A. Boyd, Mary A. Larson: *Oral History and Digital Humanities – Voice, Access, and Engagement*
• Anne Kelly Knowles: *Placing History*.

**ARTICLES:**

• Bernard S. Cohen: “The Command of Language and the Language of Command”.
• E. P. Thompson: “Custom, Law, and Common Right”.
• E.P. Thompson: “Time, Work-Discipline, and Industrial Capitalism”.
• Ranajit Guha: “On Some Aspects of the Historiography of Colonial India”.
• Ranajit Guha: “The Prose of Counter-Insurgency”
• Shahid Amin: “Gandhi as Mahatma”
• David Arnold: “Touching the Body: Perspectives on the Indian Plague”
• Jacques le Goff: “Merchant’s Time and Church Time in the Middle Ages”
• Lucien Febvre: “Sensibility and History – How to Reconstitute the Emotional Life of the Past”
• Emmanuel le Roy Ladurie: “The History of Rain and Fine Weather”
• Philippe Aries: “Pictures of the Family”
• Maurice Aymard: “The Costs of War”
• Fernand Braudel: “History and the Social Sciences- The Longue Duree”
• Jean Meuvret: “Food Crises and Demography in France during the Ancien Regime”
• Karl Marx: *Communist Manifesto*, Chapter 1.
• Karl Marx: “British Rule in India, 10 June 1853”
• Karl Marx: “Future Results of British Rule in India, 22 July 1853”
• DDKosambi: “Social and Economic Aspects of the Bhagvad Gita”
• Irfan Habib: “Potentialities of Capitalist Development in the Economy of Mughal India”
• Romila Thapar: “Somnatha”
• Robert Darnton: “Peasants Tell Tales”
• Clifford Geertz: “The Balinese Cock-Fight”
• Arthur Conon Doyle: “Sign of Four”
E-book Links:

Grading Plan:
(The table is only indicative)

<table>
<thead>
<tr>
<th>Type of Evaluation</th>
<th>Weightage (in %)</th>
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</thead>
<tbody>
<tr>
<td>Quiz-1</td>
<td>8%</td>
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<tr>
<td>Mid SemExam</td>
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<td>Quiz-2</td>
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<tr>
<td>End Sem Exam</td>
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</tr>
<tr>
<td>Assignments</td>
<td>(15x2) 30%</td>
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</table>

Mapping of Course Outcomes to Program Objectives: (1 – Lowest, 2—Medium, 3 – Highest, or a ‘-’ dash mark if not at all relevant).

Computer Science and Engineering

```plaintext
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<th>C01</th>
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</tbody>
</table>
```
Teaching-Learning Strategies in brief (4-5 sentences):

The course will be based on classroom lectures and will require intensive reading and writing. On average, each student will be required to read between 500 to 800 pages of books and articles, and submit written work between 3,000 to 4,000 words, cumulatively.

In each class some select students will be given a small topic from the next class to read up on, and they will be expected to initiate discussions around these.

Pictures, Extracts from primary sources, audio and video resources will be used to illustrate the points being taught.

The assignments and exams will focus on training students to develop their own ideas, and apply computer science tools, to the topics on hand.
CO1: Describe the concept of modern State, and its emergence in colonial India
CO2: Explain range of academic theories relating to state formation, and colonialism
CO3: Analyze the different features and institutions which make-up the State in colonial India
CO4: Evaluate the Institutional and social processes which formed the State in colonial India.
CO5: Assess primary evidence using computational tools to form their own conclusions.
CO6: Develop their own theory about the positives and negatives of the colonial State.

Course Topics: The course is divided into five modules: (i) Idea of the State in India and Europe, (ii) Geography of the colonial State, (iii) Economy of the colonial State, (iv) Technologies of Governance of the colonial State, and (v) Mapping the Modern State in India.

Module 1: Definitions of the state in India over the past two millennia, and in the philosophies of Hobbes, the Enlightenment, Adam Smith and the Utilitarians, 20th Century scholars; Development of the State among Mughal, Rajput and Maratha kingships and in Europe.

