

<b>Name of the Course: B.Sc. in Information Technology (Artificial Intelligence)</b>				
<b>Subject: Image Processing and Image Processing Lab</b>				
<b>Course Code:</b> BITAI 501,BITAI 591		<b>Semester: V</b>		
<b>Duration:</b> 36 Hrs.		<b>Maximum Marks: 100+100</b>		
<b>Teaching Scheme</b>		<b>Examination Scheme</b>		
<b>Theory: 3 hrs./week</b>		<b>End Semester Exam: 70</b>		
<b>Tutorial: 0</b>		<b>Attendance : 5</b>		
<b>Practical: 4 hrs./week</b>		<b>Continuous Assessment: 25</b>		
<b>Credit: 3 + 2</b>		<b>Practical Sessional internal continuous evaluation: 40</b>		
		<b>Practical Sessional external examination: 60</b>		
<b>Aim:</b>				
<b>Sl. No.</b>				
1.	Review the fundamental concepts of a digital image processing system			
2.	Evaluate the techniques for image enhancement and image restoration.			
3.	Interpret image segmentation and representation techniques.			
4.	Interpret Image compression standards.			
<b>Objective:</b>				
<b>Sl. No.</b>				
1.	To study the image fundamentals and mathematical transforms necessary for image processing.			
2.	To study the image enhancement techniques.			
3.	To study image restoration procedures. To study the image compression procedures.			
<b>Pre-Requisite:</b>				
<b>Sl. No.</b>				
1.	Mathematics			
2.	Digital Electronics, Signals and systems.			
<b>Contents</b>				
<b>Chapter</b>	<b>Name of the Topic</b>	<b>Hrs./week</b>	<b>Hours</b>	<b>Marks</b>
01	Introduction ,Background, Digital Image Representation, Fundamental steps in Image Processing, Elements of Digital Image Processing - Image Acquisition, Storage, Processing, Communication, Display.	3		8
02	Digital Image Formation [4L] A Simple Image Model, Geometric Model- Basic Transformation (Translation, Scaling, Rotation), Perspective Projection, Sampling & Quantization - Uniform & Non uniform	3		10
03	Mathematical Preliminaries [9L] Neighbour of pixels, Connectivity, Relations, Equivalence & Transitive Closure; Distance Measures, Arithmetic/Logic Operations, Fourier Transformation, Properties of The Two Dimensional Fourier Transform, Discrete Fourier Transform, Discrete Cosine & Sine Transform.	8		16
04	Spatial Domain Method, Frequency Domain Method, Contrast Enhancement -Linear & Nonlinear Stretching, Histogram Processing; Smoothing - Image Averaging, Mean Filter, Low-pass Filtering;	8		16



	Image Sharpening, High-pass Filtering, Highboost Filtering, Derivative Filtering, Homomorphic Filtering; Enhancement in the frequency domain - Low pass filtering, High pass filtering.		
05	Image Restoration [7L] Degradation Model, Discrete Formulation, Algebraic Approach to Restoration - Unconstrained & Constrained; Constrained Least Square Restoration, Restoration by Homomorphic Filtering, Geometric Transformation - Spatial Transformation, Gray Level Interpolation.	7	10
06	Image Segmentation [7L] Point Detection, Line Detection, Edge detection, Combined detection, Edge Linking & Boundary Detection - Local Processing, Global Processing via The Hough Transform; Thresholding - Foundation, Simple Global Thresholding, Optimal Thresholding; Region Oriented Segmentation - Basic Formulation, Region Growing by Pixel Aggregation, Region Splitting & Merging.	7	10
	<b>Sub Total:</b>	<b>36</b>	<b>70</b>
	<b>Internal Assessment Examination &amp; Preparation of Semester Examination</b>		
	<b>Total:</b>		

**Practical:**

**Skills to be developed:**

Intellectual skills:

1. Skill to Analyze images in the frequency domain using various transforms.
2. Skill to Interpret image segmentation and representation techniques

