RCOEM

Shri Ramdeobaba College of
Engineering and Management, Nagpur

SHRI RAMDEOBABA COLLEGE OF ENGINEERING AND MANAGEMENT, NAGPUR – 440013

An Autonomous College affiliated to
Rashtrasant Tukadoji Maharaj Nagpur University,
Nagpur, Maharashtra (INDIA)

PROGRAMME SCHEME & SYLLABI
2023 – 2024

B. Tech. COMPUTER SCIENCE & ENGINEERING (ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING)

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Dr. R. S. Pande

Principal
Shri Ramdeobaba College of Engineering & Management
Ph. : 0712-2580011 Fax : 0712 - 2583237
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About the Department

The Bachelor of Technology program in Computer Science & Engineering, with a focus on Artificial Intelligence & Machine Learning (AI & ML), started in the academic year 2020-21. The initial intake of students was 60, however it has increased to 180 from the academic session 2022-23. The undergraduate course spans four years and aims to equip students with the necessary knowledge and skills to develop intelligent machines, software, or applications using a state-of-the-art blend of Artificial Intelligence, Machine Learning, and Deep Learning technologies. It provides a solid foundation in Computer Science and Engineering.

The objective is to provide students with the ability to propose resolutions for scientific, technical, and intricate real-world challenges. The aim is to foster the capacity to develop intelligent systems using artificial intelligence (AI) and machine learning (ML) methodologies across diverse disciplines, in order to address societal requirements. The objective is to foster a multidisciplinary approach to design and development.

The major focus of the programme is to create skilled engineers to innovate, design, think and provide intelligent solutions to problems in a variety of domains such as Education, healthcare, security, information forensics, Data virtualization, Agriculture, efficient transportation, smart cities and business applications, in various government and public sectors etc.

Salient Features of the Department

The programme covers fundamental courses of Computer science and engineering major including programming for problem solving, Data Structures, Computer Architecture, Operating Systems, Algorithms, Computer Networks, Database Management Systems, Compiler Design. The foundation of Computer Science and Engineering enriched by the specialized technical courses on Artificial Intelligence, Machine learning, Deep Learning, Natural Language processing, Data Analytics and Visualization, Image and video processing, Computer vision, Internet of thing. Courses on various application domain and advanced techniques are included such as : Information Retrieval, Biomedical Image Processing, Social network Analysis, Cyber Security Intelligence, Reinforcement learning, Cloud computing, Big data Analytics, Robotics, Game theory, Cognitive systems, Soft Computing.

The programme offers an opportunity to assimilate the students by studying both foundational and experimental components of AI and ML. Artificial Intelligence (AI) & Machine Learning (ML) are increasingly necessary to translate today's exponentially growing data into direct business value. It illustrates how AI and ML fit in the data science ecosystem, and presents several real-world use cases that show how companies are implementing ML to maximize their business results. The Curriculum also covers human and ethical aspects through the courses like Cyber laws and Ethics in IT, Constitution of India, Environment Sciences, Business Communication for Engineers, Indian Traditional Knowledge etc. The programme offers one full semester industry internship facility to final year students to nurture and build professional, ethical and responsible citizen.

Department Vision

To Continually improve the education environment, in order to develop graduates with strong academic and technical background needed to achieve distinction in the discipline. The excellence is expected in various domains like workforce, higher studies or lifelong learning. To strengthen links between industry through partnership and collaborative development works.

Department Mission

To develop strong foundation of theory and practices of computer science amongst the students to enable them to develop into knowledge, responsible professionals, lifelong learners and implement the latest computing technologies for the betterment of the society.

Program Education Objectives (PEOs)

1. To be able to comprehend, understand and analyse Computer Science Engineering problems related to real life which can be better resolved by artificial intelligence and machine learning.
2. To impart exhaustive knowledge of Computer Science Engineering, AI and Machine Learning to cater the industrial needs and excel in innovation and management fields by prediction analysis.
3. To promote collaborative learning and spirit of team work through multidisciplinary AI based projects and diverse professional ethics.
4. To inculcate a conviction to believe in self, impart professional and ethical attitude and nurture to be an effective team member, infuse leadership qualities, and build proficiency in soft skills and the abilities to relate engineering with the social, political and technical issues as per the current scenario.

Programme Outcomes (POs)

1. Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
2. Problem analysis: Identify, formulate, review research literature, and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
3. Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
4. Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

5. Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
6. The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
7. Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
8. Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9. Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
10. Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
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 and in multidisciplinary environments.
12. Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Programme Specific Outcomes (PSOs)

1. The ability to understand, analyse and demonstrate the knowledge of human cognition, Artificial Intelligence and Machine Learning in terms of real world problems to meet the challenges of the future.
2. The ability to develop computational knowledge and project development skills using innovative tools and techniques to solve problems in the areas related to Artificial Intelligence, Machine learning, Deep Learning.

Teaching Scheme for Bachelor of Technology
B. Tech. CSE (Artificial Intelligence and Machine Learning)
(Semester - I)

Sr. No.	Course Type	Course Code	Course Name	Hours/Week			Credits	Maximum marks			ESE Exam Duration (Hrs.)
				L	T	P		Continuous Assessment	End Sem Exam	Total	
1.	BSC	CHT1001	Chemistry of Smart Materials	2	0	0	2	50	50	100	2 Hrs.
2.	BSC	CHP1001	Chemistry of Smart Materials Lab	0	0	2	1	50	-	50	-
3.	BSC	MAT1002	Calculus	3	0	0	3	50	50	100	3 Hrs.
4.	ESC	CAT1001	Digital Electronics	3	0	0	3	50	50	100	3 Hrs.
5.	ESC	CAP1001	Digital Electronics Lab	0	0	2	1	50	-	50	-
6.	ESC	CAT1002	Programming for Problem Solving	3	0	0	3	50	50	100	3 Hrs.
7.	ESC	CAP1002	Programming for Problem Solving Lab	0	0	2	1	50	-	50	-
8.	VSEC	CAT1003	Computer Workshop – I	1	0	0	1	50	-	50	-
9.	VSEC	CAP1003	Computer Workshop – I Lab	0	0	2	1	50	-	50	-
10.	HSSM -IKS	HUT1001	Foundational Literature of Indian Civilization	2	0	0	2	50	50	100	2 Hrs. -
11.	CCA	PET1001	Sports-Yoga- Recreation	1	0	0	1	50	-	50	-
12.	CCA	PEP1001	Sports-Yoga- Recreation	0	0	2	1	50	-	50	-
			TOTAL	**15**	**0**	**10**	**20**			**850**	

Teaching Scheme for Bachelor of Technology
B. Tech. CSE (Artificial Intelligence and Machine Learning)
(Semester - II)

Sr. No.	Course Type	Course Code	Course Name	Hours/Week			Credits	Maximum marks			ESE Exam Duration (Hrs.)
				L	T	P		Continuous Assessment	End Sem Exam	Total	
1.	BSC	PHT2001	Introduction to Quantum Computing	2	1	0	3	50	50	100	3 Hrs.
2.	BSC	PHP2001	Quantum Computing Lab	0	0	2	1	50	-	50	-
3.	BSC	MAT2002	Discrete Mathematics	3	0	0	3	50	50	100	3 Hrs.
4.	BSC	MAP2001	Computational Mathematics Lab	0	0	2	1	50	-	50	-
5.	BSC	CHT2007	Bioinformatics	2	0	0	2	50	50	100	2 Hrs.
6.	ESC	CAT2001	Object Oriented Programming	3	0	0	3	50	50	100	3 Hrs.
7.	ESC	CAP2001	Object Oriented Programming Lab	0	0	2	1	50	-	50	-
8.	PCC	CAT2002	Computer Architecture	2	0	0	2	50	50	100	2 Hrs.
9.	VSEC	CAT2003	Computer Workshop- II	1	0	0	1	50	-	50	-
10.	VSEC	CAP2003	Computer Workshop – II Lab	0	0	2	1	50	-	50	-
11.	AEC	HUT2002	English for Professional Communication	2	0	0	2	50	50	100	2 Hrs.
12.	AEC	HUP2002	English for Professional Communication Lab	0	0	2	1	50	-	50	-
13	CCA	HUP0001	Liberal/Performing Art	0	0	2	1	50	-	50	-
14.	VEC	HUT2004	Foundational Course in Universal Human Values	1	0	0	1	50	-	50	-
			TOTAL	**16**	**1**	**12**	**23**			**1000**	

Sr. No.	Course Code	Course Name	Hours/ week	Credits	Maximum marks
1.	HUP0001-1	Fundamentals of Indian Classical Dance: Bharatnatayam	2	1	50
2.	HUP0001-2	Fundamentals of Indian Classical Dance: Kathak	2	1	50
3.	HUP0001-3	Introduction to Digital Photography	2	1	50
4.	HUP0001-4	Introduction to Japanese Language and Culture	2	1	50
5.	HUP0001-5	Art of Theatre	2	1	50
6.	HUP0001-6	Introduction to French Language	2	1	50
7.	HUP0001-7	Introduction to Spanish Language	2	1	50
8.	HUP0001-8	Art of Painting	2	1	50
9.	HUP0001-9	Art of Drawing	2	1	50
10.	HUP0001-10	Nature Camp	2	1	50
11.	PEP0001-21	Disaster Management Through Adventure Sports	2	1	50
12.	PEP0001-22	Self-Défense Essentials and Basics Knowledge of Défense Forces	2	1	50
13.	CHP0001-31	Art of Indian Traditional Cuisine	2	1	50
14.	CHP0001-32	Introduction to Remedies by Ayurveda	2	1	50

Exit option: Award of UG Certificate in Major with 43 credits and an additional 8 credits.			
Exit Courses			
1.	Web Designer	Online/offline certification Course	8
2.	IT Support Engineer		8
3.	Certified Programmer (language learned in Sem-1 and/or Sem-2 [C ,C + + ,Java, Python])		8

Teaching Scheme for Bachelor of Technology
B. Tech. CSE (Artificial Intelligence and Machine Learning)
(Semester - III)

Sr. No.	Course Code	Course Name	Hours/Week			Credits	Maximum marks			ESE Exam Duration (Hrs.)
			L	T	P		Continuous Assessment	End Sem Exam	Total	
1.	CAT3001	Data Structures	3	1	0	4	50	50	100	3 Hrs.
2.	CAP3001	Data Structures Lab	0	0	2	1	50	-	50	-
3.	CAT3002	Operating Systems	3	0	0	3	50	50	100	3 Hrs.
4.	CAP3002	Operating Systems Lab	0	0	2	1	50	-	50	-
5.	CAP3003	Software Lab-I	0	0	4	2	50	-	50	-
6.	MAT4001	Probability and Statistics	3	0	0	3	50	50	100	3 Hrs.
7.	Open Elective	Open Elective I	4	0	0	4	50	50	100	3 Hrs.
8.	CAP3004	Idea Lab	0	0	4	2	50	-	50	-
9.	CAT3005	Cyber Law and Ethics	2	0	0	2	50	50	100	2 Hrs.
10.	HUT3001	Business Communication	2	0	0	2	50	50	100	2 Hrs.
		TOTAL	**17**	**1**	**12**	**24**			**800**	