Module 2: Study how the territory of British India was gained and how it defined the nature of the state. It will look at the land-locked nature of the sub-continent and the open sea-faces on three sides, the river valleys, mountains, deserts and forests, and the trade routes. It will study the trigonometrical survey and the cadastral surveys which fixed territory. It will look at how the frontiers, boundaries and borders, as well as the regions and provinces were formed.

Module 3: Study the economy and resources of the colonial state; how it came to manage and govern the land, its agricultural and mineral products, the forests and water resources, the manufactures and commerce. It will also study the financial foundations of the state and its accounts.

Module 4: The fourth section of the course will look at the technology of governance. These will include (a) technologies of government and administration, (b) technologies of transport and communication and (c) technologies of measurement. This module will include a study of the military, police, civil and judicial administration, the schools, colleges and universities, the medical institutions, the other institutions of state and legal systems. It will also include posts and telegraph, the railways, telephones and press. Finally, it will also discuss the various methods of measuring land, forest, wealth, populations, etc. Students will use their skill of information technology to study the manner in which these technologies worked.

Module 5: Study the ideology of the colonial state, how it saw itself as a legatee of the Mughals and yet as scientific and modern with a mission to “civilize”; how it considered its main task to be the guarantor of stability and peace, while also claiming for itself the role of protector of the poor. Students will use their skill of information technology to study the spread of the State.

Preferred Text Books:

1. Michael Mann: *South Asia’s Modern History: Thematic Perspectives*
2. Lakshmi Subramanian: *History of India: 1707 to 1857*

**Reference Books**

1. Sekhar Bandyopadhyay: *From Plassey to Partition.*
2. Romila Thapar: *From Lineage to State.*
5. Manu Goswami: *Producing India – From Colonial Economy to National Space.*
10. Marc Galanter: *Law and Society in Modern India.*
11. S. Gopal: *British Policy in India, 1858-1905.*
20. Ian J. Kerr: *Engines of Change: The Railroads that Made India.*
22. Nicholas B Dirks: *Castes of Mind: Colonialism and the Making of Modern India.*
23. Madhav Gadgil, Ramachandra Guha: *This Fissured Land.*

**Articles.**

5. Mahesh Rangarajan, “Imperial Agendas and India’s Forests : The Early History of Indian Forestry, 1800-1878”, *Indian Economic and Social History Review*, 1994
10. Bernard Cohn: “Representing Authority in Victorian India”.
E-book Links:

Grading Plan:
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Mapping of Course Outcomes to Program Objectives: (1 – Lowest, 2—Medium, 3 – Highest, or a ‘-’ dash mark if not at all relevant).
### Teaching-Learning Strategies in brief (4-5 sentences):

The course will be based on classroom lectures and will require intensive reading and writing. On an average, each student will be required to read between 1,000 to 1,500 pages of books and articles and submit written work between 6,000 to 8,000 words, cumulatively.

In each class some select students will be given a small topic from the next class to read up on, and they will be expected to initiate discussions around these.

Pictures, Extracts from primary sources, audio and video resources will be used to illustrate the points being taught.

The assignments and project will focus on training students to develop their own ideas, and apply computer science tools, to the topics on hand.

Note: This course description format comes into effect from Spring 2022.
Semester, Year : Monsoon 2022

Pre-Requisites : Passed Introduction to Human Sciences (HS8.102)

Course Outcomes :

CO1: Define the concept of Nationalism.
CO2: Explain range of academic theories interpreting Nationalism.
CO3: Analyze the different characteristics which form Nationalism.
CO4: Evaluate the positive and negative attributes of Nationalism.
CO5: Develop their own understanding about the role of Nationalism in today’s world.

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) Asia and Africa

(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) Iqbal

f) Savarkar, Golwalkar

g) Jinnah

Preferred Text Books :

1. John Hutchinson: *Nationalism*
2. S. Irfan Habib: *Indian Nationalism – The Essential Writings*

Reference Books :

1. Benedict Anderson: *Imagined Communities*.
2. Ernest Gellner: *Nations and Nationalisms*.
3. Eric Hobsbawm: *Nations and Nationalism since 1780*
4. Hans Kohn: *The Idea of Nationalism*
5. E. H. Carr: *Nationalism and After*
6. Partha Chatterjee: *Nationalist Thought and the Colonial World*
7. Javeed Alam: *India- Living With Modernity*
9. V. D. Savarkar: *Hindutva*.
10. Rabindranath Tagore: *Nationalism*.
11. M. S. Golwalkar: *We or Our Nationhood Defined*.
12. Jawaharlal Nehru: *Discovery of India*.
15. Bipan Chandra: *Colonialism and Nationalism in Modern India*.
16. Sumit Sarkar: *Modern India*.

