Semester-I

Name of the Course: B.Sc. in Information Technology (AI) **Subject:** Programming for Problem Solving & Programming for Problem Solving Lab			
Course Code: BITAI 101 & BITAI 191		**Semester: I**	
Duration: 36 Hrs.		**Maximum Marks: 100+100**	
Teaching Scheme		**Examination Scheme**	
Theory: 3 hrs./week		**End Semester Exam: 70**	
Tutorial: 0		**Attendance : 5**	
Practical: 4 hrs./week		**Continuous Assessment: 25**	
Credit: 3 + 2		**Practical Sessional internal continuous evaluation: 40**	
		Practical Sessional external examination: 60	
Aim:			
Sl. No.			
1.	Implement your algorithms to build programs in the C programming language		
2.	Use data structures like arrays, linked lists, and stacks to solve various problems		
3.	Understand and use file handling in the C programming language		
Objective:			
Sl. No.			
1.	To write efficient algorithms to solve various problems		
2.	To understand and use various constructs of the programming language		
3.	To apply such as conditionals, iteration, and recursion in programming		
Pre-Requisite:			
Sl. No.			
1.	**Basic Knowledge of Computer System**		
Contents		**Hrs./week**	
Chapter	**Name of the Topic**	**Hours**	**Marks**
01	**Introduction to Computers**	**6**	**10**

	Computer Systems, Computing Environments, Computer Languages, Creating and Running Programs, Software Development, Flow charts. Number Systems: Binary, Octal, Decimal, Hexadecimal Introduction to C Language - Background, C Programs, Identifiers, Data Types, Variables, Constants, Input / Output Statements Arithmetic Operators and Expressions: Evaluating Expressions, Precedence and Associativity of Operators, Type Conversions.		
02	**Conditional Control Statements** Bitwise Operators, Relational and Logical Operators, If, If-Else, Switch-Statement and Examples. Loop Control Statements: For, While, DoWhile and Examples. Continue, Break and Goto statements Functions: Function Basics, User-defined Functions, Inter Function Communication, Standard Functions, Methods of Parameter Passing. Recursion- Recursive Functions.. Storage Classes: Auto, Register, Static, Extern, Scope Rules, and Type Qualifiers.	**8**	**10**
03	**Preprocessors and Arrays** Preprocessor Commands Arrays - Concepts, Using Arrays in C, Inter-Function Communication, Array Applications, Two-Dimensional Arrays, Multidimensional Arrays, Linear and Binary Search, Selection and Bubble Sort.	**8**	**16**
04	**Pointers** Pointers for Inter-Function Communication, Pointers to Pointers, Compatibility, Lvalue and Rvalue, Arrays and Pointers, Pointer Arithmetic and Arrays, Passing an Array to a Function, Memory Allocation Functions, Array of Pointers, Programming Applications, Pointers to void, Pointers to Functions, Command Line Arguments. Strings - Concepts, C Strings, String Input/Output Functions, Arrays of Strings, String Manipulation Functions.	**8**	**16**
05	**Structures and File** Definition and Initialization of Structures, Accessing Structures, Nested Structures, Arrays of Structures, Structures and Functions, Pointers to Structures, Self-Referential Structures, Unions, Type Definition (typedef), Enumerated Types. Input and Output: Introduction to Files, Modes of Files, Streams, Standard Library Input/Output Functions, Character Input/Output Functions.	**6**	**18**

	Sub Total:	**36**	**70**
	Internal Assessment Examination & Preparation of Semester Examination	**4**	**30**
	Total:	**40**	**100**

Practical:

Skills to be developed:
Intellectual skills:

1. The ability to learn concepts and apply them to other problems. ...
2. Basic mathematical skills.
3. A passion for problem solving.
4. Confidence around a computer programming Language.