(Semester - IV)

Sr. No.	Course Code	Course Name	Hours/Week			Credits	Maximum marks			ESE Exam Duration (Hrs.)
			L	T	P		Continuous Assessment	End Sem Exam	Total	
1.	CAT4001	Artificial Intelligence	3	0	0	3	50	50	100	3 Hrs.
2.	CAP4001	Artificial Intelligence Lab	0	0	2	1	50	-	50	-
3.	CAT4002	Design and Analysis of Algorithms	3	0	0	3	50	50	100	3 Hrs.
4.	CAT4003	Theory of Computation	3	0	0	3	50	50	100	3 Hrs.
5.	MAT4001	Linear Algebra	3	0	0	3	50	50	100	3 Hrs.
6.	Open Elective	Open Elective II	2	0	0	2	50	50	100	2 Hrs.
7.	CAP4004	Software Lab-II	0	0	2	1	50	-	50	-
8.	CAP4005	Software Lab-III	0	0	2	1	50	-	50	-
9.	CAP4006	Community Engagement Project	0	0	4	2	50	-	50	-
10.	HUT4003	Environmental Education	2	0	0	2	50	50	100	2 Hrs.
11.	HUT4004	Managerial Economics	2	0	0	2	50	50	100	2 Hrs.
		TOTAL	**18**	**0**	**10**	**23**			**900**	

Exit option : Award of UG Diploma in Major with 90 credits and an additional 8 credits			
Exit Courses			
1	Application Development (Android)	Online/offline certification Course	8
2	Certified software Engineer (Devop)		8

Teaching Scheme for Bachelor of Technology
B. Tech. CSE (Artificial Intelligence and Machine Learning)
(Semester - V)

Sr. No.	Course Code	Course Name	Hours/Week			Credits	Maximum marks			ESE Exam Duration (Hrs.)
			L	T	P		Continuous Assessment	End Sem Exam	Total	
1.	CAT5001	Machine Learning	3	0	0	3	50	50	100	3 Hrs.
2.	CAP5001	Machine Learning Lab	0	0	2	1	50	-	50	-
3.	CAT5002	Computer Networks	3	0	0	3	50	50	100	3 Hrs.
4.	CAP5002	Computer Networks Lab	0	0	2	1	50	-	50	-
5.	CAT5003	Database Management Systems	3	0	0	3	50	50	100	3 Hrs.
6.	CAP5003	Database Management Systems Lab	0	0	2	1	50	-	50	-
7.	CAT5004	Program Elective-1	3	0	0	3	50	50	100	3 Hrs.
8.	CAT5005	Microcontroller Design	3	0	0	3	50	50	100	3 Hrs.
9.	CAP5005	Microcontroller Design Lab	0	0	2	1	50	-	50	-
10.	Open Elective	Open Elective III	2	0	0	2	50	50	100	2 Hrs.
		TOTAL	**17**	**0**	**8**	**21**			**800**	

(Semester - VI)

Sr. No.	Course Code	Course Name	Hours/Week			Credits	Maximum marks			ESE Exam Duration (Hrs.)
			L	T	P		Continuous Assessment	End Sem Exam	Total	
1.	CAT6001	Deep Learning-I	3	0	0	3	50	50	100	3 Hrs.
2.	CAP6001	Deep Learning-I Lab	0	0	2	1	50	-	50	-
3.	CAT6002	Computer Vision	3	0	0	3	50	50	100	3 Hrs.
4.	CAP6002	Computer Vision Lab	0	0	2	1	50	-	50	-
5.	CAT6003	Program Elective-2	3	0	0	3	50	50	100	3 Hrs.
6.	CAP6003	Program Elective-2 Lab	0	0	2	1	50	-	50	-
7.	CAT6004	Program Elective-3	3	0	0	3	50	50	100	3 Hrs.
8.	CAP6004	Program Elective-3 Lab	0	0	2	1	50	-	50	-
9.	CAT6005	Internet of Things	2	0	0	2	50	50	100	2 Hrs.
10.	CAP6006	Mini Project	0	0	4	2	25	25	50	-
		TOTAL	**14**	**0**	**12**	**20**			**750**	

Exit option : Award of UG Degree in Major with 131 credits and an additional 8 credits			
Exit Courses			
1	Certified Network Engineer (CCNA,CISCO)	Online/offline certification Course	8
2	Certified Database Engineer (Oracle, DB2)		8
3	Certified Cloud Engineer (AWS, AZURE)		8
4	Certified AIML Engineer		8
5	Certified Data Science Engineer		8

Teaching Scheme for Bachelor of Technology
B. Tech. CSE (Artificial Intelligence and Machine Learning)

(Semester - VII)

Sr. No.	Course Code	Course Name	Hours/Week			Credits	Maximum marks			ESE Exam Duration (Hrs.)
			L	T	P		Continuous Assessment	End Sem Exam	Total	
1.	CAT7001	Deep Learning-II	3	0	0	3	50	50	100	3 Hrs.
2.	CAP7001	Deep Learning-II Lab	0	0	2	1	50	-	50	-
3.	CAT7002	Cloud Computing	3	0	0	3	50	50	100	3 Hrs.
4.	CAP7002	Cloud Computing Lab	0	0	2	1	50	-	50	-
5.	CAT7003	Data Analytics & Visualization	1	0	0	1	50	-	50	-
6.	CAP7003	Data Analytics & Visualization Lab	0	0	2	1	50	-	50	-
7.	CAT7004	Program Elective-4	3	0	0	3	50	50	100	3 Hrs.
8.	CAT7005	Robotics and Intelligent Systems	2	0	0	2	50	50	100	2 Hrs.
9.	CAP7006	Major Project-1	0	0	8	4	50	50	100	-
		TOTAL	**12**	**0**	**14**	**19**			**700**	

(Semester - VIII)

Sr. No.	Course Code	Course Name	Hours/Week			Credits	Maximum marks			ESE Exam Duration (Hrs.)
			L	T	P		Continuous Assessment	End Sem Exam	Total	
1.	CAT8001	Program Elective-5	3	0	0	3	50	50	100	3 Hrs.
2.	CAT8002	Program Elective-6	3	0	0	3	50	50	100	3 Hrs.
3.	CAP8003	Major Project-2	0	0	12	6	50	50	100	-
		OR								
1.	CAT8001	Program Elective-5	3	0	0	3	50	50	100	3 Hrs.
2.	CAT8004	Research Methodology	3	0	0	3	50	50	100	2 Hrs.
3.	CAT8005	Research Project	0	0	12	6	50	50	100	-
		OR								
1.	INTR-801	Industry Internship	0	0	24	12	100	100	200	-

Teaching Scheme for Bachelor of Technology
B. Tech. CSE (Artificial Intelligence and Machine Learning)

Electives Basket

Elective-I	Elective-II	Elective-III	Elective-IV	Elective-V	Elective-VI
Software Engineering	Natural Language Processing	Customer Relationship Management	Big Data Analytics	Human Computer Interaction	Financial Analysis
Design Pattern	Data Mining and Warehousing	Software Testing	Reinforcement Learning	Generative Adversarial Network	Time Series Analysis
Robotic Process Automation	Compiler Design	Blockchain Technology	System Design	Information Retrieval	Edge Computing

List of Open Electives

Sr. No.	Subject Code	Name of Subject
Open Elective-I	CAT3006	Statistical Computing with R
Open Elective-II	CAT4007	Fundamentals of Machine Learning
Open Elective-III	CAT5006	Big Data Analytics

Syllabus for Semester I, B. Tech - Computer Science & Engineering (Artificial Intelligence and Machine Learning)

Course Code : CHT1001 **Course : Chemistry of Smart Materials**

L: 2 Hrs, T: 0 Hr, P: 0 Hr, Per Week **Total Credits : 2**

Course Outcomes

On successful completion of course student will learn:

1. Classify and explain the different types of sensors for various applications.
2. Discuss unique properties of nano-materials to solve challenges in our life and applications in computational world.
3. Discuss how spectroscopic methods are used for qualitative and quantitative analysis.
4. Analyze the utilization of green computing technology for environmental issues

Unit - I : Smart Sensors and Materials

RFID and IONT materials: Synthesis, properties and applications in logistic information, intelligent packaging systems (Graphene oxide, carbon nanotubes (CNTs) and polyaniline). Sensors: Introduction, types of sensors (Piezoelectric and electrochemical), nanomaterials for sensing applications (Strain sensors, gas sensor, biomolecules and volatile organic compounds).

Unit - II : Nanomaterials

Introduction, classification, size dependent properties, surface area, optical and catalytic properties, Synthesis methods of nanomaterials- Top down and bottom-up approach.

Carbon nanomaterials: Types, properties and applications of CNT and graphene. Applications of nano materials.

Unit - III : Characterization Techniques and computational tools:

Fundamentals of spectroscopy, Electronic Spectroscopy, Nuclear Magnetic Resonance Spectroscopy. Basics of Nuclear magnetic resonance quantum computer Synthesis of drugs, basic soft-wares for bio-chemical assessment of drugs.

Unit - IV : Green Computing and Chemistry

E-wastes- Types, environmental and health risks, segregation and recycling (Hydrometallurgical, pyrometallurgical and direct recycling), Extraction of precious metals from e-wastes, Twelve principles of Green Chemistry. Green Computing, Role of Green Computing in Environment and Research, Green devices and Green data Servers.

Text Books

1. Shikha Agrawal, Engineering Chemistry: Fundamentals and Applications, Cambridge University Press.
2. Dr. Rajshree Khare, A Textbook of Engineering Chemistry (AICTE), S.K. Kataria & Sons.
3. S. S. Dara, A Textbook of Engineering Chemistry, S. Chand Publications.
4. A. K. Das and M. Das, An introduction to nanomaterials and nanoscience, CBS Publishers and Distributors
5. M Afshar Alam, Sapna Jain, Hena Parveen, Green Computing Approach Towards Sustainable Development, Wiley Interscience Publications.
6. Sensor & transducers, D. Patranabis, 2nd edition, PHI

Reference Books

1. E-waste recycling and management: present scenarios and environmental issues, Khan, Anish, and Abdullah M. Asiri. 2019, Springer, Vol. 33. ISBN: 978-3-030-14186-8.
2. Hans-Eckhardt Schaefer, Nanoscience: The Science of the Small in Physics, Engineering, Chemistry, Biology and Medicine, Springer-Verlag Berlin Heidelberg.

Syllabus for Semester I, B. Tech - Computer Science & Engineering (Artificial Intelligence and Machine Learning)

Course Code : CHP1001 **Course : Chemistry of Smart Materials Lab**

L: 0 Hrs, T: 0 Hr, P: 2 Hr, Per Week **Total Credits : 1**

The Chemistry laboratory course will consist of experiments illustrating the principles of chemistry relevant to the study of science and engineering.

Course Outcomes

The students will learn to:

1. Apply the fundamental principles of measurement and skills in preparation and handling of hazardous chemicals and interpret the statistical data related to measurements.
2. Estimate the rate constants of reactions and order of the reaction and/or to validate adsorption isotherms.
3. Use of various computational tools for analysis of different spectral properties and bio-activities.