**List of Practical: Sl. No. 1& 2 compulsory & at least three from the rest)**

1. Display an image to illustrate change in image quality with decreasing gray levels-128, 64, 32, 16 and 8.
2. Write a code in Matlab to perform the following operations on an image:
  - a. Increase and decrease brightness of an image.
  - b. Manipulate contrast of an image.
  - c. Determine negative of an image.
3. Read an image and perform histogram equalization of the input image and analyse the result.
4. Read a grayscale image and convert it to a binary image using hard thresholding. Make the threshold value a user defined parameter. Vary the threshold and observe the result.
5. Read an image, convolve the image with the mask  $1/9 \times \begin{bmatrix} 1 & 1 & 1 \\ 1 & 1 & 1 \\ 1 & 1 & 1 \end{bmatrix}$

And show that it performs averaging operation which results in blurring of the image. Also analyse the impact of increasing the size of the mask to 5x5, that is, mask is

$$1/9 \times \begin{bmatrix} 1 & 1 & 1 & 1 & 1 \\ 1 & 1 & 1 & 1 & 1 \\ 1 & 1 & 1 & 1 & 1 \\ 1 & 1 & 1 & 1 & 1 \\ 1 & 1 & 1 & 1 & 1 \end{bmatrix}$$



6. Read an image and then corrupt the image by salt-and-pepper noise and Gaussian noise. Then apply an averaging filter of size 3 X 3 and 5 x 5 to this corrupted image. Comment on the result obtained.
7. Read an image and then corrupt the image by salt-and-pepper noise. Now apply a 3 x 3 box filter, a 5 x 5 box filter and a median filter to the corrupted image and comment on the result obtained.
8. Write a matlab program that performs a two-dimensional Butterworth low-pass and high-pass filter of the given image for two different cut-off frequencies.
9. Read an input image to perform the following operations:
  - a. High-pass filtering in the frequency domain
  - b. Low-pass filtering in the frequency domain
  - c. Band-pass filter in the frequency domain
  - d. Band-stop filter in the frequency domain
10. Read an image and degrade the image using motion blur.

**Assignments: Based on 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
Gonzalves,	Digital Image Processing		Pearson
Jahne	Digital Image Processing,		Springer India

**Reference Books:**

Chanda&Majumder	Digital Image Processing & Analysis		PHI
Jain	Fundamentals of Digital Image Processing		PHI
Sonka,	Image Processing, Analysis & Machine Vision,		VIKAS

**List of equipment/apparatus for laboratory experiments:**

Sl. No.	
1.	<b>Computer</b>
2.	<b>Software : Matlab, Python</b>
3.	
4.	
5.	

**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	Total Marks	No of question	To answer	Marks per question	Total Marks



		to be set		to be set			
<b>A</b>	<b>1,2,3,4,5,6</b>	<b>10</b>	<b>10</b>	<b>5</b>	<b>3</b>	<b>15</b>	<b>70</b>
<b>B</b>							
<b>c</b>	<b>1,2,3,4,5,6</b>			<b>5</b>	<b>3</b>	<b>45</b>	

- 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:**

<b>Group</b>	<b>Chapter</b>	<b>Marks of each question</b>	<b>Question to be set</b>	<b>Question to be answered</b>
<b>A</b>	<b>ALL</b>	<b>1</b>	<b>10</b>	<b>10</b>
<b>B</b>	<b>ALL</b>	<b>5</b>	<b>5</b>	<b>3</b>
<b>C</b>	<b>ALL</b>	<b>15</b>	<b>5</b>	<b>3</b>

**Examination Scheme for Practical Sessional examination:**

**Practical Internal Sessional Continuous Evaluation**

**Internal Examination:**

Continuous evaluation			<b>40</b>
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**External Examination: Examiner-**

Signed Lab Assignments	<b>10</b>	
On Spot Experiment	<b>40</b>	
Viva voce	<b>10</b>	<b>60</b>