List of Practical: Sl. No. 1 to10 compulsory & at least three from the rest)

1. Write a c program to display the word "welcome".
2. Write a c program to take a variable int and input the value from the user and display it.
3. Write a c program to add 2 numbers entered by the user and display the result.
4. Write a c program to calculate the area and perimeter of a circle.
5. Write a C program to find maximum between two numbers.
6. Write a C program to check whether a number is divisible by 5 and 11 or not.
7. Write a C program to input angles of a triangle and check whether triangle is valid or not.
8. Write a C program to check whether a year is leap year or not.
9. Write a C program to input basic salary of an employee and calculate its Gross salary according to following:
   Basic Salary <= 10000 : HRA = 20%, DA = 80%
   Basic Salary <= 20000 : HRA = 25%, DA = 90%
   Basic Salary > 20000 : HRA = 30%, DA = 95%
10. Write a c program to print “welcome” 10 times.
11. Write a c program to print first n natural numbers using while loop.
12. Write a c program to print all the odd numbers in a given range.
13. Write a c program to add first n numbers using while loop.
14. Write a c program to print all numbers divisible by 3 or 5 in a given range.
15. Write a c program to add even numbers in a given range.
16. Write a c program to find the factorial of a given number.
17. Write a c program to find whether a number is prime or not.
18. Write a c program to print the reverse of a number.
19. Write a c program to add the digits of a number.
20. Write a c program to print the Fibonacci series in a given range using recursion.
21. Write a c program to check whether a number is an Armstrong number or not.
22. Write a c program to find g.c.d. and l.c.m. of two numbers using function.

Assignments:

1. Based on theory lectures.

List of Books

Text Books:

Name of Author	Title of the Book	Edition/ISSN/ISBN	Name of the Publisher
YashavantKanetkar,	Let us C	13th Edition	BPB Publication
E. Balaguruswamy	Programming in ANSI C		Tata McGraw-Hill
Gary J. Bronson	A First Book of ANSI C	4th Edition	ACM

Reference Books:

Byron Gottfried	Schaum's Outline of Programming with C		McGraw-Hill
Kenneth A. Reek	Pointers on C		Pearson
Brian W. Kernighan and Dennis M. Ritchie	The C Programming Language		Prentice Hall of India

List of equipment/apparatus for laboratory experiments:

Sl. No.	
1.	Computer

End Semester Examination Scheme. Maximum Marks-70. Time allotted-3hrs.

Group	Unit	Objective Questions (MCQ only with the correct answer)		Subjective Questions			
		No of question to be set	Total Marks	No of question to be set	To answer	Marks per question	Total Marks
A	1,2,3,4,5	10	10				
B	3, 4, 5			5	3	5	60
C	1,2,3,4,5			5	3	15	

- Only multiple choice type questions (MCQ) with one correct answer are to be set in the objective part.
- Specific instruction to the students to maintain the order in answering objective questions

should be given on top of the question paper.

Examination Scheme for end semester examination:

Group	Chapter	Marks of each question	Question to be set	Question to be answered
A	All	1	10	10
B	All	5	5	3
C	All	15	5	3

Examination Scheme for Practical Sessional examination:

Practical Internal Sessional Continuous Evaluation

Internal Examination:

Continuous evaluation			**40**

External Examination: Examiner-

Signed Lab Assignments	**10**	
On Spot Experiment	**40**	
Viva voce	**10**	**60**

Name of the Course: B.Sc. in Information Technology (AI) **Subject:** Electrical and Electronics Engineering, Electrical and Electronics Engineering Lab	
Course Code: BITAI 102 & BITAI 192	**Semester: I**
Duration: 36 Hrs.	**Maximum Marks: 100+100**
Teaching Scheme	**Examination Scheme**
Theory: 3 hrs./week	**End Semester Exam: 70**
Tutorial: 0	**Attendance : 5**
Practical: 4 hrs./week	**Continuous Assessment: 25**
Credit: 3 + 2	**Practical Sessional internal continuous evaluation: 40**
	Practical Sessional external examination: 60

Aim:	
Sl. No.	
1.	It aims to apply knowledge of science, mathematics, and engineering principles to solve electrical and electronics engineering problems.
2.	It also edifies understanding the impact of electrical & electronics engineering solutions in a global, economic, environmental, and societal context.

Objective:	
Sl. No.	
1.	To impart profound scientific & engineering knowledge to comprehend, analyze, design and create new thoughts and products for solving real life Engineering problems.
2.	Ability to conduct experimental investigation, analyze, evaluate and interpret results in the field electrical & electronics circuits & measurements, electrical machines, power systems, control systems, power electronics & drives and microprocessor & microcontroller, electronics devices etc.