List of Experiments

[1] Preparation of different Solutions: Molar solution, Normal solution and percent solution and Determination of concentration.

[2] Demonstration of Handling of hazardous chemicals, MSDS (material safety data sheet), waste minimization strategies and chemical waste disposal.

[3] Basic statistical analysis of results of neutralization of acid against the base and preparing acceptable graphs using software.

[4] Prediction of infrared/NMR spectral and analytical data of organic molecules using Computational Software.

[5]. Spectroscopic/Colorimetric determine of wavelength of maximum absorption of chemical/biological compound in solution and determination of concentration using Lambert-Beer's Law.

[6] To study chemical kinetics of peroxydisulphate and iodide ions reactions and to find out order of the reaction and analysis of experimental data using Computational Software.

[7] Molecular docking of drugs using open computational software.

[8] Determination of rate of the reaction at room temperature and analysis of experimental data using Computational Software

[9] Use of open access software for the interpretation of various parameters of materials including drugs

[10] Estimation of Copper from PCB

Suggested Books/Reference Books

(1) S. S. Dara, A Textbook on Experiments and Calculations in Engineering Chemistry, S. Chand Publications.

(2) J. B. Yadav, Advanced Practical Physical Chemistry, Krishna's Prakashan Media (P) Limited.

(3) A. J. Elias, Collection of Interesting General Chemistry Experiments, Universities Press Publications.

(4) V. K. Ahluwalia, S. Dhingra and A. Gulati, College Practical Chemistry, Universities Press Publications.

(5) Ashutosh Kar , Advanced Practical Medicinal Chemistry, New Age International Publisher.

Suggested Reference Books

(1) David Young, Computational Chemistry: A Practical Guide for Applying Techniques to RealWorld Problems, Wiley Interscience Publications

Syllabus for Semester I, B. Tech - Computer Science & Engineering (Artificial Intelligence and Machine Learning)

Course Code : MAT1002 **Course : Calculus**

L: 3 Hrs, T: 0 Hr, P: 0 Hr, Per Week **Total Credits : 3**

Course Objective

The objective of this course is to familiarize the prospective engineers with techniques in Calculus. It aims to equip the students with standard concepts and tools at an intermediate to advanced level that will serve them well towards tackling more advanced level of mathematics and applications that they would find useful in their disciplines.

Course Outcomes

On successful completion of the course, student shall be able to

1. Apply the concepts of continuity and differentiability to find Taylor's and Maclaurin series.
2. Understand the methods of partial derivatives and apply these concepts to determine extreme values of the functions of two variables.
3. Demonstrate the basic knowledge of vector differentiation and line integral.
4. Understand proper and improper integrals and use it find area, length, volume and surface of revolution
5. Internalize convergence of sequences and apply it to determine whether infinite series convergent or divergent with appropriate tests.

Syllabus

Module - 1 : (8 Lectures)

Differential Calculus: Functions of single variable: Review of limit, continuity and differentiability. Mean value theorems: Rolle's theorem, Lagrange's theorem, Cauchy's theorem, Taylor's theorem, Taylor's and Maclaurin series.

Module - 2 : (8 Lectures)

Partial Differentiation : Partial derivatives, Euler's Theorem, chain rule, total derivative, Jacobians, Maxima, Minima for the functions of two variables.

Module - 3 : (8 Lectures)

Vector Calculus : Scalar and vector fields, gradient of scalar point function, directional derivatives, divergence and curl of vector point function, Line integral.

Module - 4 : (8 Lectures)

Integral Calculus : Fundamental theorem of Integral calculus, mean value theorems, evaluation of definite integrals, applications in area, length, volumes and surface of solids of revolutions, Improper integrals: Beta and Gamma functions.

Module - 5 : (8 Lectures)

Infinite series : Sequences, Infinite series of real and complex numbers, Cauchy criterion, tests of convergence, absolute and conditional convergence, uniform convergence, power series, radius of convergence.

Textbooks/References

1. Erwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
2. Veerarajan T., Engineering Mathematics for first year, Tata McGraw-Hill, New Delhi, 2008.
3. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2010.
4. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 35th Edition, 2000.
5. Ramana B.V., Higher Engineering Mathematics, Tata McGraw Hill New Delhi, 11th Reprint, 2010.
6. P. N. Wartikar and J. N. Wartikar, A text book of Applied Mathematics Volume I & II, Pune Vidhyarthi Griha Prakashan, Pune-411030 (India).

Syllabus for Semester I, B. Tech - Computer Science & Engineering (Artificial Intelligence and Machine Learning)

Course Code : CAT1001 **Course : Digital Electronics**

L: 3 Hrs, T: 0 Hr, P: 0 Hr, Per Week **Total Credits : 3**

Course Objectives

The objective of this course is to familiarize the prospective engineers with:

1. Logic functions using Boolean algebraic theorems and techniques
2. Conventional combinational and sequential circuits including conversions of flip-flops.
3. The exploration of the semiconductor memories and programmable logic devices.
4. The basic concept of microprocessor with addressing mode and instruction set for programming.

Course Outcomes

After successful completion of this course, the student will be able to,

1. Outline binary arithmetic operations and optimize Boolean functions using Karnaugh map (k-map) method.
2. Apply combinational circuits for realization of basic building blocks of conventional digital circuits.
3. Design sequential blocks like flip flops, counters, registers, simple finite state machine and similar circuits.
4. Describe the memory elements and combinational digital circuits implementation with programmable logic devices.
5. Use addressing modes and instruction set of target microprocessors for writing efficient assembly language programs.

Syllabus

Unit - I : Basics of Digital Electronics

Motivation for digital systems: Logic and Boolean algebra, Number Systems. Logic Gates & Truth Tables, Demorgan's law, Minimization of combinational circuits using Karnaugh maps up to five variables. Map manipulation-essential prime implicants, non-essential prime implicants.

Unit - II : Combinational Circuit Design

Design procedure: Multiplexers, Demultiplexer, Encoders, Decoders, Code Converters, Adders, Subtractor (Half, Full), BCD Adder/ Subtractor, ripple and carry look-ahead addition booth's Algorithm, bit-pair recoding, Integer Division- restoring and non-restoring division.

Unit - III : Sequential circuit Design-I

Storage elements, Flip-flops and latches: D, T, J/K, S/R flip-flops. Master Slave Conversion of one of type of F/F to another Sequential circuit. Analysis –Input equations, state table, and analysis with J-K Flip flops. Sequential circuit Design, Design procedure, designing with D & J-K Flip flop.

Unit - IV : Sequential circuit Design-II

Counters, asynchronous and synchronous design using state and excitation tables. Registers & Shift registers., Mealey & Moore Machines

Unit - V : Memory & Programmable logic Devices

Semiconductor RAM memories, Static and Dynamic Memories, ROM, higher order memory design, multi-module memories, Memory interleaving, , Secondary storage – Magnetic disk, Optical disk, PLA, PAL.

Unit - VI : Fundamental of Microprocessor

Introduction to μp 8085, Addressing modes, Instruction set, Programming of μp 8085.

Text Books

1. Morris Mano; Digital Logic Design; Fourth edition, McGraw Hill
2. R.P .Jain; Modern Digital Electronic; Fourth edition; Tata McGraw-Hill.
3. V.J.Vibhute; 8-Bit Microprocessor & Microcontrollers; fifth edition.

Reference Books

1. A. Anand Kumar; Fundamental of Digital Electronics; Second Edition, PHI
2. A.P. Godse; Digital circuit & design; Technical Publications; 2009.
3. Ramesh Gaonkar; 8 bit Microprocessor; CBS Publishers; 2011.

Syllabus for Semester I, B. Tech - Computer Science & Engineering (Artificial Intelligence and Machine Learning)

Course Code : CAP1001 **Course : Digital Electronics Lab**

L: 0 Hrs, T: 0 Hr, P: 2 Hr, Per Week **Total Credits : 1**

Course Outcome

On Successful completion of course, students will be able to:

1. Use logic gates for designing digital circuits
2. Implement combinational circuits using VHDL
3. Implement sequential circuits using VHDL
4. Apply the knowledge gained for their project work based on the hardware digital circuits

Practical based on above theory syllabus

Syllabus for Semester I, B. Tech - Computer Science & Engineering (Artificial Intelligence and Machine Learning)

Course Code: CAT1002 **Course : Programming for Problem Solving**

L: 3 Hrs, T: 0 Hr, P: 0 Hr, Per Week **Total Credits : 3**

Course Outcomes

On successful completion of course student will learn:

1. Create C programs using loops and decision-making statements to solve and execute the given problem.
2. Develop programs and functions one dimensional and two-dimensional arrays.
3. Apply the concept of pointers, structures to develop programs.
4. Implement files in C to store the data for the given problem.

Unit - I : Introduction to Programming

Introduction to components of a computer system (disks, memory, processor, where a program is stored and executed, operating system, compilers etc.)Idea of Algorithm: Steps to solve logical and numerical problems. Representation of Algorithm: Flowchart /Pseudo code with examples. Arithmetic expressions and precedence

Unit - II : C Programming Language

Introduction to C language: Keywords, Constant, Variable, Data types, Operators, Types of Statements, Pre-processor Directives, Decision Control Statement-if, if-else, nested if-else statement, switch case, Loops and Writing and evaluation of conditionals and consequent branching.

Unit - III : Arrays and Basic Algorithms

Arrays: 1-D, 2-D, Character arrays and Strings. Searching, Basic Sorting Algorithms (Bubble, Insertion and Selection), Finding roots of equations, notion of order of complexity through example programs (no formal definition required)

Unit - IV : Functions and Recursion

User defined and Library Functions, Parameter passing in functions, call by value, passing arrays to functions: idea of call by reference. Recursion: As a different way of solving problems. Example programs, such as Finding Factorial, Fibonacci series, Ackerman function etc. Quick sort or Merge sort.

Unit - V : Pointers and Structures

Structures, Defining structures, Array of Structures, Introduction to pointers, Defining pointers, Pointer arithmetic, pointer operators, Use of Pointers in self-referential structures, notion of linked list (no implementation)

Unit - VI : File handling

Streams in C, Types of Files, File Input/ Output Operations: Modes of file opening, Reading and writing the file, Closing the files, using fflush ().

Text Books

1. Programming in ANSI C: E. Balguruswami McGraw Hill
2. Mastering C: K. R. Venugopal and S. R. Prasad, Tata McGraw Hill

Reference Books

1. Programming with C: Byron Gottfried, Schaums Outline Series.
2. Let Us C: Yashwant Kanetkar, BPB Publication

Syllabus for Semester I, B. Tech - Computer Science & Engineering (Artificial Intelligence and Machine Learning)

Course Code: CAP1002 **Course : Programming for Problem Solving Lab**

L: 0 Hrs, T: 0 Hr, P: 2 Hr, Per Week **Total Credits : 1**

Course Outcomes

On successful completion of course student will be able to:

1. Create C programs using loops and decision making statements to solve and execute the given problem.
2. Develop programs and functions one dimensional and two dimensional arrays.
3. Apply the concept of pointers, structures to develop programs.
4. Implement files in C to store the data for the given problem.

