Annexure I

Course Curriculum for

B Tech in Artificial Intelligence and Data Science

2023-2024 onwards

Computer Science and Engineering Department

NATIONAL INSTITUTE OF TECHNOLOGY DELHI

(An autonomous Institute under the aegis of Ministry of Education, Govt. of India.)

Department of Computer Science and Engineering
National Institute of Technology Delhi

1.1 About the Department

The Computer Science and Engineering Department was started in 2010 along with the foundation of NIT Delhi. Initially, only the Bachelor of Technology Programme was offered with the intake 30 which presently has been increased to 60. Now, apart from B. Tech., the department also offers Master of Technology (CSE & Analytics), and Ph.D. program which cover a number of important areas of Computer Science and Engineering. The department provides the students with a broad undergraduate and graduate curriculum, based on the application and theoretical foundations of computer science. The departmental faculties and students participate in interdisciplinary research. The department envisions producing quality graduates, capable of leading the world in the technical realm. The department is equipped with the latest configuration and high computing system with hi-speed Internet facilities. The Computer Science Program at this institute are dedicated to educate students and to advance research in computer and information technology. The department has all the facilities to carry out the related teaching and research work.

1.2 Vision

- To communicate quality Computer Science education for producing globally identifiable technocrats and entrepreneurs upholding sound ethics, profound knowledge, and innovative ideas to meet industrial and societal expectations.

1.3 Mission

- To impart value-based technical knowledge and skill relevant to Computer Science and Engineering through effective pedagogies and hands-on experience on the latest tools and technologies to maximize employability.
- To strengthen multifaceted competence in allied areas of Computer Science in order to nurture creativity and innovations to adapt the ever-changing technological scenario requiring communally cognizant solutions.
- To create an appetite for research that leads to pursuing a research career or higher education in contemporary and emerging areas of computer science.
- To inculcate the moral, ethical, and social ideals essential for prosperous nation building.

2. B. Tech Artificial Intelligence and Data Science

2.1 Program Outcomes (POs)

Engineering Graduates will be able to:

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 analyze 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 modeling 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

2.2 Program Educational Objectives (PEOs)

PEO-1	Graduates will be capable of applying advanced tools and techniques to innovate ideas and create intelligent systems for a wide range of real-world problems while maintaining strong ethical standards.
PEO-2	Graduates will be prepared to pursue higher studies and continue to develop their professional knowledge.
PEO-3	Graduates will recognize the importance of research and professional development in the rapidly evolving fields of AI and Data Science. .
PEO-4	Graduates will be prepared with an entrepreneurial mindset, enabling them to identify business opportunities, create startups, exhibit leadership qualities with demonstrable attributes in lifelong learning

2.3 Program Specific Outcomes (PSOs)

PSO-1	Ability to analyze, build, and design new techniques and tools to produce innovative industrial solutions using mathematical and theoretical concepts of Artificial Intelligence and Data Science.
PSO-2	Ability to carry out research and education in trans-disciplinary fields to solve real world problems using state-of-art algorithms and techniques of Artificial Intelligence and Data Science.

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Course Scheme

Year	First Semester						Second Semester					
	Sub. Code	**Subject Name**	**L**	**T**	**P**	**C**	**Sub. Code**	**Subject Name**	**L**	**T**	**P**	**C**
I	ADLB 101	Mathematical Foundations for Data Science	3	0	0	3	ADLB 151	Probability and Statistics	3	0	0	3
	ADLB 102	Discrete Mathematics	3	1	0	4	ADBB 152	Computer Organization and Architecture	3	0	2	4
	ADBB 103	Computer Programming-I	3	0	2	4	ADBB 153	Data Structures and Algorithms	3	0	2	4
	ADBB 104	Computer Fundamentals	2	0	2	3	ADBB 154	Programming using Python	1	0	2	2
	PHBB 112	Quantum Physics	3	1	0	4	ADLB 155	System Programming	3	1	0	4
	HMLB 102	Theory and Practices of Human Ethics	1	0	0	1	HHS 150	Holistic Health & Sports	0	0	2	1
	EVPB 102	Nature and Care	0	0	2	1	ADPB 156	Project I	0	0	4	2
		Total	**15**	**2**	**6**	**20**	**Total**		**13**	**1**	**12**	**20**
	Third Semester						**Fourth Semester**					
II	ADBBXXX	Artificial Intelligence	3	0	2	4	ADBBXXX	Data Science	3	0	2	4
	ADBBXXX	Database Management Systems	3	0	2	4	ADBBXXX	Data Warehousing and Mining	3	0	2	4
	ADLBXXX	Optimization Techniques	3	1	0	4	ADBBXXX	Big Data Management	2	0	2	3
	ADBBXXX	Operating Systems	3	0	2	4	ADBBXXX	Machine Learning	3	0	2	4
	ADBBXXX	Computer Graphics	3	0	2	4	ADBBXXX	Theory of Computation	3	0	0	3
							ADPB200	Project II	0	0	4	2
		Total	**15**	**1**	**8**	**20**		**Total**	**14**	**0**	**12**	**20**

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Year	Fifth Semester						Sixth Semester					
	Sub. Code	**Subject Name**	**L**	**T**	**P**	**C**	**Sub. Code**	**Subject Name**	**L**	**T**	**P**	**C**
III	ADBBXXX	Neural Networks and Deep Learning	3	0	2	4	ADLBXXX	Social Network Analysis	3	1	0	4
	ADBBXXX	Natural Language Processing	3	1	0	4	ADBBXXX	Big Data Analytics	3	0	2	4
	ADBBXXX	Cloud Computing	3	0	2	4	ADBBXXX	Soft Computing	3	0	2	4
	ADLBXXX	Image Processing and Computer Vision	3	0	2	4	ADLBXXX	Program Elective-I	3	0	0	3
	ADBBXXX	Internet of Things	3	1	0	4	ADLBXXX	Program Elective -I	3	0	0	3
							ADPB300	Project – III	0	0	4	2
		Total	**15**	**2**	**6**	**20**	ADPBXXX	**Internship (during summer break)**	**Credit will be given to the next Semester**			
								Total	**15**	**1**	**8**	**20**
IV	**Seventh Semester**						**Eighth Semester**					
	ADLBXXX	Cyber Security	3	0	0	3	ADPB400	B. Tech Project (Internship inside NIT Delhi / Outside NIT Delhi)	-	-	-	16
	ADLBXXX ADLBXXX	Program Elective-II Program Elective-II	3 3	1 1	0 0	4 4	ADLBXXX	Independent Study/ MOOC Course	3	0	0	3
							ADPBXXX	Seminar	0	0	2	1
								Total	**3**	**0**	**2**	**20**
	ADBBXXX	Program Elective-III	3	0	2	4						
	ADBBXXX	Program Elective-III	3	0	2	4						
	ADPBXXX	Internship	0	0	2	1						
		Total	**12**	**2**	**6**	**20**						