<b>Name of the Course: B.Sc. in Information Technology (Artificial Intelligence)</b>			
<b>Subject:</b> Machine Learning			
<b>Course Code:</b> BITAI 502		<b>Semester:</b> V	
<b>Duration:</b> 36 Hrs.		<b>Maximum Marks:</b> 100	
<b>Teaching Scheme</b>		<b>Examination Scheme</b>	
<b>Theory:</b> 3 hrs./week		<b>End Semester Exam:</b> 70	
<b>Tutorial:</b> 1 hrs./week		<b>Attendance :</b> 5	
<b>Practical:</b> 0		<b>Continuous Assessment:</b> 25	
<b>Credit:</b> 4			
<b>Aim:</b>			
<b>Sl. No.</b>			
1.	Compare and contrast pros and cons of various machine learning techniques and to get an insight of when to apply a particular machine learning approach.		
2.	Analyse various machine learning approaches and paradigms		
<b>Objective:</b>			
<b>Sl. No.</b>			
1.	To design and analyse various machine learning algorithms and techniques with a modern outlook focusing on recent advances.		
2.	Explore supervised and unsupervised learning paradigms of machine learning.		
3.	To explore Deep learning technique and various feature extraction strategies.		
<b>Pre-Requisite:</b>			
<b>Sl. No.</b>			
1.	Statistics.,		
2.	Mathematics		
3.	Programming Basic knowledge		
<b>Contents</b>			<b>Hrs./week</b>
<b>Chapter</b>	<b>Name of the Topic</b>	<b>Hours</b>	<b>Marks</b>
01	Supervised Learning (Regression/Classification) Basic methods: Distance-based methods, Nearest-Neighbours, Decision Trees, Naive Bayes Linear models: Linear Regression, Logistic Regression, Generalized Linear Models Support Vector Machines, Nonlinearity and Kernel Methods ,Beyond Binary Classification: Multi-class/Structured Outputs, Ranking.	8	20
02	Unsupervised Learning, Clustering: K-means/Kernel K-means, Dimensionality Reduction: PCA and kernel PCA, Matrix Factorization and Matrix Completion, Generative Models (mixture models and latent factor models).	6	14
03	Evaluating Machine Learning algorithms and Model Selection, Introduction to Statistical Learning Theory, Ensemble Methods (Boosting, Bagging, Random Forests)	7	14

04	Sparse Modeling and Estimation, Modeling Sequence/Time-Series Data, Deep Learning and Feature Representation Learning.	7	10
05	Scalable Machine Learning (Online and Distributed Learning), A selection from some other advanced topics, e.g., Semi-supervised Learning, Active Learning, Reinforcement Learning, Inference in Graphical Models, Introduction to Bayesian Learning and Inference.	8	12
	<b>Sub Total:</b>	<b>36</b>	<b>70</b>
	<b>Internal Assessment Examination &amp; Preparation of Semester Examination</b>	<b>4</b>	<b>30</b>
	<b>Total:</b>	<b>40</b>	<b>100</b>

**Practical:**

**Skills to be developed:**

Intellectual skills:

1. Skill to mathematically analyse various machine learning approaches and paradigms
2. Skill to compare and contrast pros and cons of various machine learning techniques and to get an insight of when to apply a particular machine learning approach

**Assignments: : Assignment from theory**

**List of Books**

**Text Books:**

Name of Author	Title of the Book	Edition/ISSN/ISBN	Name of the Publisher
Kevin Murphy	Machine Learning: A Probabilistic Perspective		MIT Press
Trevor Hastie, Robert Tibshirani, Jerome Friedman,	The Elements of Statistical Learning,		Springer

**Reference Books:**

Christopher Bishop	Pattern Recognition and Machine Learning		Springer
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**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
<b>A</b>	<b>ALL</b>	<b>10</b>	<b>10</b>	<b>5</b>	<b>3</b>	<b>15</b>	<b>70</b>
<b>B</b>	<b>ALL</b>			<b>5</b>	<b>3</b>	<b>45</b>	
<b>c</b>	<b>ALL</b>						

- 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.

<b>Examination Scheme for end semester examination:</b>				
<b>Group</b>	<b>Chapter</b>	<b>Marks of each question</b>	<b>Question to be set</b>	<b>Question to be answered</b>
<b>A</b>	<b>ALL</b>	<b>1</b>	<b>10</b>	<b>10</b>
<b>B</b>	<b>ALL</b>	<b>5</b>	<b>5</b>	<b>3</b>
<b>C</b>	<b>ALL</b>	<b>15</b>	<b>5</b>	<b>3</b>