Practical based on above theory syllabus

Syllabus for Semester I, B. Tech - Computer Science & Engineering (Artificial Intelligence and Machine Learning)

Course Code: CAT1003 **Course : Computer Workshop-I**

L: 1 Hrs, T: 0 Hr, P: 0 Hr, Per Week **Total Credits : 1**

Course Objectives

1. Understand the definition and principles of UI/UX in order to design with intention.
2. Achieve an understanding of the life-cycle of application design the process, purpose, and tools.
3. Learn the basics of HCI (human-computer interaction) and the psychology behind user decision-making.
4. Explore UI/UX tools to interpret requirements of modern applications.
5. Elaborate design decisions through presentations of assignments.

Course Outcomes

On successful completion of the course, students will be able to:

1. Understand basics of UI/UX
2. Design and develop web pages using HTML, CSS and JavaScript
3. Infer the significance of Wire framing and build prototypes.

Unit - 1 : UI/UX Overview

Introduction to UI/UX, Principles of UI/UX, UI Components, Design Thinking, Interaction Design, Usability.

Unit - 2 : UI Programming

Basic of HTML5, Elements of HTML5, Background of CSS, Bootstrap CSS, Fundamentals of JavaScript, HTML DOM Manipulations.

Unit - 3 : UX Programming

Figma Basics, How to identify user needs, Wireframe and Prototype, Digital Storytelling.

Text Books

1. UI/UX design for designer and developers: by Nathan Clark
2. Web Design: A Beginner's Guide Second Edition by Wendy Willard
3. User story mapping by Jeff Patton, O'Reilly Publication

Syllabus for Semester I, B. Tech - Computer Science & Engineering (Artificial Intelligence and Machine Learning)

Course Code: CAP1003 **Course : Computer Workshop-I Lab**

L: 0 Hrs, T: 0 Hr, P: 2 Hr, Per Week **Total Credits : 1**

Course Objectives

1. Understand the definition and principles of UI/UX in order to design with intention.
2. Achieve an understanding of the life-cycle of application design—the process, purpose, and tools.
3. Learn the basics of HCI (human-computer interaction) and the psychology behind user decision-making.
4. Explore UI/UX tools to interpret requirements of modern applications.
5. Elaborate design decisions through presentations of assignments.

Course Outcomes

On successful completion of the course, students will be able to:

1. Design and develop static web pages using HTML and CSS
2. Develop dynamic web pages using JavaScript
3. Create high-fidelity designs and prototypes in Figma

Syllabus

Practical based on Theory Syllabus

Syllabus for Semester I, B. Tech - Computer Science & Engineering (Artificial Intelligence and Machine Learning)

Course Code : HUT1001 **Course : Foundational Literature of Indian Civilization**

L: 2 Hrs, T: 0 Hr, P: 0 Hr, Per Week **Total Credits : 2**

Course Outcome

At the end of the course the students will be able to achieve the following:

CO1 : Understand the Indian knowledge system and its scientific approach

CO2 : Get introduced to the Vedic corpus and recognize the multi-faceted nature of the knowledge contained in the Vedic corpus

CO3: Understand the salient features of the philosophical systems of the Vedic and non-Vedic schools

CO4: Develop a basic understanding of the ancient wisdom recorded in various Indian literary work

Syllabus

Unit - 1 : Overview of Indian Knowledge System

Importance of ancient knowledge, defining IKS, IKS classification framework, Historicity of IKS, Some unique aspects of IKS.

Unit - 2 : The Vedic corpus

Introduction of Vedas, four Vedas, divisions of four Vedas, six Vedangas, Distinct features of Vedic life.

Unit - 3 : Indian Philosophical systems

Development and unique features, Vedic schools of philosophy, Samkhya and Yoga School of philosophy, Nayay and Vaisesika school of philosophy, Purva-mimamsa and Vedanta schools of Philosophy, Non-vedic philosophies: Jainism, Buddhism, and other approaches

Unit - 4 : Indian wisdom through ages

Panchtantras, Purans: contents and issues of interests, Itihasa: uniqueness of the two epics (Ramayan and Mahabharata), Key issues and messages from Ramayana, Mahabharata – a source of worldly wisdom;

Indian ancient Sanskrit literature: Kalidas, Vishakadutta, Bhavbhuti, Shudraka**any one text as decided by the course teacher

Reference Material

1. B. Mahadevan, Vinayak Rajat Bhar, Nagendra Pavana R. N., "Introduction to Indian Knowledge System: Concepts and Applications" PHI, 2022
2. S.C. Chatterjee and D.M. Datta, An introduction to Indian Philosophy, University of Calcutta, 1984

Syllabus for Semester I, B. Tech - Computer Science & Engineering (Artificial Intelligence and Machine Learning)

Course Code : PET1001 | **Course : Sports-Yoga-Recreation**
L: 1 Hrs, T: 0 Hr, P: 0 Hr, Per Week | **Total Credits : 1**

Course Code : PEP1001 | **Course : Sports-Yoga-Recreation**
L: 0 Hrs, T: 0 Hr, P: 2 Hr, Per Week | **Total Credits : 1**

Aim of the Course

The course aims at creating awareness about the fundamentals of Physical Education, Sports, Yoga, Recreation and its effectiveness to promote Health and wellness through Healthy Lifestyle.

Course Objectives

1. To impart the students with basic concepts of Sports, Yoga and Recreational activities for health and wellness.
2. To familiarize the students with health-related Exercise and evaluate their Health-related Fitness.
3. To make Overall growth & development with team spirit, social values and leadership qualities among students through various sports, games and Yogic activities.
4. To create Environment for better interaction and recreation among students as neutralizer for stress through various minor and recreational games.

Course Outcomes

On completion of the course, students will be able to:

1. Understand fundamental skills, basic principle and practices of sports and Yoga.
2. Practically learn the principles of implementing general and specific conditioning of physical exercises and yoga.
3. Develop Health-related fitness and Body-mind co-ordination through various fitness activities, sports, recreational games and yoga.
4. Practice Healthy & active living with reducing Sedentary Life style.

Course Content

Unit - 1 : Theory : Introduction

- Meaning, Definition and Importance of Health & Wellness
- Dimensions of Health and Wellness
- Factors influencing Health and Wellness
- Physical Fitness, Nutrition, Habits, Age, Gender, Lifestyle, Body Types

- Health & Wellness through Physical Activities, Sports, Games, Yoga and Recreation activities
- Causes of Stress & Stress relief through Exercise and Yoga
- Safety in Sports

Unit - 2 : Practical- Exercises for Health and Wellness

- Warm-Up and Cool Down - General & Specific Exercises
- Physical Fitness Activities
- Stretching Exercises
- General & Specific Exercises for Strength, Speed, Agility, Flexibility, coordinative abilities
- Cardiovascular Exercises
- Assessment of BMI
- Relaxation techniques
- Physical Efficiency Tests

Unit - 3 : Yoga

- Shukshma Vyayam
- Suryanamaskar
- Basic Set of Yogasanas – Sitting, standing, supine and prone position
- Basic Set of Pranayama & Meditation

References

1. Russell, R.P. (1994). Health and Fitness Through Physical Education. USA: Human Kinetics.
2. Uppal, A.K. (1992). Physical Fitness. New Delhi: Friends Publication.
3. AAPHERD "Health related Physical Fitness Test Manual."1980 Published by Association drive Reston Virginia
4. Kumar, Ajith. (1984) Yoga Pravesha. Bengaluru: Rashtrothanna Prakashana.
5. Dr. Devinder K. Kansal, A Textbook of Test Evaluation, Accreditation, Measurements and Standards (TEAMS 'Science)

Syllabus for Semester II, B. Tech - Computer Science & Engineering (Artificial Intelligence and Machine Learning)

Course Code : PHT2001 **Course: Introduction to Quantum Computing**

L: 2 Hrs, T: 1 Hr, P: 0 Hr, Per Week **Total Credits : 3**

Course Objectives

1. To introduce the fundamentals of quantum computing to students
2. The problem-solving approach using finite dimensional mathematics

Course Outcomes

After successful completion of the course, the students will be able to -

1. Use the basic quantum theory relating to the probabilistic behaviour of an electron in an atom.
2. Utilize the knowledge of complex vector space in the domain of quantum theory.
3. Analyse classical and quantum approach towards the quantum computation.
4. Classify deterministic and probabilistic systems and analyse quantum observations and quantum measurements.
5. Use quantum gates in building architecture and quantum algorithms.

Module - 1 : Basic Quantum Theory

Brief introduction about Quantum Computers and Quantum mechanics, Wave nature of Particles, Bohr's quantization condition, Heisenberg's Uncertainty principle, Wave function, probability, Schrodinger's wave equation, Operators, Electron in an infinite potential well, Eigen value and Eigen functions.

Module - 2 : Complex Vector Spaces

Algebra and Geometry of Complex numbers, Real and Complex Vector Spaces, definitions, properties, Abelian group, Euler's formula, Dr Moivre's formula, Matrix properties.

Module - 3 : Linear Algebra in Quantum Computing

Basis and Dimensions, Inner products, Hilbert Spaces, Eigenvalues and Eigenvectors, Hermitian and Unitary Matrices, Tensor Product, Applications of linear algebra in computer graphics.

Module - 4 : Classical and Quantum Systems

Deterministic and Probabilistic Systems, Quantum Systems, Stochastic billiard ball, Probabilistic double slit experiment with bullet and photon, Superposition of states, assembling systems, Entangled states.

Module - 5 : Quantum representation of systems

Dirac notations, Stern-Gerlach experiment, transition amplitude, norm of the ket, Bloch Sphere, Observables, Spin matrices, commutator operator, expectation values, variance, standard deviation, Heisenberg's uncertainty principle in matrix mechanics, measuring, dynamics, observations.

Module - 6 : Architecture and Algorithms

Bits and Qubits, Classical Gates and their equivalent quantum representation, Reversible Gates: CNOT, Toffoli, Fredkin, gates, outline of Pauli X, Y, Z gates, Hadamard gates, Deutsch Gate.

Quantum Algorithms: Deutsch's algorithm, Grover's search algorithm.

Applications of quantum computing in Cryptography, Quantum teleportation, Cybersecurity, banking, finance, advance manufacturing and artificial intelligence.

Text Book

1. Quantum computing for computer scientists, Noson S. Yanofsky, Mirco A. Mannucci, Cambridge University Press 2008
2. Introduction to Quantum Mechanics, 2nd Edition, David J. Griffiths, Prentice Hall New Jersey 1995

Reference Books

1. Quantum computing explained, David McMahon, Wiley-interscience, John Wiley & Sons, Inc. Publication 2008
2. Quantum computation and quantum information, Michael A. Nielsen and Isaac L. Chuang, Cambridge University Press 2010

Syllabus for Semester II, B. Tech - Computer Science & Engineering (Artificial Intelligence and Machine Learning)

Course Code : PHP2001 **Course: Quantum Computing Lab**

L: 0 Hrs, T: 0 Hr, P: 2 Hr, Per Week **Total Credits : 1**

Course Outcomes

The physics laboratory will consist of experiments and programming exercises illustrating the principles of quantum physics and quantum computing relevant to the study of computer science and engineering.