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Year	Program Elective-I											
	Sub. Code	**Subject Name**	**L**	**T**	**P**	**C**	**Sub. Code**	**Subject Name**	**L**	**T**	**P**	**C**
III	ADLBXXX	Human Computer Interface	3	0	0	3	ADLBXXX	Nature Inspired Algorithms	3	0	0	3
	ADLBXXX	Cognitive Networks	3	0	0	3	ADLBXXX	Blockchain Technology	3	0	0	3
	ADLBXXX	Fundamentals of Robotics	3	0	0	3	ADLBXXX	Sensor Networks	3	0	0	3
	ADLBXXX	Biometrics Systems	3	0	0	3	ADLBXXX	Sentiment Analysis	3	0	0	3
	ADLBXXX	Statistical Methods for Data Science	3	0	0	3	ADLBXXX	Reinforcement learning	3	0	0	3
	ADLBXXX	Multimedia Databases	3	0	0	3	ADLBXXX	Information Storage and Retrieval	3	0	0	3
	Program Elective-II											
IV	ADLBXXX	Fuzzy Logic and Applications	3	1	0	4	ADLBXXX	Quantum Computing	3	1	0	4
	ADLBXXX	Foundations of Cryptography	3	1	0	4	ADLBXXX	Digital Forensics	3	1	0	4
	ADLBXXX	Drone Applications	3	1	0	4	ADLBXXX	GIS Applications	3	1	0	4
	ADLBXXX	High performance Parallel Computing Architecture	3	1	0	4	ADLBXXX	Multi Agent Applications	3	1	0	4
	ADLBXXX	Game Theory	3	1	0	4	ADLBXXX	Graph Mining	3	1	0	4
	ADLBXXX	Biometric Security	3	1	0	4	ADLBXXX	IoT and Multimedia Technology	3	1	0	4
	Program Elective-III											
IV	ADBBXXX	Augmented and Virtual reality	3	0	2	4	ADBBXXX	Social Computing	3	0	2	4
	ADBBXXX	Performance Modelling	3	0	2	4	ADBBXXX	Spatio – Temporal Data Analysis	3	0	2	4
	ADBBXXX	Motion Planning for Robotics	3	0	2	4	ADBBXXX	Convex Optimization	3	0	2	4
	ADBBXXX	Compiler Design	3	0	2	4	ADBBXXX	Computational Biology	3	0	2	4
	ADBBXXX	Intelligent Data Management	3	0	2	4	ADBBXXX	Speech Recognition	3	0	2	4
	ADBBXXX	Forensics Biometric Analysis	3	0	2	4	ADBBXXX	Time Series Analysis	3	0	2	4

COURSE CONTENT

Department: Computer Science and Engineering

Course no: ADLB 101	**BSC (YES/ NO)**	**ESC (YES/ NO)**	**HSC (YES/ NO)**	**PC (YES/ NO)**	**PE (YES/ NO)**	**IN-IS-SP-MP (YES/ NO)**
	NO	NO	NO	YES	NO	NO
Type of course	**Program Core**					
Course Title	**MATHEMATICAL FOUNDATION OF DATA SCIENCE**					
Course objectives:	The purpose of this course is to introduce the concepts of mathematics as the basic building blocks for data science; extend the concept of linear systems of equations, matrices and determinants, and vector spaces for data science; gain insights about probability and optimization theory for modern day computing applications; and promote research activities to uphold in the theory and practice.					
POs						

Semester	**Autumn: Yes**		**Spring:**		
I	**Lecture**	**Tutorial**	**Practical**	**Credits**	**Total teaching hours**
Contact Hours	3	0	0	3	36
Prerequisite course code as per proposed course numbers	NIL				
Prerequisite credits	NIL				
Equivalent course codes as per proposed course and old course	NIL				
Overlap course codes as per proposed course numbers	NIL				

Text Books:		
1	Title	Introduction to linear algebra
	Author	Gilbert Strang
	Publisher	Wellesley-Cambridge Press
	Edition	Sixth edition 2023
2	Title	Optimization by vector space methods
	Author	David Luenberger
	Publisher	John Wiley and Sons
	Edition	1969 th edition (January 23, 1997)
Reference Book:		
1	Title	Linear Algebra
	Author	Kenneth Hoffman and Ray Kunze
	Publisher	Pearson

	Edition	Second Edition 2018
Content	**Unit** – 1 (5 Hours) Introduction; Typology of problems; Importance of linear algebra, statistics and optimization from a data science perspective; Structured thinking for solving data science problems. **Unit**-2 (8 Hours) Vectors; Matrices and their properties (determinants, traces, rank, nullity, etc.); Addition and Multiplication; Eigenvalues and eigenvectors; Matrix factorizations; Distances and Nearest Neighbors; Similarities; Projections; Notion of hyperplanes; half-planes. **Unit** – 3 (9 Hours) Probability theory and axioms; Random variables; Probability distributions and density functions (univariate and multivariate); Conditional Probability, Bayes' Theorem, Continuous and discrete distributions, Transformation of random variables, estimating mean, variance, covariance, Expectations and moments; Covariance and correlation; Statistics and sampling distributions; Hypothesis testing; Confidence (statistical) intervals; Correlation functions; White-noise process; Exponential family of distributions (Bernoulli, Beta, Binomial, Dirichlet, Gamma, & Gaussian) **Unit** – 4 (8 Hours) Unconstrained optimization; Necessary and sufficiency conditions for optima; Gradient descent methods; Constrained optimization, KKT conditions; Introduction to non-gradient techniques; Introduction to least squares optimization; Optimization view of machine learning. **Unit** – 5 (6 Hours) Linear regression as an exemplar function approximation problem; Linear classification problems.	
Course Outcomes	• Represents the rudiments of Data Science (L2) • Extend the use of linear systems of equations, matrices and determinants, and vector spaces in the science of data (L2) • Demonstrate the rules of probability and statistics for understanding the nature of data (L3) • Articulate the use of different optimization techniques for data analysis (L3) • Illustrate analytical models for real-word scenarios (L4)	
Course Assessment	Continuous Evaluation 25%	
	Mid Semester 25%	
	End Semester 50%	