E-book Links :

Grading Plan :

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Mapping of Course Outcomes to Program Objectives: (1 – Lowest, 2—Medium, 3 – Highest, or a ‘-’ dash mark if not at all relevant).

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Teaching-Learning Strategies in brief (4-5 sentences):

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Pictures, Extracts from primary sources, audio and video resources will be used to illustrate the points being taught.

The assignments and project will focus on training students to develop their own ideas, and apply them to real life conditions.

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**Title of the Course:** Introduction to Politics, with reference to India

**Faculty Name:** Dr Aakansha Natani

**Name of the Program:** B.Tech in Computer Science and Engineering

**Course Code:** HS4.201

**Credits:** 4

**L - T - P:**

(L - Lecture hours, T-Tutorial hours, P - Practical hours)

**Semester, Year:** Monsoon 2022 (Ex: Spring, 2022)

**Pre-Requisites:** None

**Course Outcomes:**

After completion of this course successfully students will be able to:

**CO1:** Describe the concept of politics and identify the general scope and methods of Political Science at an introductory level.

**CO2:** Explain range of academic theories relating to key concepts of Political Science. **CO3:** Analyze the different features of Constitution and democratic institutions in India **CO4:** Evaluate the political process in India and suggest policy recommendations for reforms.

**CO5:** Assess the nature of Constitutional Government and Democracy in India from various perspectives.

**CO6:** Develop one’s own understanding on how to address contemporary challenges in the Indian Political System.

**Course Topics:**

(please list the order in which they will be covered, and preferably arrange these as five to six modules.)
The course is divided into five modules:

1. Introduction to Political Science - Politics, State and Government
3. Constitutional Government and Democracy in India - Features of Constitution,
   Organs of government - Legislature, Executive, Judiciary
4. Nature of Indian Political System - Federalism, Secularism, Multiculturalism
5. Political Process in India - Party System, Electoral Process, Contemporary Challenges and Reforms

Module 1: Introduction to various perspectives on how we define politics and its domain; Nature and scope of Political Science as a field of knowledge; Meaning and origin of State: divine theory and social contract theory; Forms and functions of government Module 2: Brief introduction to key concepts of Political Science; Liberty: Negative and Positive; Equality: Equality of Opportunity; Justice: Social Justice; Rights: Legal Rights and Human Rights; Democracy: Idea and Practice

Module 3: Philosophy and features of Indian constitution, Structure and functions of Parliament (Legislature), Prime Minister and his cabinet (Executive), Supreme Court of India (Judiciary); Balance of Power

Module 4: Structure and functioning of federalism in India; centre-state relations; Meaning and interpretation of secularism in the Indian context; Provisions for unity in diversity


Preferred Text Books:

Selected Chapters from-

1. Andrew Heywood: Politics (forth edition)
2. Andrew Heywood: Political Theory: An Introduction
4. Neerja Gopal Jayal and Pratap Bhanu Mehta (Eds): The Oxford Companion to Politics in India
5. Bidyut Chakrabarty and Rajendra Kumar Pandey: Indian Government and Politics

Reference Books:
1. Rand Dyck: *Studying Politics: An Introduction to Political Science, Third edition*
2. Larry Johnston: *Politics: An Introduction to the Modern Democratic State*
3. Eric Mintz, David Close, and Osvaldo Croci: *Politics, Power and the Common Good: An Introduction to Political Science.*
4. Rajeev Bhargav and Ashok Acharya (eds): *Political Theory: An Introduction*
5. Granville Austin: *The Indian Constitution: Cornerstone of A Nation*
6. Paul R Brass: *The Politics of India Since Independence*
7. Niraja Gopal Jayal: *Democracy in India (Themes in Politics)*
8. Atul Kohli and Prerna Singh, (ed.): *Routledge handbook of Indian politics*
9. Sujit Choudhry, Madhav Khosla, And Pratap Bhanu Mehta, (ed.): *The Oxford Handbook of The Indian Constitution*
10. B L Fadia: *Indian Government and Politics*
11. Ramchandra Guha: *India after Gandhi*
12. Rajni Kothari: *Politics in India*