<b>Name of the Course: B.Sc. in Information Technology (Artificial Intelligence)</b>			
<b>Subject:</b> Pattern Recognition			
<b>Course Code:</b> BITAI 503A		<b>Semester:</b> V	
<b>Duration:</b> 36 Hrs.		<b>Maximum Marks:</b> 100	
<b>Teaching Scheme</b>		<b>Examination Scheme</b>	
<b>Theory:</b> 3 hrs./week		<b>End Semester Exam:</b> 70	
<b>Tutorial:</b> 0		<b>Attendance :</b> 5	
<b>Practical:</b> 0		<b>Continuous Assessment:</b> 25	
<b>Credit:</b> 3			
<b>Aim:</b>			
<b>Sl. No.</b>			
1.	Skills to Design and construct a pattern recognition system		
2.	Skills to Know the major approaches in statistical and syntactic pattern recognition.		
<b>Objective:</b>			
<b>Sl. No.</b>			
1.	To introduce the fundamental algorithms for pattern recognition		
2.	To instigate the various classification and clustering techniques		
<b>Pre-Requisite:</b>			
<b>Sl. No.</b>			
1.	Statistics.,		
2.	Mathematics		
3.	Programming Basic knowledge		
<b>Contents</b>			<b>Hrs./week</b>
<b>Chapte r</b>	<b>Name of the Topic</b>	<b>Hours</b>	<b>Marks</b>
01	<b>Basics of pattern recognition</b>	2	5
02	<b>Bayesian decision theory :</b> Classifiers, Discriminant functions, Decision surfaces ,Normal density and discriminant functions ,Discrete features	8	6
03	<b>Parameter estimation methods</b> Maximum-Likelihood estimation ,Gaussian mixture models ,Expectation-maximization method , Bayesian estimation	6	8
04	<b>Hidden Markov models for sequential pattern classification</b> Discrete hidden Markov models , Continuous density hidden Markov models	8	8
05	<b>Dimension reduction methods</b> Fisher discriminant analysis, Principal component analysis, Parzen-window method ,. K-Nearest Neighbour method	3	6



06	<b>Non-parametric techniques for density estimation</b>	2	6
07	<b>Linear discriminant function based classifier</b> Perceptron , Support vector machines	2	4
08	<b>Non-metric methods for pattern classification</b> Non-numeric data or nominal data , Decision trees	3	13
09	<b>Unsupervised learning and clustering</b> Criterion functions for clustering ,Algorithms for clustering: K-means, Hierarchical and other methods	2	14
	<b>Sub Total:</b>	<b>36</b>	<b>70</b>
	<b>Internal Assessment Examination &amp; Preparation of Semester Examination</b>	<b>4</b>	<b>30</b>
	<b>Total:</b>	<b>40</b>	<b>100</b>

**Practical:**

**Skills to be developed:**

1. Will be able Understand the concept of a pattern and the basic approach to the development of pattern recognition and machine intelligence algorithms.

2. Will be able to Understand and apply both supervised and unsupervised classification methods to detect and characterize patterns in real-world data.

**Assignments: : Assignment from theory**

**List of Books**

**Text Books:**

Name of Author	Title of the Book	Edition/ISSN/ISBN	Name of the Publisher
R. O. Duda, P. E. Hart and D. G. Stork	Pattern Classification		
S. Theodoridis and K. Koutroumbas	Pattern Recognition		Academic Press

**Reference Books:**

C. M. Bishop	Pattern Recognition and Machine Learning		Springer
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**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
<b>A</b>	<b>ALL</b>	<b>10</b>	<b>10</b>	<b>5</b>	<b>3</b>	<b>15</b>	<b>70</b>
<b>B</b>	<b>ALL</b>					<b>45</b>	
<b>c</b>	<b>ALL</b>			<b>5</b>	<b>3</b>		



<ul style="list-style-type: none"><li>• Only multiple choice type question (MCQ) with one correct answer are to be set in the objective part.</li><li>• Specific instruction to the students to maintain the order in answering objective questions should be given on top of the question paper.</li></ul>							
<b>Examination Scheme for end semester examination:</b>							
<b>Group</b>	<b>Chapter</b>	<b>Marks of each question</b>	<b>Question to be set</b>	<b>Question to be answered</b>			
<b>A</b>	<b>ALL</b>	<b>1</b>	<b>10</b>	<b>10</b>			
<b>B</b>	<b>ALL</b>	<b>5</b>	<b>5</b>	<b>3</b>			
<b>C</b>	<b>ALL</b>	<b>15</b>	<b>5</b>	<b>3</b>			