Course no: ADLB 102	BSC (YES/ NO)	ESC (YES/ NO)	HSC (YES/ NO)	PC (YES/ NO)	PE (YES/ NO)	IN-IS-SP-MP (YES/ NO)
	NO	NO	NO	YES	NO	NO

Type of course	**Program Core**
Course Title	**DISCRETE MATHEMATICS**
Course objectives:	The purpose of this course is to understand and use discrete mathematics which is the backbone of computer science. In this course the students will learn various ways for describing sets, i.e., logic and proofs, identify induction hypotheses and prove elementary properties of modular arithmetic, and apply graph theory models of data structures to solve problems of connectivity and constraint satisfaction.
POs	

Semester	**Autumn: Yes**		**Spring:**		
I	**Lecture**	**Tutorial**	**Practical**	**Credits**	**Total teaching hours**
Contact Hours	3	1	0	4	36
Prerequisite course code as per proposed course numbers	NIL				
Prerequisite credits	NIL				
Equivalent course codes as per proposed course and old course	NIL				
Overlap course codes as per proposed course numbers	NIL				

Text Books:		
1	Title	Discrete Mathematics and applications
	Author	K.H.Rosen
	Publisher	TataMcGraw Hill
	Edition	Fifth edition 2003
Reference Book:		
1	Title	Elements of Discrete Mathematics
	Author	C.L.Liu
	Publisher	McGraw-Hill Book Company.
	Edition	Second edition 1985
2	Title	Discrete Mathematics for Computer Scientists and Mathematicians
	Author	1. J .L.Mott, A.Kandel, T.P .Baker
	Publisher	Prentice Hall of India
	Edition	Second edition 1986
3	Title	Logic and Discrete Mathematics

	Author	W.K.Grassmann and J.P.Tremblay
	Publisher	Pearson
	Edition	1995

Content	**Unit** – 1 (5 Hours) Mathematical reasoning; propositions; negation disjunction and conjunction; implication and equivalence; truth tables; predicates; quantifiers; natural deduction; rules of Inference; methods of proofs; use in program proving; resolution principle. **Unit**-2 (10 Hours) Set theory; Paradoxes in set theory; inductive definition of sets and proof by induction; Peono postulates; Relations; representation of relations by graphs; properties of relations;equivalence relations and partitions; Partial orderings; Posets; Linear and well-ordered sets **Unit** – 3 (7 Hours) Graph Theory; elements of graph theory, Euler graph, Hamiltonian path, trees, tree traversals, spanning trees. **Unit** – 4 (7 Hours) Functions; mappings; injection and surjections; composition of functions; inverse functions; special functions; Peono postulates; pigeonhole principle; recursive function theory. **Unit** – 5 (7 Hours) Definition and elementary properties of groups, semigroups, monoids, rings, fields, vector spaces and lattices. Elementary combinatorics; counting techniques; recurrence relation; generating functions.
Course Outcomes	● Illustrate the basics of discrete mathematics and predicate calculus (L2). ● Explain set theory and relations (L2). ● Demonstrate the concepts of graph theory and experiment with trees to solve problems like minimum spanning tree and tree traversals (L3). ● Develop the concept of functions and recursive function theory (L3). ● Illustrate different algebraic structures (L2).
Course Assessment	Continuous Evaluation 25%
	Mid Semester 25%
	End Semester 50%

Course no: ADBB 103	BSC (YES/ NO)	ESC (YES/ NO)	HSC (YES/ NO)	PC (YES/ NO)	PE (YES/ NO)	IN-IS-SP-MP (YES/ NO)
	NO	NO	NO	YES	NO	NO
Type of course	**Program Core**					
Course Title	**COMPUTER PROGRAMMING-I**					
Course objectives:	This course aims to provide the students with a foundation in computer programming. The goals of the course are to develop the basic programming skills in students, and to improve their proficiency in applying the basic knowledge of programming to solve problems related to their field of engineering.					
POs						

Semester	**Autumn: Yes**		**Spring:**		
I	**Lecture**	**Tutorial**	**Practical**	**Credits**	**Total teaching hours**
Contact Hours	3	0	2	4	36
Prerequisite course code as per proposed course numbers	NIL				
Prerequisite credits	NIL				
Equivalent course codes as per proposed course and old course	NIL				
Overlap course codes as per proposed course numbers	NIL				

Text Books:		
1	Title	Programming in ANSI C
	Author	E. Balagurusamy
	Publisher	TATA McGraw Hill
	Edition	6th edition, 2012
Reference Book:		
1	Title	Let Us C
	Author	Yashavant Kanetkar
	Publisher	Infinity Science Press
	Edition	13th edition, 2012
2	Title	The C Programming Language
	Author	Brian Kernighan & Dennis Ritchie
	Publisher	Prentice Hall
	Edition	2nd Edition, 1988
3	Title	Schaum's Outline of Programming with C
	Author	Byron S Gottfried
	Publisher	TATA Mc Graw Hill

	Edition	2nd edition, 1996
Content	**Unit – 1** (5 Hours) Introduction to Computers: Hardware and Software. Basic Model of Computation, Notion of Algorithms, Flowcharts, Top down design, Bottom up approaches of problem solving, Number system **Unit – 2** (9 Hours) Introduction to programming language, Basics of C, Basic Data types – int, float, double, char, Bool, Void. Arithmetic and logical operators: precedence and associativity. Flow of Control- Conditional statements- If-else, Switch-case constructs, Loops- While, do-while, for. **Unit – 3** (7 Hours) Function – User defined functions, library functions, Parameter passing – call by value, call by reference, recursion. **Unit – 4** (7 Hours) Arrays- Advantages and drawbacks, One dimensional, Multi-Dimensional Arrays and strings: Declaration, Initialization, Accessing, Passing arrays and strings as parameters to functions. Pointers, Dynamic memory allocation, Dynamic arrays – One dimensional, Multidimensional dynamic arrays. **Unit – 5** (8 Hours) Structure: Declaration, Initialisation, passing structure to function, Use of pointers in structure. Preprocessors, Macros, File management in C I/O – Opening, closing and editing files. Correctness & Efficiency Issues in Programming, Time & Space measures.	
Course Outcomes:	● Illustrate the steps involved in compiling, linking, and debugging any code written in a specific language (L2). ● Explain the basic concepts such as keyword, identifiers, header files, and the methods of iteration or looping and branching, etc (L2). ● Apply the concepts of functions to understand modular programming (L3). ● Utilise the concept of pointers and arrays to structure data in a computer program (L3). ● Develop the basic applications in C programming using structures, union and file handling (L6).	
Course Assessment	Continuous Evaluation 25%	
	Mid Semester 25%	
	End Semester 50%	

Lab Experiments:

Exp. No.	Experiments
1.	Installation of C Development Environment.
2.	Introduction to Programming Logic Building.