Contents		**Hrs./week**	
Chapter	**Name of the Topic**	**Hours**	**Marks**
01	**Electrical Circuits & Measurements** Fundamental laws of electric circuits, Steady State Solution of DC Circuits – Introduction to AC Circuits –Sinusoidal steady state analysis, Power and Power factor – Single Phase and Three Phase Balanced Circuits. Classification of instruments – Operating Principles of indicating Instruments	**4**	**14**
02	**Electrical Machines** Construction, Principle of Operation, Basic Equations and Applications of DC Generators, DC Motors, Single Phase Transformer, single phase induction Motor.	**9**	**13**
03	**Semiconductor Devices And Applications** Introduction – Characteristics of PN Junction Diode – Zener Effect – Zener Diode and its Characteristics – Half wave and Full wave Rectifiers – Voltage Regulation. Bipolar Junction	**6**	**20**

	Transistor – CB, CE, CC Configurations and Characteristics – Elementary Treatment of Small Signal Amplifier.		
04	**Digital Electronics** Binary Number System – Boolean algebra theorems, Digital circuits – Introduction to sequential Circuits, Flip-Flops – Registers and Counters – A/D and D/A Conversion –digital processing architecture.	**9**	**13**
05	**Fundamentals of Communication Engineering** Introduction – Elements of Communication Systems, Modulation and Demodulation: Principles of Amplitude and Frequency Modulations. Digital Communication – Communication Systems: Radio, Antenna, TV, Fax, ISDN, Microwave, Satellite and Optical Fibre (Block Diagram Approach only).	**8**	**10**
	Sub Total:	**36**	**70**
	Internal Assessment Examination & Preparation of Semester Examination	**4**	**30**
	Total:	**40**	**100**

Practical:

Skills to be developed:

Intellectual skills:

1. **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
2. **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
3. **Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings
4. **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.
5. **Professional Skills**: Able to utilize the knowledge of high voltage engineering in collaboration with power systems in innovative, dynamic and challenging environments, for the research based team work.

List of Practicals:

1.Verification of Kirchhoff's current and voltage laws.
2.Verification of network theorems.
3.Study of characteristics of DC motor
4.Open circuit and short circuit test on single phase transformer.

5.Study the performance characteristics of a single phase induction motor .
6.Familiarization of resistors using colour coded method and multimeter.
7.PN junction diode and zener diode characteristics
8.Transistor CE and CB characteristics.
9.Full wave and Half wave Characteristics
10.Study of CRO.

Assignments:

1. Based on theory

List of Books
Text Books:

Name of Author	**Title of the Book**	**Edition/ISSN/ISBN**	**Name of the Publisher**
DP Kothari and 1.J Nagarath	Electrical Machines "Basic Electrical and Electronics Engineering		McGraw Hill Education(India) Private Limited, Third Reprint,2016
S.K. Bhattacharya	Basic Electrical and Electronics Engineering		Pearson India, 2011
Reference Books:			
Sedha R.S	Applied Electronics		S. Chand & Co., 2006
A.E.Fitzgerald, David E Higginbotham and Arvin Grabel	Basic Electrical Engineering		*Mc*Graw Hill Education(India) Private Limited, 2009

List of equipment/apparatus for laboratory experiments:

Sl. No.	
1.	CRO/DSO
2.	Function Generator
3.	Basic electrical Trainer kit
4.	Basic Electronics components like diodes, transistors, resistors, multimeter, jumper wires, breadboard

End Semester Examination Scheme. Maximum Marks-70. Time allotted-3hrs.

Group	**Unit**	**Objective Questions** (MCQ only with the correct answer)		**Subjective Questions**			
		No of question to be set	**Total Marks**	**No of question to be set**	**To answer**	**Marks per question**	**Total Marks**
A	1,2,3,4,5	10	10				
B	3, 4, 5			5	3	5	60
C	1,2,3,4,5			5	3	15	

- Only multiple choice type question (MCQ) with one correct answer are to be set in the objective part.
- Specific instruction to the students to maintain the order in answering objective questions should be given on top of the question paper.