On completion of the course, the students will be able to

1. Develop skills required for experimentation and verification of physics laws.
2. Utilise Mathematica software for graph plotting and for least squares fitting of the experimental data.
3. Compare the properties of real and complex matrices with reference to their use in quantum system.
4. Apply the computational methods to solve eigenvalues and eigenfunctions, tensor products.
5. Simulate classical and quantum gates.

List of Experiments

1. Introduction to IBM quantum computer.
2. Simulation of classical gates by quantum representation of the gates and inputs.
3. Arithmetic operations using IBM Quantum computer.
4. Simulation of quantum gates: CNOT gate, Toffoli gate, Fredkin gate, Hadamard gate on IBM quantum computer.
5. Linear and Nonlinear data fitting by least squares fit method
6. Working with Vectors.
7. Working with Matrices: Real and Complex numbers.
8. Eigen values, Eigen functions, Properties of Inner Product and Unitary Matrices, Tensor Product.
9. Verification of Ohm's law and error analysis of the data using Linear Least Square Fit (LLSF) method.
10. Analysis of energy values and wave function using Mathematica software

Reference Books

1. Lab manual prepared by Physics Department, RCOEM, Nagpur

Syllabus for Semester II, B. Tech - Computer Science & Engineering (Artificial Intelligence and Machine Learning)

Course Code : MAT2002 **Course: Discrete Mathematics**

L: 3 Hrs, T: 0 Hr, P: 0 Hr, Per Week **Total Credits : 3**

Course Objective

The objective of this course is to expose student to understand the basic importance of Logic, Number theory, Algebraic structures like groups and Field, combinatory and graph theory in computer science and Information technology.

Course Outcomes

On successful completion of the course, student shall be able to

1. Formulate problems and solve recurrence relations
2. Apply techniques of number theory to solve problems from linear congruence's, coding theory etc. in cryptography.
3. Internalize logical notations to define and reason about fundamental mathematical concepts and use it derive logical inference.
4. Apply groups and fields in coding theory.
5. Understand the Lattice as algebraic structure and use it for pattern recognition and in cryptography.

Syllabus

Module - 1 : (9 Lectures)

Combinatorics: Addition and multiplication rule in combinatorics, Linear and Circular permutation, Combination, Binomial Identities, Inclusion and Exclusion Principle, distribution Principle, recurrence relations, generating function, examples using ordinary power series and exponential generating functions.

Module - 2 : (8 Lectures)

Modular Arithmetic: Modular Arithmetic, Euclid's Algorithm, primes, Fermat's theorem, Euler's theorem, Diophantine equations, Linear congruence's, Chinese Remainder theorem, application to Cryptography.

Module - 3 : (7 Lectures)

Mathematical Logic : Statement and notations, connectives, Negation, conjunction, disjunction, conditional & bi-conditional statement. Tautologies, equivalence of formulas, Duality law, Tautological implications, Theory of inference for statement calculus.

Module - 4 : (9 Lectures)

Groups and Fields : Group definitions and examples, cyclic group, permutation groups, subgroups and homomorphism, co-sets, Lagrange's theorem and Normal subgroup, Error correcting codes, Hamming codes. Finite field, Galois field.

Module - 5 : (7 Lectures)

Lattice theory : Lattices as partially ordered set, Properties of Lattice, Lattices as algebraic system, sub lattices, direct product, homomorphism, some special Lattices.

Text Books

1. Discrete Mathematical Structures with Applications to Computer Science: J. P. Tremblay and R. Manohar, Tata McGraw-hill.
2. Discrete Mathematics: Babu Ram, Pearson Publication.
3. Combinatorial Mathematics: C. L. Liu & D. P. Mohapatra, 3rd edition, Tata McGraw-hill.
4. David M Burton, 'Elementary Number Theory', McGraw Hill, Seventh edition 2014.

Reference Books

1. Foundations of Discrete Mathematics: K. D. Joshi, New age international Publication.
2. Discrete Mathematics: Kolman, Busby & Ross, Pearson Publication.

Syllabus for Semester II, B. Tech - Computer Science & Engineering (Artificial Intelligence and Machine Learning)

Course Code : MAP2001 **Course : Computational Mathematics Lab**

L: 0 Hrs, T: 0 Hr, P: 2 Hr, Per Week **Total Credits : 1**

Course Objectives

The computational Mathematics Lab course will consist of experiments demonstrating the principles of Mathematics relevant to the study of Science and Engineering. Students will show that they have learnt Laboratory skills that will enable them to properly acquire and analyze the data in the lab and draw valid conclusions.

Course Outcomes

By using open source software SageMath Students will be able to

CO1: Download SageMath and use it as an advance calculator.

CO2: Sketch and analyze function graphs.

CO3: Apply the concepts of differential calculus to find extreme value of continuous functions and analyze solutions of difference equations

CO4: Evaluate improper integrals and its applications to find length, area, volume, centre of gravity and mass.

CO5: Understand and Analysis Data inscription standards.

CO6: Analyze the data to find best fit curve.

Mapping of Course outcomes (COs) with Experiments

Exp. No.	Name of Experiments	Mapped COs
1	To use SageMath as advanced calculator	CO1
2	2D Plotting with SageMath	CO2
3	3D Plotting with SageMath	CO2
4	Differential Calculus with SageMath	CO3
5	Solution of difference equations in SageMath	CO3
6	To Learn Cryptography by using SageMath	CO5
7	Curve Fitting by using SageMath	CO6
8	Integral Calculus with SageMath	CO4

Syllabus for Semester II, B. Tech - Computer Science & Engineering (Artificial Intelligence and Machine Learning)

Course Code : CHT2007 **Course : Bioinformatics**

L: 2 Hrs, T: 0 Hr, P: 0 Hr, Per Week **Total Credits : 2**

Course Outcomes

After the successful completion of the course, students shall be able to

CO1: Explain the functioning of various metabolic processes in the human body.

CO2: Acknowledge the importance of metabolic simulations in drug discovery,

CO3: Explain the functioning of various types of the drugs for therapeutic applications.

CO4: Use knowledge of bioinformatics for basic formulation of drug design

Unit - I : Introduction to Biomolecules Carbohydrates

Introduction and classification Amino Acid: Chemistry properties and metabolism.

Proteins: primary, Secondary, tertiary and quaternary structure,

Lipids: Chemistry, Metabolism of fatty acids, Phospholipids, Cholesterol regulation of metabolism. Nucleic Acid: Chemistry of DNA and RNA, Vitamins: Structure and functions of some vitamins.

Unit - II : Introduction to bioinformatics

Introduction, Biological data: Sequence, gene expression, pathways and molecular interaction: Data bases: Sequence, Gene bank, Dogmass- central and peripheral, The standard genetic code, applications.

Unit -III Drug and Data Bases

Drug and Data bases: Introduction, classification of drugs, Drug Solubility/permeability, Drug Likeness Introduction to metabolic engineering and systems biology, role of metabolic simulations in drug discovery.

Unit - IV : Computer Aided Drug Design

Introduction to molecular docking, rigid docking, flexible docking, 3D pharmacophore, 3D data base searching and virtual searching, pharmacophore modelling, brief introduction about various online tools for drug designing and molecular docking.

Text Books

1. Upadhayay, K. Upadhayay, N. Nath, Biophysical Chemistry (Principles and Techniques), Himalaya Publishing House, 2009.
2. David L. Nelson and Michael M. Cox, Lehninger Principles of Biochemistry, Fifth Edition, W. H. Freeman and Company, New York, 2008.

3. Young David. Computational drug design: A Guide for Computational and Medicinal Chemists. Publisher: Wiley. 2009. ISBN: 9780470126851

Reference Books

1. Bioinformatics: Sequence and Genome Analysis, Mount. D. W, CSHL Press, New York 2nd Edition 2004.
2. Introduction to Bioinformatics by Arthur M. Lesk University of Cambridge, Published in the United States by Oxford University Press Inc., New York
3. Introduction to Computational Biology: Maps, Sequences and Genomes, Waterman, M., Chapman and Hall, 1995.
4. Abraham, Donald (Ed). Burger's medicinal chemistry and drug discovery. Publisher: John Wiley & Sons, Inc. 2003. ISBN: 0471270903
5. Schlick, T. Molecular modelling and simulation: an interdisciplinary guide. Publisher: Springer. 2002. ISBN: 0-387-95404-X
6. Leach, Andrew. Molecular Modelling: Principles and Applications. Publisher: Prentice Hall. 2001. ISBN: 0582239338.
7. Jensen, Jan H. Molecular Modeling Basics. Publisher: CRC Press. 2010. ISBN: 978- 1420075267
8. Hinchliffe Alan. Molecular modelling for beginners. Publisher: John Wiley and Sons Ltd. 2008. ISBN: 978 0470513149

E- Text Book

1. Computer Aided Drug Design by Prof. Mukesh Doble, Biotechnology, IIT, Madras (Swayam NPTEL)

Syllabus for Semester II, B. Tech - Computer Science & Engineering (Artificial Intelligence and Machine Learning)

Course Code : CAT2001 **Course : Object Oriented Programming**

L: 3 Hrs, T: 0 Hr, P: 0 Hr, Per Week **Total Credits : 3**

Course Objectives

1. To make students understand Fundamental features of an object oriented language like Java: object classes and interfaces, exceptions and libraries of object collections
2. Introduce students with fundamental concepts like exception handling, generics, collection classes and streams.

Course Outcomes

On successful completion of the course, students will be able to:

1. Understand the object-oriented programming features, classes, objects and methods.
2. Develop efficient programs by implementing the concept of Inheritance, polymorphism exception handling.
3. Use the concept of generics, collections, streams to develop solution to the given problem.
4. Analyze characteristics and need of design pattern in software design process.

Syllabus

Unit - I

Features of Object-Oriented Programming languages, Abstraction, Encapsulation, Inheritance, polymorphism and late binding. Programming paradigms, Bytecode, JDK, JRE, JVM.

Concept of a class and object, ways of representing objects, access control of members of a class, instantiating a class, constructor.

Unit - II

Concept of overloading: Constructor Overloading, Function Overloading.

Arrays and Array of objects, Wrapper classes (Integer, Double etc.), String Class, creating packages, importing packages.

Lambda Expressions Introduction, Block, Passing Lambda expression as Argument

Unit - III

Concept of inheritance, methods of derivation, use of super keyword and final keyword in inheritance, run time polymorphism, abstract classes and methods, Interface, implementation of interface, static and non-static members.

Unit - IV

Exceptions, types of exception, use of try catch block, handling multiple exceptions, using finally, throw and throws clause, user defined exceptions, Introduction to streams, byte streams, character streams, file handling in Java, Serialization.

Unit - V

Generics, generic class with two type parameter, bounded generics.

Collection classes: Arraylist, LinkedList, TreeSet, HashMap, Iterator, ListIterator, Comparator, Comparable

Unit - VI

Introduction to Design Patterns, Need of Design Pattern, Classification of Design Patterns, Role of Design Pattern in Software design, Creational Patterns, Structural Design Patterns and Behavioral Patterns.