3.	Basic Concepts of a Computer Programming Language.
4.	Implementation of sequential constructs.
5.	Implementation of selection constructs.
6.	Implementation of Iterative constructs and their nested variants.
7.	Implementation of arrays (One dimensional and multi-dimensional along with operations performed on arrays).
8.	Implementation of functions (normal functions, recursive functions and parameter passing methods).
9.	Implementation of Pointers with arrays, strings and functions.
10.	Implementation of structures and Union.
11.	Implementation of file handling in C.

Course no: ADBB 104	BSC (YES/ NO)	ESC (YES/ NO)	HSC (YES/ NO)	PC (YES/ NO)	PE (YES/ NO)	IN-IS-SP-MP (YES/ NO)
	NO	NO	NO	YES	NO	NO

Type of course	**Program Core**
Course Title	**COMPUTER FUNDAMENTALS**
Course objectives:	This course aims to provide knowledge of computer hardware and other peripherals to the students. They will become familiar with different types of softwares, networking devices and concepts.
POs	

Semester	**Autumn: Yes**		**Spring:**		
I	**Lecture**	**Tutorial**	**Practical**	**Credits**	**Total teaching hours**
Contact Hours	2	0	2	3	24
Prerequisite course code as per proposed course numbers	NIL				
Prerequisite credits	NIL				
Equivalent course codes as per proposed course and old course	NIL				
Overlap course codes as per proposed course numbers	NIL				

Text Books:		
1	Title	Computer Fundamentals
	Author	Peter Nortan
	Publisher	TATA McGraw Hill
	Edition	5th edition, 2003
Reference Book:		
1	Title	Computer Science Handbook
	Author	Allen B. Tucker
	Publisher	CRC Press
	Edition	2nd edition, 2004
2	Title	Introduction to Computer Science
	Author	I. T. L. Education Solutions Limited, Itl Esl
	Publisher	Pearson Education
	Edition	4th impression, 2009

Content	**Unit – 1** (3 Hours) Computer hardware: Evolution of Computer Hardware, Moore's Law, Classification of Computers, Fundamental Units of Computer, Communication between various units, Processor speed, Multiprocessor system Input Output devices, Storage Devices. **Unit – 2** (5 Hours)

	Number System: Introduction and type of Number system, Conversion between number system, complements Arithmetic operations on number system, Signed and unsigned number system, Fixed and floating point numbers. **Unit – 3** (5 Hours) Logic development and algorithms: Various techniques to solve a problem, Ways to specify an algorithm, Flow charting techniques, Types of Computer Languages. **Unit – 4** (6 Hours) Operating Systems and System Software: What is Operating System–Evolution of OS, Types of Operating System batch system, multiprogramming, multiprocessing, multi user, time sharing, personal system, parallel system, real time system, Single User System, Multi User Systems, Booting, Approaches to OS design and implementation: Microkernel, Layered, Kernel Approach, Introduction to Development tools: Editors, Translators, Compiler, Debugger, Assembler. **Unit – 5** (5 Hours) Data communication, Computer network and Internet Basics: Concepts and Terminology, Analog and Digital Data Transmission, Transmission Impairments, Guided Transmission Media, Wireless Transmission, Introduction to Computer Network, Types of Networks: Broadcast and Point-to-point- LAN-MAN-WAN- Wireless networks.
Course Outcomes	• To illustrate the binary system and its importance in computer architecture (L2) • To identify where, when and how enhancements of computer hardware and software have taken place (L3) • To develop skills for problem solving approaches (L3) • To analyse different types of operating systems, network types and topologies (L4)
Course Assessment	Continuous Evaluation 25%
	Mid Semester 25%
	End Semester 50%

Lab Experiments:

Exp. No.	Experiments
1.	Basic Unix commands
2.	Familiarisation with operating system along with file management commands like create, copy, move, delete and rename files and folders.
3.	Study of Motherboard.
4.	Calculation of Total mark, grade based on boundary conditions for n number of students using Spread sheet.
5.	Preparation of presentation (with transition and animations , insertion of scanned images and internet contents)

6.	Figure creation using Draw.io
7.	Basic of programming
8.	Programs to calculate average of 3 numbers, area of triangle, volume of cylinder, Temperature conversion.
9.	Largest of 3 numbers, Check whether even or odd, Roots of quadratic equation, Character name of the day.
10.	Print natural numbers, Factorial value, Multiplication table, Sum of digits, Sum of a set of numbers, calculation of grade based on boundary conditions
11.	Programs to convert from one number system to another.

Course no: ADLB 151	BSC (YES/ NO)	ESC (YES/ NO)	HSC (YES/ NO)	PC (YES/ NO)	PE (YES/ NO)	IN-IS-SP-MP (YES/ NO)
	YES	NO	NO	NO	NO	NO
Type of course	**Basic Science Core**					
Course Title	**PROBABILITY AND STATISTICS**					
Course objectives:	The purpose of this course is to introduce the fundamental rules of Probability, discrete and continuous distributions, and statistical methods that are most commonly used in Computer Science and Engineering. Students will be introduced to stochastic processes, Markov chains and statistical inference methods and will apply the theory and methods to the evaluation of queuing systems and computation of their vital characteristics.					
POs						

Semester	**Autumn:**		**Spring: Yes**		
II	**Lecture**	**Tutorial**	**Practical**	**Credits**	**Total teaching hours**
Contact Hours	3	0	0	3	36
Prerequisite course code as per proposed course numbers	NIL				
Prerequisite credits	NIL				
Equivalent course codes as per proposed course and old course	NIL				
Overlap course codes as per proposed course numbers	NIL				