Examination Scheme for end semester examination:

Group	Chapter	Marks of each question	Question to be set	Question to be answered
A	All	1	10	10
B	All	5	5	3
C	All	15	5	3

Examination Scheme for Practical Sessional examination:

Practical Internal Sessional Continuous Evaluation

Internal Examination:

Continuous evaluation			**40**

External Examination: Examiner-

Signed Lab Assignments	**10**	
On Spot Experiment	**40**	
Viva voce	**10**	**60**

Name of the Course: B.Sc. in Information Technology (AI) **Subject:** Soft Skills & Soft Skills Lab			
Course Code: BITAI 103 & BITAI 193		**Semester: I**	
Duration: 36 Hrs.		**Maximum Marks: 100+100**	
Teaching Scheme		**Examination Scheme**	
Theory: 3 hrs./week		**End Semester Exam: 70**	
Tutorial: 0		**Attendance: 5**	
Practical: 2 hrs./week		**Continuous Assessment: 25**	
Credit: 3 + 1		**Practical Sessional internal continuous evaluation: 40**	
		Practical Sessional external examination: 60	
Aim:			
Sl. No.			
1.	Ability to read English with ability to read English with understanding and decipher paragraph patterns, writer techniques and conclusions		
2.	Skill to develop the ability to write English correctly and master the mechanics of writing the use of correct punctuation marks and capital letter		
3.	Ability to understand English when it is spoken in various contexts.		
Objective:			
Sl. No.			
1.	To enable the learner to communicate effectively and appropriately in real life situation		
2.	To use English effectively for study purpose across the curriculum		
3.	To use R,W,L,S and integrate the use of four language skills, Reading, writing , listening and speaking.		
4.	To revise and reinforce structures already learnt.		
Pre-Requisite:			
Sl. No.			
1.	Basic knowledge of English Language.		
Contents		**Hrs./week**	
Chapter	**Name of the Topic**	**Hours**	**Marks**
01	**Grammar** Correction of sentence, Vocabulary/word formation, Single word for a group of words, Fill in the blank, transformation of sentences, Structure of sentences – Active / Passive Voice – Direct / Indirect Narration.	**6**	**15**
02	**Essay Writing** Descriptive – Comparative – Argumentative – Thesis statement- Structure of opening / concluding paragraphs – Body of the essay.	**5**	**5**
03	**Reading Comprehension** Global – Contextual – Inferential – Select passages from recommended text.	**5**	**10**
04	**Business Correspondence** Letter Writing – Formal. Drafting. Biodata- Resume′-	**5**	**8**

	Curriculum Vitae.		
05	**Report Writing** Structure, Types of report – Practice Writing.	**5**	**5**
06	**Communication skills** Public Speaking skills, Features of effective speech, verbal-nonverbal.	**5**	**15**
07	**Group discussion** Group discussion – principle – practice	**5**	**12**
	Sub Total:	**36**	**70**
	Internal Assessment Examination & Preparation of Semester Examination	**4**	**30**
	Total:	**40**	**100**

Practical:

Skills to be developed:

Intellectual skills:

1. Skill of Grammar
2. Various writing skills
3. Skill of reading English text
4. Skill of effective written communication
5.

Motor Skills:

1. Skill of using Correct body language while giving a presentation
2. Various non-verbal communication skills
3. Skill of using correct gestures and expressions while speaking publicly
4. Essential approach and attitude in Group Discussion or Viva

List of Practical:

1. Honing 'Listening Skill' and its sub skills through Language Lab Audio device.
2. Honing 'Speaking Skill' and its sub skills.
3. Helping them master Linguistic/Paralinguistic features (Pronunciation/Phonetics/Voice modulation/ Stress/ Intonation/ Pitch & Accent) of connected speech.
4. Honing 'Conversation Skill' using Language Lab Audio –Visual input, Conversational Practice Sessions (Face to Face / via Telephone, Mobile phone & Role Play Mode).
5. Introducing 'Group Discussion' through audio –Visual input and acquainting them with key strategies for success.
6. GD Practice Sessions for helping them internalize basic Principles (turn- taking, creative intervention, by using correct body language, courtesies & other soft skills) of GD.
7. Honing 'Reading Skills' and its sub skills using Visual / Graphics/Diagrams /Chart Display/Technical/Non Technical Passages, Learning Global / Contextual / Inferential Comprehension.
8. Honing 'Writing Skill' and its sub skills by using Language Lab Audio –Visual input, Practice Sessions

Assignments:
Based on theory lectures.