Text Books

1. Herbert Schildt; JAVA The Complete Reference; Ninth Edition, Tata McGraw- Hill Publishing Company Limited.
2. Design Patterns By Erich Gamma, Pearson Education

Reference Books

1. Paul Deitel, Harvey Deitel; Java 9 for Programmers; Pearson
2. Herbert Schildt and Dale Skrien; Java Fundamentals A Comprehensive Introduction; Tata McGraw- Hill Education Private Ltd 2013.

Syllabus for Semester II, B. Tech - Computer Science & Engineering (Artificial Intelligence and Machine Learning)

Course Code : CAP2001 **Course : Object Oriented Programming Lab**

L: 0 Hrs, T: 0 Hr, P: 2 Hr, Per Week **Total Credits : 1**

Course Objectives

1. To develop ability of students to implement basic concepts and techniques of object oriented programming paradigm like encapsulation, inheritance, polymorphism, exception handling.
2. Develop solution to problems using collection classes, generics, streams, multithreading.

Course Outcomes

On completion of the course the student will be able to

1. Develop the solutions using basic features of Object-Oriented Programming.
2. Design efficient and reusable solutions using inheritance and exception handling techniques.
3. Create and use type-safe object through generics and collection classes

Syllabus

Experiments based on above Syllabus.

Syllabus for Semester II, B. Tech - Computer Science & Engineering (Artificial Intelligence and Machine Learning)

Course Code : CAT2002 **Course : Computer Architecture**

L: 2 Hrs, T: 0 Hr, P: 0 Hr, Per Week **Total Credits : 2**

Course Objectives

The objective of this course is to familiarize the prospective engineers with:

1. Concepts of computer architecture by developing understanding of various functional units, components of computers and working of all the modules.
2. Design principles of modern computers including memory, bus system, input/output operation, interrupt handling mechanism and parallelization.

Course Outcomes

On Successful completion of course, students will be able to:

1. Demonstrate the understanding about the functional units of a digital computer system.
2. Execute complete instruction on different types of bus architectures with control signal generation.
3. Analyse memory, multiprocessor and multicore architectures and their implications in parallel computing.

Syllabus

Unit - I : Basic Structure of Computers

Functional units of computer, basic operational concepts- Instruction, processor and memory, operating steps, address, Big- and Little-endian assignments, Instructions set architecture of a CPU- Instruction Formats, Instruction sequencing, addressing modes, and instruction set classification, subroutine & parameter passing, expanding opcode, RISC and CISC.

Unit - II : Basic Processing Unit and Data Representation

Basic Concepts- Instruction execution, Bus architecture- One bus and Multi-bus, Execution of a Complete Instruction, sequencing of control signals, Hardwired control, Micro-programmed Control. Floating point numbers-representation, guard bits and rounding.

Unit - III : Memory & Input/output

Cache memory, Cache size vs. block size, mapping functions, replacement algorithms, Cache read/write policy, Virtual Memory, I/O mapped I/O and memories mapped I/O, interrupt and interrupt handling mechanisms, vectored interrupts, synchronous vs. asynchronous data transfer, Bus Arbitration, Direct Memory Access

Unit - IV : Pipelining

Basic concepts of pipelining, throughput and speedup, Introduction of Parallel Computing: SISD, MISD, SIMD, MIMD

Text Books

1. V. C. Hamacher, Z. G. Vranesic and S. G. Zaky; Computer Organisation; 5th edition; Tata McGraw Hill, 2002.
2. W. Stallings; Computer Organization & Architecture; PHI publication; 2001.
3. J. P. Hayes; Computer Architecture & Organization; 3rd edition; McGraw-Hill; 1998.

Reference Books

1. M Mano; Computer System and Architecture; PHI publication; 1993.
2. A. S. Tanenbaum; Structured Computer Organization; Prentice Hall of India Ltd.

Syllabus for Semester II, B. Tech - Computer Science & Engineering (Artificial Intelligence and Machine Learning)

Course Code : CAT2003 **Course : Computer Workshop-II**

L: 1 Hrs, T: 0 Hr, P: 0 Hr, Per Week **Total Credits : 1**

Course Objective

The objective of this course is to familiarize the students with an important web framework for developing user interfaces. It aims for developing high end web applications by the use of ReactJS features.

Course Outcomes

After successful completion of this course, the student will be able to,

1. Implement the fundamentals of React with Java Script and JSX
2. Understand Templating concept along with different types of components, props and state in React JS
3. Implement Router with React Router.

Course Contents

Unit - I : Introduction to React

React JS Introduction, Advantages of React JS, Introduction to JSX, Difference between JS and JSX.

Unit - II : Components in React

React Components overview, Types of components, Controlled, Split Up, Composable, Reusable, Component Declarations and Styling Components

State and it significance, Read state and set state, Passing data to component using props, Validating props using prop Types, Supplying default values to props using default Props

Unit - III : Routing with react router

Introduction to React Router, Routing in single page applications, Browser Router and Hash Router components Configuring route with Route component.

Text Books

1. Pure React- a step by step guide - Dave Ceddia
2. Road to learn react - Robin Wieruch
3. React in Action 1st Edition - Mark Tielens Thomas

Syllabus for Semester II, B. Tech - Computer Science & Engineering (Artificial Intelligence and Machine Learning)

Course Code : CAP2003 **Course : Computer Workshop-II Lab**

L: 0 Hrs, T: 0 Hr, P: 2 Hr, Per Week **Total Credits : 1**

Course Objective

The objective of this course is to familiarize the students with an important web framework for developing user interfaces. It aims for developing high end web applications by the use of ReactJS features.

Syllabus

Practical based on Theory Syllabus

Course Outcomes

After successful completion of this course, the student will be able to

1. Understanding the fundamentals of ReactJS including components, props, state, and lifecycle methods.
2. Design and implement complex applications by composing smaller, reusable components together.
3. Building Web Applications to create dynamic and interactive web applications using React and other related technologies like JSX and ES6.
4. Implement React Router to handle client-side routing and create single-page applications.

Syllabus for Semester II, B. Tech - Computer Science & Engineering (Artificial Intelligence and Machine Learning)

Course Code : HUT2002 **Course : English for Professional Communication**

L: 2 Hrs, T: 0 Hr, P: 0 Hr, Per Week **Total Credits : 2**

Course Objectives

The main objective of this course is to enhance the employability skills of students as well as prepare them for effective work place communication.

Course Outcomes

On successful completion of the course the students will be able to achieve the following:

CO1 : Demonstrate effective use of word power in written as well as oral communication.

CO2 : Understand the techniques of listening and apply the techniques of reading comprehension used in professional communication.

CO3 : Apply the principles of functional grammar in everyday as well as professional communication.

CO4 : Effectively implement the comprehensive principles of written communication by applying various writing styles.

CO5 : Create precise and accurate written communication products.

Unit - 1 : Vocabulary Building

1.1 Importance of using appropriate vocabulary

1.2 Techniques of vocabulary development

1.3 Commonly used power verbs, power adjectives and power adverbs.

1.4 Synonyms, antonyms, phrases & idioms, one-word substitutions and standard abbreviations

Unit - 2 : Listening and Reading Comprehension

2.1 Listening Comprehension: active listening, reasons for poor listening, traits of a good listener, and barriers to effective listening

2.2 Reading Comprehension: types and strategies.

Unit - 3 : Functional Grammar and Usage

3.1 Identifying Common Errors in use of: articles, prepositions, modifiers, modal auxiliaries, redundancies, and clichés

3.2 Tenses

3.3 Subject-verb agreement, noun-pronoun agreement

3.4 Voice

Unit - 4 : Writing Skills

4.1 Sentence Structures

4.2 Sentence Types

4.3 Paragraph Writing: Principles, Techniques, and Styles

Unit - 5 : Writing Practices

5.1 Art of Condensation: Précis, Summary, and Note Making

5.2 Correspondence writing techniques and etiquettes – academic writing

5.3 Essay Writing

Books

1. Communication Skills. Sanjay Kumar and PushpLata. Oxford University Press. 2011.
2. Practical English Usage. Michael Swan. OUP. 1995.
3. Remedial English Grammar. F.T. Wood. Macmillan.2007
4. On Writing Well. William Zinsser. Harper Resource Book. 2001
5. Study Writing. Liz Hamp-Lyons and Ben Heasly. Cambridge University Press. 2006.
6. Exercises in Spoken English. Parts. I-III. CIEFL, Hyderabad. Oxford University Press

Syllabus for Semester II, B. Tech - Computer Science & Engineering (Artificial Intelligence and Machine Learning)

Course Code : HUP2002 **Course : English for Professional Communication Lab**

L: 0 Hrs, T: 0 Hr, P: 2 Hr, Per Week **Total Credits : 1**

Course Objectives

To enhance competency of communication in English among learners

Course Outcomes

On completion of English Lab course, students will be able to achieve the following:

CO1 : Apply effective listening and speaking skills in professional and everyday conversations.

CO2 : Demonstrate the techniques of effective Presentation Skills

CO3 : Evaluate and apply the effective strategies for Group Discussions

CO4 : Analyse and apply the effective strategies for Personal Interviews

CO5 : Implement essential language skills- listening, speaking, reading, and writing

Syllabus

List of practical

Computer Assisted + Activity Based Language Learning

Practical - 1 : Everyday Situations: Conversations and Dialogues – Speaking Skills

Practical - 2 : Pronunciation, Intonation, Stress, and Rhythm

Practical - 3 : Everyday Situations: Conversations and Dialogues – Listening Skills Activity Based Language Learning

Practical - 4 : Presentation Skills: Orientation & Mock Session

Practical - 5 : Presentation Skills: Practice

Practical - 6 : Group Discussions: Orientation & Mock Session

Practical - 7 : Group Discussions: Practice

Practical - 8 : Personal Interviews: Orientation & Mock Session

Practical - 9 : Personal Interviews: Practice

Syllabus for Semester II, B. Tech - Computer Science & Engineering (Artificial Intelligence and Machine Learning)

Course Code : HUP0001-1 **Course : Fundamentals of Indian Classical Dance: Bharatnatayam**

L: 0 Hrs, T: 0 Hr, P: 2 Hr, Per Week **Total Credits : 1**

Course Objective

The course aims to introduce the students to Bharatnatyam, an important element of Indian traditional knowledge system. The course will not only provide the learning and skill to perform this art but would also enhance many mental and physical aspects of the students such as strength, flexibility, discipline, self-confidence, creativity, focus, coordination, etc.

Course Outcomes

On completion of the course, students will be able to achieve the following:

CO1: Understand the importance of dance and Bharatnataym as an Indian dance form

CO2: Develop skills to perform the dance form at its basic level.

CO3: Evaluate their strengths and interest to take bridge course to give Pratham (1st level formal exam of Bharatnatayam).

Syllabus

Practical -1: Orientation in Bharatnatayam

Practical-2: Tattu Adavu till 8, Naatta Adavu 4 Steps, Pakka Adavu 1 step, Metta Adavu 1 Step, Kuditta Metta Adavu 4 Steps,

Practical -3: Practice sessions

Practical-4: Tatta Kuditta Adavu (Metta), Tatta Kuditta Adavu (Metta) 2 Steps, Tirmanam Adavu 3 Steps, Kattu Adav - 3 Steps, Kattu Adav - 3 Steps

Practical-5: Practice sessions

Practical-6: Tiramanam (front) 3 Steps, Repeat of Tiramanam (Overhead) 3 Steps, Practical-7: Practice sessions

Practical – 8: Final practice sessions and performances.