Text Books:		
1	Title	Introduction to Probability and Statistics for Engineers and Scientists
	Author	Sheldon M Ross
	Publisher	Elsevier
	Edition	Fifth Edition
Reference Book:		
1	Title	Probability and Statistics with Reliability, Queuing, and Computer Science Applications
	Author	K. Trivedi
	Publisher	Wiley
	Edition	Second edition (2002)
2	Title	Probability, random variables, and stochastic processes.
	Author	Papoulis, Athanasios, and S. Unnikrishna Pillai
	Publisher	Tata McGraw-Hill Education
	Edition	2002
3	Title	Introduction to Mathematical Statistics
	Author	Robert V Hogg, Joseph McKean, Allen T Craig

		Publisher	Pearson
		Edition	Seventh Edition
4.		Title	Probability and Computing: Randomized Algorithms and Probabilistic Analysis
		Author	Michael Mitzenmacher, Eli Upfal
		Publisher	Cambridge University Press
		Edition	
Content	**Unit – 1** (7 Hours) Events and outcomes. Probability rules Sample space and events, The axioms of probability. Conditional probability, Independence, Bayes' Rule, Law of Total Probability Elementary theorems of probability **Unit – 2** (7 Hours) Random variables, Joint and marginal distributions. Expectation and variance. Discrete distributions: Bernoulli, Binomial, Geometric, and Poisson. **Unit – 3** (7 Hours) Continuous distributions and densities: Uniform, Exponential, Gamma, Normal Central Limit Theorem and Normal approximations, Law of Large Numbers. **Unit – 4** (7 Hours) Statistical Inference: Introduction of sampling, Sampling distributions of mean and variance, Point and interval estimation. **Unit – 5** (8 Hours) Stochastic processes: concepts and classifications. Bernoulli process. Poisson process. Markov chains. Transition probabilities. Steady-state distribution		
Course Outcomes	● Illustrate the principal concepts about probability (L2). ● Explain the concept of a random variable and the discrete probability distributions (L2). ● Explain continuous distributions and solve the distribution-related problems (L3). ● Apply the fundamentals of statistics to experiment with statistical inferences (L3). ● Utilise stochastic processes and Markov chains to solve real life problems (L3).		
Course Assessment	Continuous Evaluation 25%		
	Mid Semester 25%		
	End Semester 50%		

Course no: ADBB 152	BSC (YES/ NO)	ESC (YES/ NO)	HSC (YES/ NO)	PC (YES/ NO)	PE (YES/ NO)	IN-IS-SP-MP (YES/ NO)
	NO	NO	NO	YES	NO	NO
Type of course	**Program Core**					
Course Title	**COMPUTER ORGANIZATION AND ARCHITECTURE**					
Course objectives:	The purpose of this course is to have a thorough understanding of the basic structure and operation of a digital computer. Students will learn the basic operations involved in the execution of an instruction, interrupts and their usage to implement I/O control and data transfers and identify the different architectural design issues that can affect the performance of a computer such as RISC architecture, instruction set design, and addressing modes.					
POs						

Semester	**Autumn:**		**Spring: Yes**		
II	**Lecture**	**Tutorial**	**Practical**	**Credits**	**Total teaching hours**
Contact Hours	3	0	2	4	36
Prerequisite course code as per proposed course numbers					
Prerequisite credits					
Equivalent course codes as per proposed course and old course					
Overlap course codes as per proposed course numbers					

Text Books:

1	Title	Computer Organization and Design - The Hardware/Software Interface
	Author	D. A. Patterson and J. L. Hennessy
	Publisher	Morgan Kaufmann
	Edition	2014

Reference Book:

1	Title	Computer System Architecture
	Author	M. Morris Mano
	Publisher	Prentice Hall of India Pvt Ltd
	Edition	Third edition, 2002
2	Title	Computer Organization and Architecture - Designing for Performance
	Author	W. Stallings
	Publisher	Prentice Hall of India
	Edition	2002
3	Title	Computer Organization
	Author	C. Hamacher, Z. Vranesic and S. Zaky
	Publisher	McGrawHill

	Edition	2002
4.	Title	Computer Architecture and Organization
	Author	J .P. Hayes
	Publisher	McGraw-Hill
	Edition	1998

Content	**Unit - 1** (5 Hours) Introduction: Function and structure of a computer Functional components of a : Function and structure of a computer, Functional components of a computer, Interconnection of components, Performance of a computer. **Unit -2** (7 Hours) Representation of Instructions Representation of Instructions: Machine instructions, Operands, Addressing : Machine instructions, Operands, Addressing modes, Instruction formats, Instruction sets, Instruction set architectures - CISC and RISC architectures. **Unit - 3** (7 Hours) Processing Unit: Organization of a processor - Registers, ALU and Control unit, Data path in a CPU, Instruction cycle, Organization of a control unit - Operations of a control unit, Hardwired control unit, Microprogrammed control unit. **Unit – 4** (9 Hours) Memory Subsystem: Semiconductor memories, Memory cells - SRAM and DRAM cells, Internal Organization of a memory chip, Organization of a memory unit, Error correction memories, Interleaved memories, Cache memory unit - Concept of cache memory, Mapping methods, Organization of a cache memory unit, Fetch and write mechanisms, Memory management unit - Concept of virtual memory, Hardware support for memory management. **Unit – 5** (8 Hours) Input/Output Subsystem: Access of I/O devices, I/O ports, I/O control mechanisms - Program controlled I/O Interrupt controlled I/O and DMA controlled I/O I/O interfaces Program controlled I/O, Interrupt controlled I/O, and DMA controlled I/O, I/O interfaces - Serial port, Parallel port, PCI bus, SCSI bus, USB bus, I/O peripherals - Input devices, Output devices, Secondary storage devices.
Course Outcomes:	● Understand the fundamentals of computer organization and its relevance to classical and modern problems of computer design (K2). ● Apply knowledge of combinational and sequential logic circuits to mimic simple computer architecture to solve the given problem (K3). ● Analyze performance of various instruction set architecture, control unit, memories and various processor architectures (K4). ● Explain the basic concept of interrupts and their usage to implement I/O control and data transfers (K2).
Course Assessment	Continuous Evaluation 25%
	Mid Semester 25%
	End Semester 50%