List of Books
Text Books:

Name of Author	Title of the Book	Edition/ISSN/ISBN	Name of the Publisher
R.C. Sharma and K.Mohan	Business Correspondence and Report Writing		Tata McGraw Hill , New Delhi , 1994
.Gartside	Model Business Letters		Pitman , London , 1992
Reference Books:			
Mark MaCormack	Communication		
John Metchell	How to write reports		
S R Inthira&amp, V Saraswathi	Enrich your English – a) Communication skills b) Academic skills		CIEFL &amp, OUP
Longman	Longman Dictionary of Contemporary English/Oxford Advanced Learner's Dictionary of Current English		OUP , 1998
Maxwell Nurnberg and Rosenblum Morris	All About Words		General Book Depot, New Delhi , 1995
	A Text Book for English for Engineers &amp, Technologists		

List of equipment/apparatus for laboratory experiments:

Sl. No.	
1.	Computer
2.	Audio Devices
3.	Visual Devices
4.	Language lab Devices and the dedicated software

End Semester Examination Scheme. Maximum Marks-70. Time allotted-3hrs.

Group	Unit	Objective Questions (MCQ only with the correct answer)		Subjective Questions			
		No of question to be set	Total Marks	No of question to be set	To answer	Marks per question	Total Marks
A	1,2,3,4,5, 6	10	10				

B C	3, 4, 5, 6 1,2,3,4,5, 6			5 5	3 3	5 15	60

- Only multiple choice type question (MCQ) with one correct answer are to be set in the objective part.
- Specific instruction to the students to maintain the order in answering objective questions should be given on top of the question paper.

Examination Scheme for end semester examination:

Group	**Chapter**	**Marks of each question**	**Question to be set**	**Question to be answered**
A	All	1	10	10
B	All	5	5	3
C	All	15	5	3

Examination Scheme for Practical Sessional examination:

Practical Internal Sessional Continuous Evaluation

Internal Examination:

Continuous evaluation			**40**

External Examination: Examiner-

Signed Lab Assignments	**10**	
On Spot Experiment	**40**	
Viva voce	**10**	**60**

Name of the Course: BSc. In Information Technology (AI) **Subject:** Computational Engineering Mechanics & Computational Engineering Mechanics Lab			
Course Code: BITAI 104,BITAI 194		**Semester: I**	
Duration: 36 Hrs.		**Maximum Marks: 100 +100**	
Teaching Scheme		**Examination Scheme**	
Theory: 2 hrs./week		**End Semester Exam: 70**	
Tutorial:		**Attendance : 5**	
Practical: 4 hrs./week		**Continuous Assessment: 25**	
Credit: 2+2		**Practical Sessional internal continuous evaluation: 40**	
		Practical Sessional external examination: 60	
Aim:			
Sl. No.			
1.	Define computational Mechanics and understand its relationship with data		
2.	Identify the application		
Objective:			
Sl. No.			
1.	Define computational Mechanics and understand its relationship with data		
2.	Apply it to solve real life problem		
Pre-Requisite:			
Sl. No.			
1.	**Basic Statistical and Computational knowledge**		
Contents		**4 Hrs./week**	
Chapter	**Name of the Topic**	**Hours**	**Marks**
01	Introduction to Computer Programming Basic computer programming concepts for engineering computations. Programming in MATLAB or similar computing	**7**	**14**

	environments is emphasized and Python, R languages are also be discussed		
02	Engineering Computation Fundamental numerical methods and software tools used in engineering computation. Subjects include linear systems of equations, matrix computations, nonlinear equations, least squares approximations, interpolation, numerical integration and numerical solution of differential equations.	**7**	**14**
03	Scientific Computation Restricted to Computational Engineering majors. Explores the basic tools needed for developing scientific computing software. These include advanced programming languages (e.g. C, C++, python), object oriented programming and data structures. Subjects may include abstract data types, creation, initialization, and destruction of objects, class hierarchies, polymorphism, inheritance and dynamic binding, generic programming using templates, linked lists, queues, stacks, trees and algorithms such as searching, sorting, and hashing.	**7**	**14**
04	Software Engineering and Design Restricted to computational engineering majors. Covers methods and tools for planning, designing, implementing, validating and maintaining large software systems. May include project work to build a software system as a team, using appropriate software engineering tools and techniques	**7**	**14**
05	Applied Mathematics Introduction to modern mathematics, real analysis of functions of one variable, linear operator theory and ordinary differential equations. Elements of complex analysis, Fourier and Laplace transforms, partial differential equations, perturbation methods, analysis of functions of several variables Statics Vector algebra, force systems, free-body diagrams, engineering applications of equilibrium, including frames, friction, distributed loads, centroids, moments of inertia	**8**	**14**