<b>Name of the Course: B.Sc. in Information Technology (Artificial Intelligence)</b>			
<b>Subject:</b> Applied Cryptography			
<b>Course Code:</b> BITAI 503B	<b>Semester: V</b>		
<b>Duration:</b> 36 Hrs.	<b>Maximum Marks: 100</b>		
<b>Teaching Scheme</b>	<b>Examination Scheme</b>		
<b>Theory: 3 hrs./week</b>	<b>End Semester Exam: 70</b>		
<b>Tutorial: 0</b>	<b>Attendance : 5</b>		
<b>Practical: 0</b>	<b>Continuous Assessment: 25</b>		
<b>Credit: 3</b>			
<b>Aim:</b>			
<b>Sl. No.</b>			
1.	Ability to Understand common attacks and how to prevent them.		
2.	Ability to Understand how security is defined and proven at the cryptographic level.		
<b>Objective:</b>			
<b>Sl. No.</b>			
1.	Gain the ability to apply appropriate cryptographic techniques to a security engineering (and management) problem at hand.		
2.	A strong grasp of the basic concepts underlying classical and modern cryptography, and the fundamentals.		
<b>Pre-Requisite:</b>			
<b>Sl. No.</b>			
1.	Basic Networking Knowledge,		
2.	Basic Programming Knowledge		
3.	computer organization, discrete mathematics		
<b>Contents</b>			<b>Hrs./week</b>
<b>Chapte r</b>	<b>Name of the Topic</b>	<b>Hours</b>	<b>Marks</b>
01	<b>Basics of pattern recognition</b>	2	5
02	<b>Bayesian decision theory</b> : Classifiers, Discriminant functions, Decision surfaces ,Normal density and discriminant functions ,Discrete features	8	6
03	<b>Parameter estimation methods</b> Maximum-Likelihood estimation ,Gaussian mixture models ,Expectation-maximization method , Bayesian estimation	6	8
04	<b>Hidden Markov models for sequential pattern classification</b> Discrete hidden Markov models , Continuous density hidden Markov models	8	8
05	<b>Dimension reduction methods</b>	3	6

	Fisher discriminant analysis, Principal component analysis, Parzen-window method, K-Nearest Neighbour method		
06	<b>Non-parametric techniques for density estimation</b>	2	6
07	<b>Linear discriminant function based classifier</b> Perceptron, Support vector machines	2	4
08	<b>Non-metric methods for pattern classification</b> Non-numeric data or nominal data, Decision trees	3	13
09	<b>Unsupervised learning and clustering</b> Criterion functions for clustering, Algorithms for clustering: K-means, Hierarchical and other methods	2	14
	<b>Sub Total:</b>	<b>36</b>	<b>70</b>
	<b>Internal Assessment Examination &amp; Preparation of Semester Examination</b>	<b>4</b>	<b>30</b>
	<b>Total:</b>	<b>40</b>	<b>100</b>

**Practical:**

**Skills to be developed:**

Intellectual skills:

1. Able to Understand how security is defined and proven at the cryptographic level.

**Assignments: : Assignment from theory**

**List of Books**

**Text Books:**

Name of Author	Title of the Book	Edition/ISSN/ISBN	Name of the Publisher
Kevin Murphy	Machine Learning: A Probabilistic Perspective		MIT Press
Trevor Hastie, Robert Tibshirani, Jerome Friedman,	The Elements of Statistical Learning,		Springer

**Reference Books:**

Christopher Bishop	Pattern Recognition and Machine Learning		Springer
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**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	All	10	10	5	3	15	70
B	All			5	3	45	
C	All						

- 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:**

<b>Group</b>	<b>Chapter</b>	<b>Marks of each question</b>	<b>Question to be set</b>	<b>Question to be answered</b>
<b>A</b>	<b>ALL</b>	<b>1</b>	<b>10</b>	<b>10</b>
<b>B</b>	<b>ALL</b>	<b>5</b>	<b>5</b>	<b>3</b>
<b>C</b>	<b>ALL</b>	<b>15</b>	<b>5</b>	<b>3</b>