Course no: ADBB 153	BSC (YES/ NO)	ESC (YES/ NO)	HSC (YES/ NO)	PC (YES/ NO)	PE (YES/ NO)	IN-IS-SP-MP (YES/ NO)
	NO	NO	NO	YES	NO	NO
Type of course	**Program Core**					
Course Title	**DATA STRUCTURES AND ALGORITHMS**					
Course objectives:	This course aims to develop students' knowledge in data structures, its associated algorithms and applications in problem solving. Students will be introduced to common sorting and searching algorithms along with their complexities.					
POs						

Semester	**Autumn:**		**Spring: Yes**		
II	**Lecture**	**Tutorial**	**Practical**	**Credits**	**Total teaching hours**
Contact Hours	3	0	2	4	36
Prerequisite course code as per proposed course numbers	NIL				
Prerequisite credits	NIL				
Equivalent course codes as per proposed course and old course	NIL				
Overlap course codes as per proposed course numbers	NIL				

Text Books:		
1	Title	Introduction to Algorithms
	Author	Thomas H Cormen, Charles E Leiserson, Ronald L Rivest, Clifford Stein
	Publisher	MIT Press
	Edition	Fourth Edition, 2022
Reference Book:		
1	Title	Fundamentals of Data Structures
	Author	E. Horowitz, S. Sahni
	Publisher	Computer Science Press
	Edition	2nd Edition, 2008
2	Title	Data Structures Using C
	Author	E. Balagurusamy
	Publisher	TATA McGraw Hill
	Edition	2013
3	Title	Data Structure and Program Design
	Author	R.L. Kruse
	Publisher	Prentice Hall
	Edition	2nd Edition, 1996
4	Title	Data Structures Using C

	Author	A. M. Tanenbaum, Y. Langsam, M. J. Augenstein
	Publisher	Pearson Education
	Edition	1990

Content

Unit – 1 (5 Hours)
Introduction: Dynamic aspects of operations on data, Characteristics of data structures, Creation and manipulation of data structures, Operations on data structures, Types of data structures – linear and nonlinear. Introduction to algorithm: Asymptotic notations, Analysis of algorithms: Time and Space complexity.

Unit – 2 (7 Hours)
Arrays: Dynamic memory allocation, one-dimensional arrays, multidimensional arrays, operations on arrays, storage – Row major order, Column major order. Linked lists: types of linked lists – singly, doubly and circularly linked lists, operations on linked lists.

Unit – 3 (8 Hours)
Stacks: Implementation of stacks– array and linked list, operations on stacks, Applications of Stacks, Notations – infix, prefix and postfix, Conversion and evaluation of arithmetic expressions using Stacks. Queues: Implementation of queues– array and linked list, operations on queues, Types of queues – queue, double ended queue and priority queue.

Unit – 4 (8 Hours)
Trees: Binary tree, Binary search tree, Threaded binary tree, Height balanced trees, Tries, Heaps, Hash tables. Graph traversals: Breadth First Search, Depth First Search, Shortest path: Depth first search in directed and undirected graphs. Union-find data structure and applications. Directed acyclic graphs; topological sort.

Unit – 5 (8 Hours)
Searching: Linear search, Binary search and Hashing. Algorithms and data structures for sorting: Insertion Sort, Bubble sort, Selection Sort, Merge sort, Quick Sort, Heap sort, Radix sort, Bucket sort. Algorithm design techniques: Divide and conquer, Greedy approach, dynamic programming.

Course Outcomes:

- Recognize the need of different data structures and understand its characteristics (L2).
- Demonstrate the operations for maintaining common data structures and recognize the associated algorithms' complexity (L2).
- Apply different data structures including stacks, queues, hash tables, binary and general tree structures, search trees, and graphs for given problems (L3).
- Design, analyse and compare different algorithms for sorting and searching techniques (L5).

Course Assessment

Continuous Evaluation 25%
Mid Semester 25%
End Semester 50%

Course no: ADBB 154	BSC (YES/ NO)	ESC (YES/ NO)	HSC (YES/ NO)	PC (YES/ NO)	PE (YES/ NO)	IN-IS-SP-MP (YES/ NO)
	NO	NO	NO	YES	NO	NO
Type of course	**Program Core**					
Course Title	**PROGRAMMING USING PYTHON**					
Course objectives:	The objective of this course is to develop problem solving skills using algorithms and procedures. Moreover, the students will learn different Python data structures and their use in Data Science applications.					
POs						

Semester	**Autumn:**		**Spring: Yes**		
II	**Lecture**	**Tutorial**	**Practical**	**Credits**	**Total teaching hours**
Contact Hours	1	0	2	2	36
Prerequisite course code as per proposed course numbers	NIL				
Prerequisite credits	NIL				
Equivalent course codes as per proposed course and old course	NIL				
Overlap course codes as per proposed course numbers	NIL				

Text Books:		
1	Title	Fundamentals of Python: First Programs
	Author	Kenneth A. Lambert
	Publisher	Cengage Learning, Inc.
	Edition	2nd Edition, 2018
Reference Book:		
1.	Title	Python Programming using Problem Solving Approach
	Author	Reema Thareja
	Publisher	Oxford University Press
	Edition	2nd Edition, 2023
2.	Title	Think Python: How to Think Like a Computer Scientist
	Author	Allen B. Downey
	Publisher	O'reilly
	Edition	2nd edition, Updated for Python 3, Shroff/O'Reilly Publishers, 2016
3.	Title	Introduction to Computation and Programming Using Python
	Author	John V Guttag
	Publisher	MIT Press
	Edition	Revised and expanded Edition, 2013