	Dynamics Two- and three-dimensional kinematics and dynamics, applied to a broad class of engineering problems Mechanics of Solids Internal forces and deformations in solids, stress and strain in elastic and plastic solids, application to simple engineering problems		
	Sub Total:	**36**	**70**
	Internal Assessment Examination & Preparation of Semester Examination	**4**	**30**
	Total:	**40**	**100**

List of Books

Text Books:

Name of Author	**Title of the Book**	**Edition/ISSN/ISBN**	**Name of the Publisher**
J B Doshi	Analytical Methods in Engineering		
A N Tychonov and A Asamarski	Partial Differential Equations of Mathematical Physics		

Reference Books:

End Semester Examination Scheme. **Maximum Marks-70.** **Time allotted-3hrs.**

Group	**Unit**	**Objective Questions** (MCQ only with the correct answer)		**Subjective Questions**			
		No of question to be set	Total Marks	No of question to be set	To answer	Marks per question	Total Marks
A	1,2,3,4,5	10	10				

B	3, 4, 5			5	3	5	60
C	1,2,3,4,5			5	3	15	

- Only multiple choice type question (MCQ) with one correct answer are to be set in the objective part.
- Specific instruction to the students to maintain the order in answering objective questions should be given on top of the question paper.

Examination Scheme for end semester examination:

Group	**Chapter**	**Marks of each question**	**Question to be set**	**Question to be answered**
A	All	1	10	10
B	All	5	5	3
C	All	15	5	3

Examination Scheme for Practical Sessional examination:

Practical Internal Sessional Continuous Evaluation

Internal Examination:

Continuous evaluation			**40**

External Examination: Examiner-

Signed Lab Assignments	**10**	
On Spot Experiment	**40**	
Viva voce	**10**	**60**

Name of the Course: BSc. In Information Technology (AI) **Subject:** Introduction to AI and Machine Learning	
Course Code: BITAI105	**Semester: I**
Duration: 36 Hrs.	**Maximum Marks: 100**
Teaching Scheme	**Examination Scheme**
Theory: 3 hrs./week	**End Semester Exam: 70**
Tutorial: 1 hr./week	**Attendance : 5**
Practical: 0	**Continuous Assessment: 25**
Credit: 4	**Practical Sessional internal continuous evaluation: NA**
	Practical Sessional external examination: NA

Aim:

Sl. No.	
1.	Define Artificial Intelligence (AI) and understand its relationship with data
2.	Understand Machine Learning approach and its relationship with data science
3.	Identify the application
4.	Define Machine Learning (ML) and understand its relationship with Artificial Intelligence

Objective:

Sl. No.	
1.	Gain a historical perspective of AI and its foundations
2.	Become familiar with basic principles of AI toward problem solving, inference, perception, knowledge representation, and learning.
3.	Investigate applications of AI techniques in intelligent agents, expert systems, artificial neural networks and other machine learning models.
4.	Experience AI development tools such as an ‘AI language’, expert system shell, and/or data mining tool.
5.	Experiment with a machine learning model for simulation and analysis.
6.	Explore the current scope, potential, limitations, and implications of intelligent systems

Pre-Requisite:

Sl. No.			
2.	**Basic Statistical and Computational knowledge**		
Contents		**4 Hrs./week**	
Chapter	**Name of the Topic**	**Hours**	**Marks**
01	**Artificial intelligence fundamentals** A.I. systems integrating approaches and methods.- Advanced search- Constraint satisfaction problems – Knowledge representation and reasoning – Non-standard logics – Uncertain and probabilistic reasoning (Bayesian networks, fuzzy sets).- Foundations of semantic web: semantic networks and description logics. – Rules systems: use and efficient implementation.- Planning systems	**7**	**14**
02	**Machine learning** Computational learning tasks for predictions, learning as function approximation, generalization concept. – Linear models and Nearest-Neighbors (learning algorithms and properties, regularization). – Neural Networks (MLP and deep models, SOM). – Probabilistic graphical models. – Principles of learning processes: elements of statistical learning theory, model validation. – Support Vector Machines and kernel-based models. – Introduction to applications and advanced models. Applicative project: implementation and use of ML/NN models with emphasis to the rigorous application of validation techniques	**7**	**14**
03	**Human language technologies** Formal and statistical approaches to NLP. Statistical methods: Language Model, Hidden Markov Model, Viterbi Algorithm, Generative vs Discriminative Models Linguistic essentials (tokenization, morphology, PoS, collocations, etc.). Parsing (constituency and dependency parsing).Processing Pipelines. Lexical semantics: corpora, thesauri, gazetteers. Distributional Semantics: Word embeddings, Character embeddings. Deep Learning for natural language. **Applications:** Entity recognition, Entity linking, classification, summarization. Opinion mining, Sentiment Analysis. Question answering, Language inference, Dialogic interfaces. Statistical Machine	**7**	**14**