Grading Plan 

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Mapping of Course Outcomes to Program Objectives: (1 – Lowest, 2—Medium, 3 – Highest, or a ‘-’ dash mark if not at all relevant). Program outcomes are posted at

Matrix for CSE

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Page 150 of 160
Teaching-Learning Strategies in brief (4-5 sentences):

The course will be based on classroom lectures and in class discussion of assigned reading material. On an average, each student will be required to read between 500 to 700 pages of books and articles and submit written work between 3000-4000 words, cumulatively. The students will be expected to follow the latest news and developments in India on the topics to be discussed in this course. The assignments and project will focus on training students to develop their own ideas and research skills in social sciences. Audio-visual and interactive materials may be used.

Note: This course description format comes into effect from Spring 2022.

Course Code: HS4.301
Title of the Course: Environment and Politics in India
Faculty Name: Radhika Krishnan
L-T-P: 3-0-0
Name of the Academic Program: Humanities Elective offered to UG3/UG4.

(L= Lecture hours, T= Tutorial hours, 
P=Practical hours)

Credits: 4

1. Prerequisite Course / Knowledge: Preferably Introduction to Sociology or Introduction to Politics

2. Course Outcomes (COs) (5 to 8 for a 3 or 4 credit course):

After completion of this course successfully, the students will be able to.

CO-1:
Students will have a sense of environmental history and the emergence of ‘environment’ as a concern, globally as well as in India.

CO-2:
Students will understand basic concepts in environmental justice, environmental politics and environmental citizenship.

CO-3:
Students will appreciate the difference between environmentalism in the global North and the global South, by studying their respective demands, agendas, strategies and concerns.

CO-4:
Students will learn to analyse the dynamics of environmental legislation and regulation in India (with a specific focus on legislation related to forest management, water management and wildlife conservation).

CO-5:
Students will learn to see the various entanglements of environment, resource use and misuse and governance. They will identify actors and stakeholders involved in various resource conflicts, and get a sense of competing claims and counterclaims.

CO-6:
Students will get a sense of the various expressions of environmentalism in India, emerging from different actors such as workers and trade unions, adivasis and Dalits. They will be able to identify the underlying differences, political and cultural significance, as well as the impact of these various expressions on environmental narratives in India.

3. Mapping of Course Outcomes (COs) with Program Outcomes (POs) and Program Specific Outcomes (PSOs) – Course Articulation Matrix

Applicable for CSE

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Note: Each Course Outcome (CO) may be mapped with one or more Program Outcomes (POs) and PSOs. Write ‘3’ in the box for ‘High-level’ mapping, 2 for ‘Medium-level’ mapping, 1 for ‘Low’-level’ mapping.

**Applicable for ECE**

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4. Detailed Syllabus:

**Unit 1:**
Environmental History: Emergence of ‘environment’ as a discourse, themes in global environmentalism, themes in Indian environmentalism

**Unit 2:**
Environmental Justice, Rights and Environmental Citizenship: Applying concepts and principles of justice, rights, equality and citizenship in resource use debates.

**Unit 3:**
Environmentalism in the Global North and the Global South: Differences in concerns, strategies, demands and agendas. Impact of global environmental discourses and narratives in India. Emergence of the Environmental Justice Movement in the West and its implications for environmentalism in India. Environmentalism of the poor.

**Unit 4:**

Case Studies used include Forest/Wildlife Management in India, Big Dams in India.

**Unit 5:**
Various expressions of environmentalism in India: Trade Union and their relationship with the environmental question, Dalit environmentalism, Environmentalism and Indigeneity. Introduction to Cultural Ecology.

**Reference Books:**


Amita Baviskar, *In the Belly of the River: Tribal Conflicts over Development in the Narmada Valley* (New Delhi: Oxford University Press, 2004 [reprint, 1995]).