Content	**Unit – 1** (5 Hours) Introduction to computers – Computer Organization – Characteristics – Hardware and Software – Modes of operation – Types of programming languages – Developing a program. Algorithms – Characteristics – Flowcharts. **Unit – 2** (7 Hours) Data types; variables, assignments; immutable variables; numerical types; arithmetic operators and expressions; comments; understanding error messages; Conditions, Boolean logic, logical operators; ranges; Control statements: if-else, loops (for, while); short-circuit (lazy) evaluation **Unit – 3** (8 Hours) Strings and text files; manipulating files and directories, OS and SYS modules; text files: reading/writing text and numbers from/to a file; creating and reading a formatted file (csv or tab-separated). String manipulations: subscript operator, indexing, slicing a string; strings and number system: converting strings to numbers and vice versa. Binary, octal, hexadecimal numbers **Unit – 4** (8 Hours) Lists, tuples, and dictionaries; basic list operators, replacing, inserting, removing an element; searching and sorting lists; dictionary literals, adding and removing keys, accessing and replacing values; traversing dictionaries. **Unit – 5** (8 Hours) Design with functions: hiding redundancy, complexity; arguments and return values; formal vs actual arguments, named arguments- Program structure and design- Recursive functions – Introduction to classes and OOP. Applications: Sample problems in engineering, data pre- processing, and plotting tools.	
Course Outcomes	• Explain the problem solving fundamentals (L2) • Illustrate the syntax and semantics and looping structures in Python programming language (L2) • Utilise string handling mechanisms for data handling (L3) • Make use of lists, tuples and dictionaries in Python programming language (L3) • Develop applications using file handling mechanisms, modules and packages of python language (L6)	
Course Assessment	Continuous Evaluation 25% Mid Semester 25% End Semester 50%	

Course no: ADLB 155	BSC (YES / NO)	ESC (YES / NO)	HSC (YES / NO)	PC (YES/ NO)	PE (YES/ NO)	IN-IS-SP-MP (YES/ NO)
	NO	NO	NO	YES	NO	NO

Type of course	**Program Core**
Course Title	**SYSTEM PROGRAMMING**
Course objectives:	The purpose of this course is to provide the students with the knowledge of system-level programming. It aims to enable the students to understand the design of various system-level programs related to assembler, loader, macro, compiler and operating system.
POs	

Semester	**Autumn:**		**Spring: Yes**		
II	**Lecture**	**Tutorial**	**Practical**	**Credits**	**Total teaching hours**
Contact Hours	3	1	0	4	36
Prerequisite course code as per proposed course numbers	NIL				
Prerequisite credits	NIL				
Equivalent course codes as per proposed course and old course	NIL				
Overlap course codes as per proposed course numbers	NIL				

Text Books:

1	Title	Systems Programming
	Author	John J. Donovan
	Publisher	Tata McGraw Hill
	Edition	First Edition, 2017
2	Title	Systems Programming
	Author	Dhananjay Dhamdhere
	Publisher	McGraw Hill Education
	Edition	First Edition, 2011

Reference Book:

1	Title	System Software-An Introduction to Systems Programming
	Author	L.L. Beck
	Publisher	Addition Wesley
	Edition	3rd Edition, 1996.

Content	**Unit – 1** (5 Hours) Introduction: Evolution of the Components of a Programming System, Evolution of Operating systems. Machine Structure, Machine Language, and Assembly Language. **Unit – 2** (7 Hours) Assemblers: Design of Assembler. Table Processing: searching and sorting. Macro Language and the Macro Processor : Macro Instructions, Features of Macro facility, Implementation.

	Unit – 3 (8 Hours) Loaders: Loader Schemes, Design of an Absolute Loader, Design of a Direct-Linking Loader. **Unit – 4** (8 Hours) Compilers: Statement of problem, Phases of the compiler, Data Structures, Recursion, Call and Return statements, Storage Classes – Use, Implementation, Block Structure, Nonlocal Go To's, Interrupts, Pointers. **Unit – 5** (8 Hours) Operating Systems: I/O Programming, Memory Management, Processor Management, Device Management, Information Management.
Course outcomes	● Apply the knowledge of assembler and macro processors to convert assembly language into machine code (L3). ● Analyse working phases of Compiler to undertake meaningful language translation (L3). ● Evaluate Linkers, Loaders, interpreters and debugging methods to manages system memory and provide a portable runtime environment (L4). ● Analyze the working of an operating system and its components (L3).
Course Assessment	Continuous Evaluation 25%
	Mid Semester 25%
	End Semester 50%

Course no: PHBB-112	BSC (YES/ NO)	ESC (YES/ NO)	HSC (YES/ NO)	PC (YES/ NO)	PE (YES/ NO)	IN-IS-SP-MP (YES/ NO)
	YES	NO	NO	NO	NO	NO

Type of course	**Basic Science Core**
Course Title	**QUANTUM PHYSICS**
Course Objectives:	● This course develops concepts in quantum mechanics such that the behaviour of the physical universe can be understood from a fundamental point of view. It provides a basis for further study of quantum mechanics. ● To provide the exposure of non-relativistic quantum mechanics, the time-dependent and time-independent Schrödinger equation for simple potentials. ● The student will achieve the physical description through the mathematics of a problem. And to give the explanation of the physical meaning of the mathematical formulation and their solution to the quantum mechanics problem. ● To provide the exposure for sketching the physical parameters of a problem (e.g., wave function, potential, probability distribution, the role of operators and their connection with observables, and uncertainty, transformations), as appropriate for a particular problem and composite systems.

Course Outcomes:	**CO1:** Basic understanding of key concepts and the principle of Quantum Physics and its applications, Understanding the role of uncertainty in quantum physics.	L1, L2
	CO2: Interpretation of the wave function and apply operators to it to obtain information about a particle's physical properties such as position, momentum and energy	L1, L2, L3, L4, L5
	CO3: Solve the Schrödinger equation to obtain wave functions for some basic, physically important types of potential in one dimension, and estimate the shape of the wavefunction based on the shape of the potential	L3, L4
	CO4: Analysis and evaluation of the quantum physics with key questions and problems independently.	L4, L5

Semester	**Autumn: Yes**		**Spring:**		
I	**Lecture**	**Tutorial**	**Practical**	**Credits**	**Total teaching hours**
Contact Hours	3	1	0	4	48
Prerequisite course code as per proposed course numbers	NIL				
Prerequisite credits	NIL				
Equivalent course codes as per proposed course and old course	NIL				
Overlap course codes as per proposed course numbers	NIL				

Reference Book:		
1	Title	Concepts of Modern Physics
	Author	Arthur Beiser
	Publisher	Tata McGraw Hill