	Translation. NLP libraries: NLTK, Theano, Tensorflow		
04	**Intelligent Systems for Pattern Recognition** Particular focus will be given to pattern recognition problems and models dealing with sequential and time-series data-Signal processing and time-series analysis-Image processing, filters and visual feature detectors-Bayesian learning and deep learning for machine vision and signal processing-Neural network models for pattern recognition on non-vectorial data (physiological data, sensor streams, etc)-Kernel and adaptive methods for relational data-Pattern recognition applications: machine vision, bio informatics, robotics, medical imaging, etc.-ML and deep learning libraries overview: e.g. scikit-learn, Keras, Theano	**7**	**14**
05	**Smart applications and Robotics** Common designs for smart applications examples: fuzzy logic in control systems or cloud analysis of field sensors data streams Make or buy: selecting appropriate procurement strategies example: writing your own RRN architecture vs. Using cloud services Development platforms for smart objects examples: Brillo (IoT devices) or Android TV (Smart TVs) Development platforms for smart architectures examples: TensorFlow (server-side RNNs), or the Face Recognition API (mobile) Cloud services for smart applications examples: Google Cloud Machine Learning API, Google Cloud Vision API, Google Cloud Speech API, or Deploying Deep Neural Networks on Microsoft Azure GPU VMs Deployment and operations examples: cloud hosting vs. Device hosting, or harnessing user feedback to drive improvement Measuring success: methods and metrics examples: defining user engagement and satisfaction metrics, or assessing the naturalness of smart interactions **Introduction to robotics:** main definitions, illustration of application domains-Mechanics and kinematics of the robot-Sensors for robotics-Robot Control-Architectures for controlling behaviour in robots-Robotic Navigation-Tactile Perception in humans and robots-Vision in humans and robots-Analysis of case studies of robotic systems-Project laboratory: student work in the lab with robotic systems	**8**	**14**

	Sub Total:	**36**	**70**
	Internal Assessment Examination & Preparation of Semester Examination	**4**	**30**
	Total:	**40**	**100**

List of Books

Text Books:

Name of Author	**Title of the Book**	**Edition/ISSN/ISBN**	**Name of the Publisher**
Stuart Russell and Peter Norvig	Artificial Intelligence: A Modern Approach		
Nils J Nilsson	Artificial Intelligence: A New Sythesis		

Reference Books:

Negnevitsky	Artificial Intelligence		
AkerkarRajendr	Intro. To artificial intelligence		
AnandHareendran S and Vinod Chandra S S	Artificial Intelligence and Machine Learning		

End Semester Examination Scheme. Maximum Marks-70. Time allotted-3hrs.

Group	**Unit**	**Objective Questions** (MCQ only with the correct answer)		**Subjective Questions**			
		No of question to be set	Total Marks	No of question to be set	To answer	Marks per question	Total Marks
A	1,2,3,4,5	10	10				
B	3, 4, 5			5	3	5	60
C	1,2,3,4,5			5	3	15	

- Only multiple choice type question (MCQ) with one correct answer are to be set in the

objective part.

- Specific instruction to the students to maintain the order in answering objective questions should be given on top of the question paper.

Examination Scheme for end semester examination:

Group	Chapter	Marks of each question	Question to be set	Question to be answered
A	All	1	10	10
B	All	5	5	3
C	All	15	5	3

Name of the Course: B.Sc. in Information Technology (AI) **Subject:** Mathematics for Computer Science	
Course Code: BITAI 106	**Semester: I**
Duration: 36 Hrs	**Maximum Marks: 100**
Teaching Scheme	**Examination Scheme**
Theory: 3 **hrs./week**	End Semester Exam: 70
Tutorial:1 **hr./week**	Attendance: 5
Practical: 0	Continuous Assessment: 25
Credit:4	Practical Sessional internal continuous evaluation: NA
	Practical Sessional external examination: NA

Aim:

Sl. No.	
1.	To develop formal reasoning.
2.	Create habit of raising questions
3.	Knowledge regarding the use of Mathematics in Computer Science
4.	Ability to communicate knowledge, capabilities and skills related to the computer engineer profession

Objective: Throughout the course, students will be expected to demonstrate their understanding of

Mathematics by being able to do each of the following

Sl. No.	
1.	To understand and solve mathematical problems
2.	To impart knowledge regarding relevant topics .
3.	To familiarize students with linear Algebra, differential and integral calculus, numerical methods and statistics.