Recommended Reading

1. Introduction to Bharata's Natyasastra, Adya Rangacharya, 2011
2. The Natyasastra and the Body in Performance: Essays on the Ancient Text, edited by Sreenath Nair, 2015
3. Bharatanatyam How to ... : A Step-by-step Approach to Learn the Classical Form, Eshwar Jayalakshmi, 2011

Syllabus for Semester II, B. Tech - Computer Science & Engineering (Artificial Intelligence and Machine Learning)

Course Code : HUP0001-2 **Course : Fundamentals of Indian Classical Dance: Kathak**

L: 0 Hrs, T: 0 Hr, P: 2 Hr, Per Week **Total Credits : 1**

Course Objective

The course aims to introduce the students to Kathak, an important element of Indian traditional knowledge system. The course will not only provide the learning and skill to perform this art but would also enhance many mental and physical aspects of the students such as strength, flexibility, discipline, self-confidence, creativity, focus, coordination, etc.

Course Outcomes

On completion of the course, students will be able to achieve the following:

CO1: Understand the importance of dance and Kathak as an Indian dance form

CO2: Develop skills to perform the dance form at its basic level.

CO3: Evaluate their strengths and interest to take bridge course to give Prarambhik (1st level formal exam of Kathak).

Syllabus

Practical -1: Orientation in Kathak. Correct posture of kathak, Basic Movements and exercise Stepping, Chakkar of 5 count (Bhramari),

Practical -2: Practice sessions of practical 1

Practical -3: Hastaks, Hastaks and Steppings, Reciting asamyukta Mudra shloka, Hastak and steppings

Practical -4: Practice sessions of practical 3

Practical -5: Todas and Asamyukta hasta mudra shlok, Vandana of Shlok, 2 Todas and Vandana, Ghante Ki Tihai,

Practical -6: Practice sessions of practical 5

Practical -7: 2 1 Chakkardar Toda and Ginnti Ki Tihai, 2 Todas and 1 Chakkardar Toda, practice sessions

Practical -8: Final performances.

Recommended Reading

1. Kathak Volume1 A "Theoretical & Practical Guide" (Kathak Dance Book), Marami Medhi & Debasish Talukdar, 2022, Anshika Publication (13 September 2022)

Syllabus for Semester II, B. Tech - Computer Science & Engineering (Artificial Intelligence and Machine Learning)

Course Code : HUP0001-3 **Course : Introduction to Digital Photography**

L: 0 Hrs, T: 0 Hr, P: 2 Hr, Per Week **Total Credits : 1**

Course Objective

The course aims to develop basic skills of students in digital photography to lay a foundation for them as a hobby and/or a profession.

Course Outcome

At the end of the course the students will be able to achieve the following:

CO1: Develop an understanding of the technical aspects and aesthetics of Photography.

CO2: Apply the rules of digital photography for creating photographs.

CO3: Develop skills to enhance photographs through post processing.

CO4: Create a portfolio of their photographs in selected genre.

Syllabus

Practical 1: Orientation in digital photography: Genres, camera handling and settings

Practical 2: Rules of Composition

Practical 3: Rules of Composition: practice sessions

Practical 4: Understanding Exposure and Art of Pre-Visualization

Practical 5: Rules of Composition and Art of Pre-Visualization: practice sessions

Practical 6: Post Processing Photographs and Portfolio creation

Practical 7: Post Processing Photographs: practice sessions

Practical 8: Portfolio finalization and presentation in selected genre.

Reference Material

1. Scott Kelby (2020) The Digital Photography Book: The Step-by-Step Secrets for how to Make Your Photos Look Like the Pros, Rocky Nook, USA
2. Larry Hall (2014) Digital Photography Guide: From Beginner to Intermediate: A Compilation of Important Information in Digital Photography, Speedy Publishing LLC, Newark
3. J Miotke (2010) Better Photo Basics: The Absolute Beginner's Guide to Taking Photos Like a Pro, AMPHOTO Books, Crown Publishing Group, USA

Syllabus for Semester II, B. Tech - Computer Science & Engineering (Artificial Intelligence and Machine Learning)

Course Code : HUP0001-4 **Course : Introduction to Japanese Language and Culture**

L: 0 Hrs, T: 0 Hr, P: 2 Hr, Per Week **Total Credits : 1**

Course Objective

The course aims to develop basic communication skills in Japanese Language and help develop a basic understanding of Japanese culture in cross-cultural communication.

Course Outcome

CO1: Gain a brief understanding about Japan as a country and Japanese culture.

CO2: Develop ability to use vocabulary required for basic level communication in Japanese language.

CO3: Able to write and read the first script in Japanese language.

CO4: Able to frame simple sentences in Japanese in order to handle everyday conversations

CO5: Able to write in basic Japanese about the topics closely related to the learner.

Syllabus

Practical-1: Orientation about Japan, its language, and its culture

Practical-2: Communication Skills 1: Vocabulary for basic Japanese language

Practical -3: Practice sessions

Practical-4: Writing Skills 1: Reading and writing first script in Japanese

Practical-5: Practice sessions

Practical- 6: Communication Skills 2: framing sentences

Practical- 7: Practice sessions

Practical- 8: Writing Skills 2: Write basic Japanese and practice

Recommended Reading

1. Marugoto Starter (A1) Rikai - Course Book for Communicative Language Competences, by The Japan Foundation, Goyal Publishers & Distributors Pvt. Ltd (ISBN: 9788183078047)
2. Japanese Kana Script Practice Book – Vol. 1 Hiragana, by Ameya Patki, Daiichi Japanese Language Solutions (ISBN: 9788194562900)

Syllabus for Semester II, B. Tech - Computer Science & Engineering (Artificial Intelligence and Machine Learning)

Course Code : HUP0001-5 **Course : Art of Theatre**

L: 0 Hrs, T: 0 Hr, P: 2 Hr, Per Week **Total Credits : 1**

Course Objectives

The course aims to develop in the students, an actor's craft through physical and mental training.

Course Outcomes

On completion of the course, students will be able to achieve the following:

CO1: Understand and synthesize the working of the prominent genres of theatre across the world.

CO2: Apply the skill of voice and speech in theatre and public speaking

CO3: Apply the art of acting and also develop generic skills such as confidence, communication skills, self-responsibility, motivation, commitment, interpersonal skills, problem solving, & self-discipline.

CO4: Apply skills acquired related to technical/production aspects of theatre and also develop problem solving and interpersonal skills.

Syllabus

Practical - 1 : Orientation in theatre

Practical - 2 : Voice and Speech training

Practical - 3 : Voice and Speech training: practice sessions

Practical - 4 : Art of acting

Practical - 5 : Art of acting: practice sessions

Practical - 6 : Art of script writing

Practical - 7 : Art of script writing: practice sessions

Practical - 8 : Final performances

Reference Books

1. Boleslavsky, R. (2022). Acting: The First Six Lessons (1st ed., pp. 1-92). Delhi Open Books.
2. Shakthi, C. (2017). No Drama Just Theatre (1st ed., pp. 1-171). Partridge.
3. Bruder, M., Cohn, L. M., Olnek, M., Pollack, N., Previto, R., & Zigler, S. (1986). A Practical Handbook for the Actor (1st ed.). Vinatge Books New York.

Syllabus for Semester II, B. Tech - Computer Science & Engineering (Artificial Intelligence and Machine Learning)

Course Code : HUP0001-6 **Course : Introduction to French Language**

L: 0 Hrs, T: 0 Hr, P: 2 Hr, Per Week **Total Credits : 1**

Course Objectives

To help build a foundation and interest in French language so that the students can pursue the proficiency levels of the language in higher semesters.

Course Outcomes

On successful completion of the course the students will be able to achieve the following:

CO1: Demonstrate basic knowledge about France, the culture and similarities/differences between India and France

CO2: Learn to use simple language structures in everyday communication.

CO3: Develop ability to write in basic French about themselves and others.

CO4: Develop ability to understand beginner level texts in French

Syllabus

List of Practicals

Practical - 1 : Orientation about France, the language, and culture

Practical - 2 : Communication Skills 1: Vocabulary building for everyday conversations

Practical - 3 : Practice sessions

Practical - 4 : Reading and writing Skills : Reading and writing simple text in French

Practical - 5 : Practice sessions

Practical - 6 : Communication Skills 2: listening comprehension

Practical - 7 : Practice sessions

Practical - 8 : Writing Skills: Write basic French and practice

Recommended Reading

1. 15-minute French by Caroline Lemoine
2. Cours de Langue et de Civilisation Françaises by G. Mauger Vol. 1.1
3. Cosmopolite I by Natalie Hirschsprung, Tony Tricot

Syllabus for Semester II, B. Tech - Computer Science & Engineering (Artificial Intelligence and Machine Learning)

Course Code : HUP0001-7 **Course : Introduction to Spanish Language**

L: 0 Hrs, T: 0 Hr, P: 2 Hr, Per Week **Total Credits : 1**

Course Objectives

To help build a foundation and interest in Spanish language so that the students can pursue the proficiency levels of the language in higher semesters.

Course Outcomes

On successful completion of the course the students will be able to achieve the following:

CO1: Demonstrate basic knowledge about Spain, the culture and similarities/differences between India and France

CO2: Learn to use simple language structures in everyday communication.

CO3: Develop ability to write in basic Spanish about themselves and others.

CO4: Develop ability to read and understand beginner level texts in Spanish

Syllabus

List of Practicals

Practical - 1 : Orientation about Spain, the language, and culture

Practical - 2 : Communication Skills 1: Vocabulary building for everyday conversations

Practical - 3 : Practice sessions

Practical - 4 : Reading and writing Skills : Reading and writing simple text in Spanish

Practical - 5 : Practice sessions

Practical - 6 : Communication Skills 2: listening comprehension

Practical - 7 : Practice sessions

Practical - 8 : Writing Skills: Write basic Spanish and practice

Recommended Reading

1. 15-Minute Spanish by Ana Bremon
2. Aula Internacional 1 by Jaime Corpas ,Eva Garcia, Agustin Garmendia.
3. Chicos Chicas Libro del Alumno by María Ángeles Palomino

Syllabus for Semester II, B. Tech - Computer Science & Engineering (Artificial Intelligence and Machine Learning)

Course Code : HUP0001-8 **Course : Art of Painting**

L: 0 Hrs, T: 0 Hr, P: 2 Hr, Per Week **Total Credits : 1**

Course Objectives

Painting is fundamentally about learning to see, and to transport that vision onto paper through a variety of mark making techniques. This course aims to develop basic skills of students in painting to lay a foundation for them as a hobby and/or a profession.

Course Outcome

At the end of the course the students will be able to achieve the following:

CO1: Become familiar with the basic methods, techniques & tools of painting.

CO2: Train the eye and hand to develop sense of balance, proportion and rhythm.

CO3: Develop the ability to observe and render simple natural forms.

CO4: Enjoy the challenging and nuanced process of painting.