		Edition	6th Edition (2003)
2		Title	The Feynman Lectures on Physics
		Author	Richard P. Feynman, Robert Leighton, Mathew Sands
		Publisher	Pearson Education India
		Edition	The New Millennium Edition (2012)
3		Title	Principles of Quantum Mechanics
		Author	R. Shankar
		Publisher	Plenum Press
		Edition	2nd Edition 1994
4		Title	Introduction to Quantum Mechanics
		Author	D. Griffiths
		Publisher	Prentice-Hall
		Edition	IInd Edition (2005)
Content	**Unit I: Introduction to Quantum Mechanics** (4 Hours) Planck's radiation law, Photoelectric effect, Compton's experiment, The Bohr model, de Broglie's hypothesis, **Unit II: The Mathematical Structure of Quantum Mechanics** (10 Hours) Probability Amplitudes and Quantum States, Operators and Observables, Position and Momentum Representations, Time Evolution in Quantum Mechanics **Unit III: Wave Mechanics and Oscillators** (10 Hours) Wave mechanics: Free particle in one dimension, Infinite square well, Finite square well, Split infinite square well, Scattering of free particles, Resonant Scattering; Harmonic Oscillators: Ground state of the Quantum Harmonic Oscillator, Excited states of the Quantum Harmonic Oscillator, What oscillates in the quantum harmonic oscillator?, Quantum vs classical harmonic oscillator **Unit IV: Transformations** (10 Hours) Transformations and Symmetries, Translations: Expectation values, Wave functions, Translational Invariance and momentum as a "good quantum number"; Reflections (Parity); Rotations; Heisenberg picture and Heisenberg equation of motion **Unit V: Angular Momentum** (7 Hours) Rotational invariance and angular momentum as a good quantum number, Eigenstates of L^2 and $\hat{L}_z$. **Unit V: Composite Systems** (7 Hours) Operators, Position representation, Independent particles, Measurements; Product States vs entangled states; Entanglement Growth; EPR experiment and Bell inequalities		
Course Assessment	Continuous Evaluation 25% Mid Semester 25% End Semester 50%		

Course Code: EVPB 102	BSC (YES/ NO)	ESC (YES/ NO)	HSC (YES/ NO)	PC (YES/ NO)	PE (YES/ NO)	IN-IS-SP-MP (YES/ NO)
	NO	YES	NO	NO	NO	NO
Type of course	**Engineering Science Core**					
Course Title	Nature and Care					
Course Overview						
Course Objectives:						
Course Outcomes	CO1: Gain a comprehensive understanding of the Environmental Science aspects. CO2: Develop awareness of environment related issues. CO3: Learn about the ethical and moral responsibilities of the engineers towards environment. CO4: Learn remedial measures to solve environmental issues.					

Semester	**Autumn: Yes**		**Spring:**		
I	**Lecture**	**Tutorial**	**Practical**	**Credits**	**Total teaching hours**
Contact Hours	0	0	2	1	24
Prerequisite course code as per proposed course numbers					
Prerequisite credits					
Equivalent course codes as per proposed course and old course					
Overlap course codes as per proposed course numbers					

Text Books:

1	2008	Davis M. L. and Cornwell D. A., "Introduction to Environmental Engineering", McGraw Hill, New York 4/e

Reference Book:

1	2007	Masters G. M., Joseph K. and Nagendran R. "Introduction to Environmental Engineering and Science", Pearson Education, New Delhi. 2/e
2	1986	Peavy H. S., Rowe D.R. and Tchobanoglous G., "Environmental Engineering", McGraw Hill, New York
3	2009	Mines R. O. and Lackey L. W. "Introduction to Environmental Engineering", Prentice Hall, New Yark"
4	2010	Miheicic J. R. and Zimmerman J. B. " Environmental Engineering: Fundamentals, Sustainability, Design" John Wiley and Sons, Inc.

Content:	**Unit 1:** 1. Identification of different plant species in NIT Delhi Campus and find its uses in daily life. 2. Best out of waste competition. 3. Poster and signs making competition to spread environmental awareness. 4. Recycling and environmental pollution article writing competition. **Unit 2:** 5. Use of environment friendly alternatives for daily life products. 6. Quiz activity on rising environmental concern. 7. Organising Zero-waste day. **Unit 3:** 8. Adopt a plant programme. 9. Digital Environmental awareness activity via various social media platforms. 10. Conducting digital survey to know environmental stress faced by people. **Unit 4 :** 11. Calculate your carbon footprint. 12. Introduction to live Air Quality Index. 13. Virtual demonstration of different eco-friendly approaches for sustainable living. **Unit 5:** 14. Write a summary on any book related to environmental issues. 15. Field visit to zoological park/ Botanical garden/ Industry.
Course Assessment	Continuous Evaluation 25% Mid Semester 25% End Semester 50%

Course no: HHS 150	BSC (YES/ NO)	ESC (YES/ NO)	HSC (YES/ NO)	PC (YES/ NO)	PE (YES/ NO)	IN-IS-SP-MP (YES/ NO)
	NO	NO	YES	NO	NO	NO

Type of course	**Humanities and Social Sciences Core**
Course Title	**Holistic Heath & Sports**
Course objectives:	To create awareness about Physical Fitness & Health among students
POs	

Semester	**Autumn: Yes**		**Spring:**		
II	**Lecture**	**Tutorial**	**Practical**	**Credits**	**Total teaching hours**
Contact Hours	0	0	2	1	24
Prerequisite course code as per proposed course numbers	NIL				
Prerequisite credits	NIL				
Equivalent course codes as per proposed course and old course	NIL				
Overlap course codes as per proposed course numbers	NIL				

Content	**Unit 1: Physical Fitness & Health** Physical fitness, components of physical fitness, methods to improve components of physical fitness, health, components of health, health related fitness components, factors affecting overall health. Respiratory rate, Breathing rate, Body Mass Index. Physical Fitness Testing : Cooper's test, Push-up test, Squat test, Sit & Reach Test, Isometric Back strength test, Standing Broad jump test, Shuttle run test, 100 metre sprint test, one minute Sit-up test. **Unit 2: Yoga & its Elements** Yoga, elements of Yoga, Asanas, Pranayama, Surya Namaskar **Unit 3: First Aid & Sports Injuries** First aid, aim of first aid, techniques of first aid, CPR technique, Recovery position, introduction to sports injuries. **Unit 4: Nutrition & Balanced Diet** Nutrition, component of Nutrition, Balanced diet. **Unit 5: Sports & Psychology** Psychology, Sports Psychology, Motivation, Anxiety, Leadership, The Big 5 personality Test.
Course Outcomes:	• Students will be more aware about their overall health. • Students will learn methods to keep them physically fit and to access their physical fitness.
	Continuous Evaluation 50%
	End Semester 50%