5. **Teaching-Learning Strategies in brief (4 to 5 sentences):**

Students are introduced to theories and concepts through lectures. Photographs, short 4-5 minutes videos, posters, pamphlets, songs and slogans related to environmental issues are used during the lectures. Discussions and interventions in the classroom are highly encouraged. Students are given reading-based assignments through the course, which help them to firstly understand the concepts in some depth and secondly apply the concepts in specific situations. Each assignment involves 40-50 pages of intense reading. Quizzes are designed to test analysis of a specific case.

6. **Assessment methods and weightages in brief (4 to 5 sentences):**

<table>
<thead>
<tr>
<th>Type of Evaluation</th>
<th>Weightage (in %)</th>
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<tbody>
<tr>
<td>Mid Sem- Exam</td>
<td>15%. Questions designed to evaluate understanding of basic concepts.</td>
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<tr>
<td>End Sem Exam</td>
<td>30%. Questions designed to evaluate understanding of basic concepts. One long question which involves application of concepts discussed in the course.</td>
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<tr>
<td>Assignment 1</td>
<td>20%. Related to Unit I, II III (Essay question)</td>
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<tr>
<td>Assignment 2</td>
<td>20%. Related to Units IV V (Essay Question)</td>
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</table>
Title of the Course: Gender and Society
Course Code: HS8 201
Name of the Academic Program: Elective
L-T-P: 3-0-0
Credits 4

1. Prerequisite Course / Knowledge:
None

2. Course Outcomes (COs):
After completion of this course successfully, the students will be able to.

CO-1 Introduce students to basic concepts in gender theory and Feminist practice

CO-2 Help students question their prior opinions and think in more informed ways about the nature of gender relations, individual roles, and socio-cultural formations.

CO-3 Literature shall be taught to demonstrate the various ways in which culture establishes, represents and perpetuates

CO-4 Film shall used to demonstrate the various ways in which popular culture establishes, represents and perpetuates

CO-5 Examples of Literature and film shall be used to discuss how culture can disrupt generic roles

3. Mapping of Course Outcomes (COs) with Program Outcomes (POs) and Program Specific Outcomes (PSOs) – Course Articulation Matrix

<table>
<thead>
<tr>
<th>Quiz 1</th>
<th>7.5% Related to Unit I, III, III (Analysis of a case)</th>
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</thead>
<tbody>
<tr>
<td>Quiz 2</td>
<td>7.5% Related to Unit IV, V (Analysis of a case)</td>
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</table>
4. Detailed Syllabus:

Unit 1: Core concepts and terms: Differences between terms like Gender, Sex, Normative and Non-normative sexuality, Trans-bodies.

Unit 2: Power, Ideology and Intersectionalities: Concepts of Power, Ideology, Patriarchy, and Privilege. What are intersectionalities, and why is it important to study them when we study gender?

Unit 3: Feminist Movements: Rights struggles, Gains and losses, women in the workplace, Women in India

Unit 4: Representation of Gender: Who writes women? Short Stories on, about, and by women.
Unit 5: Popular representations of women in cinema. How does popular visual culture shape gender politics?

Reference Books:

Adichie, Chimamanda Ngozi (2014). *We Should All Be Feminists*. Fourth Estate.


5. Teaching-Learning Strategies:

Students are expected to read up to 30 pages a week and attend film screenings when required.

Lectures will be based on class readings and will assume that students will have read the required materials. Discussions in class, on chat and via emails shall be encouraged. Students are expected to write at least two, perhaps three papers that will be designed to encourage interpretative and creative writing.

6. Assessment methods and weightages:

<table>
<thead>
<tr>
<th>Type of Evaluation</th>
<th>Weightage (in %)</th>
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<td>Term paper 1</td>
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<td>Term Paper 2</td>
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Course descriptions of Bouquet Courses

Modern Complexity Theory
Principles of Programming Languages
Principles of Information Security
Optimization Methods
Adv. Algorithms
Distributed Systems
Data Systems
Compilers
Advanced Computer Networks
Software Engineering
Statistical Methods in AI
Information Retrieval & Extraction
Advanced NLP
Data Analytics I
Computer Vision
Intro to Cognitive Science
Spatial Informatics
Spatial Data Sciences
Real-Time Systems
Mechatronics System Design