Syllabus

Practical - 1 : Orientation in Painting tools & basics of lines, shapes, light, shadows and textures

Practical - 2 : The art of observation how to see shapes in drawing

Practical - 3 : Introduction Water color how to handle water paints

Practical - 4 : Introduction to acrylic colors how to handle acrylic paints

Practical - 5 : Explore layering paint and capturing the quality of light with paint.

Practical - 6 : Create landscape painting

Practical - 7 : Create Abstract painting

Practical - 8 : Paint on Canvas (try to recreate any famous painting)

Reference Material

1. Drawing made easy by Navneet Gala; 2015th edition
2. Alla Prima II Everything I Know about Painting--And More by Richard Schmid with Katie Swatland
3. Daily Painting: Paint Small and Often To Become a More Creative, Productive, and Successful Artist by Carol Marine

Syllabus for Semester II, B. Tech - Computer Science & Engineering (Artificial Intelligence and Machine Learning)

Course Code : HUP0001-9 **Course : Art of Drawing**

L: 0 Hrs, T: 0 Hr, P: 2 Hr, Per Week **Total Credits : 1**

Course Objectives

Drawing is fundamentally about learning to see, and to transport that vision onto paper through a variety of mark making techniques. This course aims to develop basic skills of students in drawing to lay a foundation for them as a hobby and/or a profession.

Course Outcome

At the end of the course the students will be able to achieve the following:

CO1: Become familiar with the basic methods, techniques & tools of drawing.

CO2: Train the eye and hand to develop sense of balance, proportion and rhythm.

CO3: Develop the ability to observe and render simple natural forms.

CO4: Enjoy the challenging and nuanced process of drawing.

Syllabus

Practical - 1 : Orientation in Drawing tools & basics of lines, shapes, light, shadows and textures

Practical - 2 : The art of observation how to see shapes in drawing

Practical - 3 : One/two-point basic linear perspective

Practical - 4 : Nature drawing and landscapes

Practical - 5 : Gestalt principles of visual composition

Practical - 6 : Figure drawing: structure and proportions of human body

Practical - 7 : Gesture drawing: expression and compositions of human figures

Practical - 8 : Memory drawing: an exercise to combine the techniques learnt

Reference Material

1. Drawing made easy by Navneet Gala; 2015th edition
2. Perspective Made Easy (Dover Art Instruction) by Ernest R. Norling

Syllabus for Semester II, B. Tech - Computer Science & Engineering (Artificial Intelligence and Machine Learning)

Course Code : HUP0001-10 **Course : Nature Camp**

L: 0 Hrs, T: 0 Hr, P: 2 Hr, Per Week **Total Credits : 1**

Course Objectives

To create an opportunity for the students to develop affinity with nature and thus subsequently impact their ability to contribute towards sustainability of nature.

Course Outcome

After the completion of the course the students will be able to do the following:

CO1: Develop an affinity with nature by observing and understanding it marvels with guidance from experts

CO2: Develop an understanding of the challenges and solutions associated with nature and its conservation.

Course content

In collaboration with the Forest Department and/or a local NGO working in the field of environment conservation, this course would be conducted in 24 hours. Students will be taken to a tiger reserve in Central Indian region or Forest fringe villages or work with an NGO from Central Indian region working on natural resource management. The camps (for 2 days) will cover any one of the following topics as decided by the course coordinator:

1. Awareness about each element of biodiversity (camps on moths, butterflies, birds, other wildlife etc)
2. Environment management (water, forest, wildlife) – practices of Forest Department in managing a tiger reserve, and other aspects of water and forest conservation.
3. Sustainable natural resource management - initiatives by rural communities and local NGOs
4. Man-animal conflict and solutions (socio-economic and technical) – role of local communities and Forest Department
5. Traditional practices in environment conservation – role of local communities and local NGOs

Syllabus for Semester II, B. Tech - Computer Science & Engineering (Artificial Intelligence and Machine Learning)

Course Code : PEP0001-21 **Course : Disaster Management Through Adventure Sports**

L: 0 Hrs, T: 0 Hr, P: 2 Hr, Per Week **Total Credits : 1**

Course Objectives

To enable the student

1. To inculcate rational thinking and scientific temper among the students.
2. To develop critical awareness about the social realities among the students.
3. To build up confidence, courage and character through adventure sports.

Course Outcomes

On completion of the course, students will be able to:

1. Understand the meaning and importance of Adventure sports.
2. Learn the various types of adventure sports, the equipment and resources required to practice disaster Management activities.
3. Learn the safety measures about different risk and their management.
4. To apply Disaster management theory to institutional & Societal problems and situations.

Course Content

1. Basic adventure
2. First AID
3. Various types of knots
4. Shelter making
5. Disaster management
6. Team building and goal setting
7. Realization of fear, risk and their roles and analyzing safety Management Plan

Syllabus for Semester II, B. Tech - Computer Science & Engineering (Artificial Intelligence and Machine Learning)

Course Code : PEP0001-22 **Course : Self-Defense Essentials and Basics Knowledge of Defense Forces**

L: 0 Hrs, T: 0 Hr, P: 2 Hr, Per Week **Total Credits : 1**

Course Outcomes

On completion of the Course the student will be able to:

- Understand the meaning, need and fitness requirements to implement self-defense
- Learn the basic techniques of selected combative sports.
- Learn to prepare basic Physical Training for Defense forces.
- Implement survival techniques during emergencies.

Course Content

- General conditioning and self-defense specific conditioning
- Applications of techniques of combative sports for self-defense.
- Self-defense techniques for specific situations: chain snatching, knife or stick attack, holding from back or front etc.
- Basic Military Knowledge and exposure making students Confident, bold, disciplined and trains them to join Armed Forces.

Syllabus for Semester II, B. Tech - Computer Science & Engineering (Artificial Intelligence and Machine Learning)

Course Code : CHP0001-31 **Course : Art of Indian Traditional Cuisine**

L: 0 Hrs, T: 0 Hr, P: 2 Hr, Per Week **Total Credits : 1**

Course Outcome

At the end of the course the students will be able to achieve the following:

CO1: Understand the factors that affect regional eating habits and the unique ingredients found in various states of India

CO2: Get insight to prepare popular dishes from various regions of India.

Module - 1 : Indian Regional foods and snacks - factors effecting eating habits.

Module - 2 : Indian gravies – ingredients, their importance

Module - 3 : Indian Sweets - ingredients, their importance

Module - 4 : Presentation of Indian Meals, Menu Planning, Food Costing

Module - 5 : Food Preservatives and Safety

List of Experiments

1) Introduction to cookery : does and don'ts
2) Introduction to Indian cuisine, philosophy and classification.
3) Regional influence on Indian Food- factors affecting eating habits
4) Preparation of Garam masala and or Chat masala with ingredients and their importance
5) Preparation of different gravies such as white, yellow or brown gravies with ingredients and their importance
6) Preparation of Indian sweets like Besan ke laddu with ingredients and their importance
7) Presentation of meal, Menu planning and Food costing
8) Common chemical food preservatives and their safety standards.

Reference Books

[1] Arora, K.,; Theory of cookery; First Edition, Frank Brothers Company (Pub) Pvt. Ltd., 2008 ISBN:9788184095036, 8184095031

[2] Philip, Thangam. E.,; Modern Cookery: Vol. 1; Sixth Edition, Orient BlackSwan., 2008 ISBN:9788125040446, 8125040447ali

[3] Parvinder S; Quantity Food Production Operations and Indian Cuisine (Oxford Higher Education); First Edition; Oxford University Press, 2011 ISBN 10: 0198068492 ISBN 13: 9780198068495

[4] Singh, Yogesh; A Culinary Tour of India; First Edition I.K. International Publishing House Pvt. Ltd.

ISBN 978-93-84588-48-9

[5] Singh Shakesh; Simplifying Indian Cuisine; First Edition, Aman Publications, ISBN81-8204-054-X

[6] Dubey Krishna Gopal; The Indian Cuisine; PHI Learning Pvt. Ltd.ISBN978-81 203-4170-8

Syllabus for Semester II, B. Tech - Computer Science & Engineering (Artificial Intelligence and Machine Learning)

Course Code : CHP0001-32 **Course : Introduction to Remedies by Ayurveda**

L: 0 Hrs, T: 0 Hr, P: 2 Hr, Per Week **Total Credits : 1**

Course Outcome

At the end of the course the students will be able to achieve the following

CO1: Know basic principle of Ayurvedic formulations.

CO2: Different types of Natural Remedies.

CO3: Basic idea about their Characterization

Module - 1 : Introduction to Ayurveda

Module - 2 : Different types of Ayurvedic formulations: Churn, Bhasma, Vati, Tailum

Module - 3 : Introduction to Methods of preparation

Module - 4 : Characterization, applications

Practicals based on above syllabus

1) Preparations of some medicinal oils like Bramhi tel, Bramhi Awala, Vatnashak Tel, Bhurngraj Tel etc.
2) Preparation of Churn, like Trifala Churn, Hingastak Churn, Trikut Churn etc.
3) Preparation of some Bhasmas and vati

Books

1) Chemistry and Pharmacology of Ayurvedic Medicinal Plants by Mukund Sabnis, Chaukhambha Amarbharati Prakashan.
2) Everyday Ayurveda by Shailesh Rathod
3) A text Book of Rasashastra by Vikas Dhole and Prakash Paranjpe
4) A text Book of Bha ajya Kalpana Vij¯nana

Syllabus for Semester II, B. Tech - Computer Science & Engineering (Artificial Intelligence and Machine Learning)

Course Code : HUT2004 **Course : Foundation Course in Universal Human Values**

L: 1 Hrs, T: 0 Hr, P: 0 Hr, Per Week **Total Credits : 1**

Course Objectives

- To help the student see the need for developing a holistic perspective of life
- To sensitize the student about the scope of life – individual, family (inter-personal relationship), society and nature/existence
- To strengthen self-reflection
- To develop more confidence and commitment to understand, learn and act accordingly

Course Outcome

On completion of course, students will be able to achieve the following:

CO1: Develop a holistic perspective of life

CO2: Better understanding of inter-personal relationships and relationship with society and nature.

CO3: An ability to strengthen self-reflection

Syllabus

Unit - 1 : Aspirations and concerns

Need for Value Education: Guidelines and content of value education.

Exploring our aspirations and concerns: Knowing yourself, Basic human aspirations Need for a holistic perspective, Role of UHV; Self-Management: harmony in human being

Unit - 2 : Health

Harmony of the Self and Body, Mental and physical health; Health for family, friends and society.

Unit - 3 : Relationships and Society

Harmony in relationships, Foundational values: Trust, Respect, Reverence for excellence, Gratitude and love; harmony in society; harmony with nature.

Reference Material

The primary resource material for teaching this course consists of

Text Book

1. R.R Gaur, R Sangal, G P Bagaria, A foundation course in Human Values and professional Ethics, Excel books, New Delhi, 2010, ISBN 978-8-174-46781-2

Reference Books

1. B L Bajpai, 2004, Indian Ethos and Modern Management, New Royal Book Co., Lucknow. Reprinted 2008.
2. PL Dhar, RR Gaur, 1990, Science and Humanism, Commonwealth Purblishers.
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