Pre-Requisite:

Sl. No.	
1.	**Knowledge of basic algebra, trigonometry and calculus .**

Contents	**4 Hrs./week**

Chapter	Name of the Topic	Hours	Marks
01	**Modern algebra** Set, Relation, Mapping, Binary Operation, Addition Modulo n, Multiplication modulo n, semi group, properties of groups, subgroup.	**3**	**7**
02	**Trigonometry** Radian or circular Measure, Trigonometric Functions, Trigonometric ratios of angle θ when θ is acute, trigonometric ratios of certain standard angles, allied angles, compound angles, multiple and sub- multiple angles.	**3**	**5**
03	**Limits and Continuity** The real number system, The concept of limit, concept of continuity.	**2**	**5**
04	**Differentiation** Differentiation of powers of x, Differentiation of ex and log x, differentiation of trigonometric functions, Rules for finding derivatives, Different types of differentiation, logarithmic differentiation, differentiation by substitution, differentiation of implicit functions, differentiation from parametric equation. Differentiation from first principles.	**4**	**10**
05	**Integrations** Integration of standard Functions, rules of Integration, More formulas in integration, Definite integrals.	**4**	**5**
06	**Differential equations** First order differential equations, practical approach to Differential equations, first order and first degree differential equations, homogeneous equations. Linear equations, Bernoulli's equation, Exact Differential Equations.	**4**	**6**
07	**Complex Numbers** Complex Numbers, Conjugate of a complex number, modulus of	**3**	**5**

	a complex Number, geometrical representation of complex number, De Moivre's theorem, n^{th} roots of a complex number.		
08	**Matrices and Determinants** Definition of a matrix, Operations on matrices, Square Matrix and its inverse, determinants, properties of determinants, the inverse of a matrix, solution of equations using matrices and determinants, solving equations using determinants.	**4**	**10**
09	**Infinite Series** Convergence and divergence, series of positive terms, binomial series, exponential series,logarithmic series.	**3**	**7**
10	**Probability** Concept of probability, sample space and events, three approaches of probability, kolmogorov's axiomatic approach to probability, conditional probability and independence of events, bay's theorem.	**3**	**5**
11	**Introduction to Statistics** Measures of central Tendency, Standard Deviation, Discrete series. Methods, Deviation taken from assumed mean, continuous series, combined standard deviation, coefficient of variation, variance.	**3**	**5**
	Sub Total:	**36**	**70**
	Internal Assessment Examination & Preparation of Semester Examination	**4**	**30**
	Total:	**40**	**100**

Assignments:

Based on the curriculum as covered by subject teacher.

List of Books

Text Books:

Name of Author	**Title of the Book**	**Edition/ISSN/ISBN**	**Name of the Publisher**
S. K. Mapa	Higher Algebra		Levant Books

Chakravorty and Ghosh	Advanced Higher Algebra		U N DharPvt. Ltd
Reference Books:			
Das and Mukherjee	Integral Calculus		U N DharPvt. Ltd
Das and Mukherjee	Differential Calculus		U N DharPvt. Ltd

End Semester Examination Scheme. Maximum Marks-70. Time allotted-3hrs.

Group	**Unit**	**Objective Questions** (MCQ only with the correct answer)		**Subjective Questions**			
		No of question to be set	Total Marks	No of question to be set	To answer	Marks per question	Total Marks
A	**1 to 11**	**10**	**10**				
B	**1 to 11**			**5**	**3**	**5**	**60**
C	**1 to 11**			**5**	**3**	**15**	

- Only multiple choice type question (MCQ) with one correct answer are to be set in the objective part.
- Specific instruction to the students to maintain the order in answering objective questions should be given on top of the question paper.

Examination Scheme for end semester examination:

Group	**Chapter**	**Marks of each question**	**Question to be set**	**Question to be answered**
A	**All**	**1**	**10**	**10**
B	**All**	**5**	**5**	**3**
C	**All**	**15**	**5**	**3**