<b>Name of the Course: B.Sc. in Information Technology (Artificial Intelligence)</b>			
<b>Subject:</b> Clinical Information System			
<b>Course Code:</b> BITAI 503C		<b>Semester:</b> V	
<b>Duration:</b> 36 Hrs.		<b>Maximum Marks:</b> 100	
<b>Teaching Scheme</b>		<b>Examination Scheme</b>	
<b>Theory:</b> 3 hrs./week		<b>End Semester Exam:</b> 70	
<b>Tutorial:</b> 0		<b>Attendance :</b> 5	
<b>Practical:</b> 0		<b>Continuous Assessment:</b> 25	
<b>Credit:</b> 3			
<b>Aim:</b>			
<b>Sl. No.</b>			
1.	Ability to Understand and appreciate the role and value of information technologies in potentially revolutionizing healthcare delivery, administration, education, and research;		
2.	Ability to distinguish the various types of healthcare information, including knowledge, data, sources, processes and standards;.		
<b>Objective:</b>			
<b>Sl. No.</b>			
1.	Identify major health informatics applications and develop basic familiarity with healthcare IT products;		
2.	Analyze obstacles and success factors for implementation and integration of information, communication and decision technologies in healthcare;.		
<b>Pre-Requisite:</b>			
<b>Sl. No.</b>			
1.	Basic Data Analytic knowledge		
2.	Basic Programming Knowledge		
<b>Contents</b>			
<b>Chapter</b>	<b>Name of the Topic</b>	<b>Hrs./week</b>	
		<b>Hours</b>	<b>Marks</b>
01	Information technology including hardware, software, characteristics of systems, Spreadsheets and presentations	5	10
02	Databases, Administrative Decision Making Support Systems	8	5
03	Clinical Decision Making Support Systems , Healthcare Information Systems and Departments	9	8
04	Strategic Planning and Implementation of Healthcare Information Systems Networks	8	18
05	Life Cycle of Healthcare Information Systems to include budgeting, proposals, and project management Electronic Health Records	2	10



06	Human factors in Healthcare Information Systems Communication Technology	2	10
07	Imaging Technology Standards for Electronic Health Records, Protection and security of healthcare information and systems	2	9
	<b>Sub Total:</b>	<b>36</b>	<b>70</b>
	<b>Internal Assessment Examination &amp; Preparation of Semester Examination</b>	<b>4</b>	<b>30</b>
	<b>Total:</b>	<b>40</b>	<b>100</b>

**Practical:**

**Skills to be developed:**

skills:

1. Able to acquire hands-on experience in analyzing a problem arising from practice and implementing a solution using a health informatics approach

**Assignments: : Assignment from theory**

**List of Books**

**Text Books:**

Name of Author	Title of the Book	Edition/ISSN/ISBN	Name of the Publisher
Cecily Morrison, Matthew R. Jones, Julie Bracken	Clinical Information Systems in Critical Care		

**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	ALL	10	10	5	3	15	70
B	All			5	3	45	
c	All						

- 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



<b>Name of the Course:</b> B.Sc. in Information Technology (Artificial Intelligence)			
<b>Subject:</b> Soft Computing			
<b>Course Code:</b> BITAI 504A	<b>Semester:</b> V		
<b>Duration:</b> 36 Hrs.	<b>Maximum Marks:</b> 100		
<b>Teaching Scheme</b>	<b>Examination Scheme</b>		
<b>Theory:</b> 3 hrs./week	<b>End Semester Exam:</b> 70		
<b>Tutorial:</b> 0	<b>Attendance :</b> 5		
<b>Practical:</b> 0	<b>Continuous Assessment:</b> 25		
<b>Credit:</b> 3			
<b>Aim:</b>			
<b>Sl. No.</b>			
1.	Cover the concepts of Fuzzy logic (FL), Artificial Neural Networks (ANNs) and Genetic Algorithm (GA).		
2.	Ability to apply Soft Computing techniques to solve a number of real life problems.		
3.	Provide exposure to theory as well as practical systems and software used in soft computing.		
<b>Objective:</b>			
<b>Sl. No.</b>			
1.	To introduce soft computing concepts and techniques and foster their abilities in designing appropriate technique for a given scenario.		
2.	To implement soft computing based solutions for real-world problems.		
3.	To give students knowledge of non-traditional technologies and fundamentals of artificial neural networks, fuzzy sets, fuzzy logic, genetic algorithms.		
<b>Pre-Requisite:</b>			
<b>Sl. No.</b>			
1.	Understanding of basic mathematical logic.		
<b>Contents</b>			
<b>Chapte r</b>	<b>Name of the Topic</b>	<b>Hrs./week</b>	
		<b>Hours</b>	<b>Marks</b>
01	Introduction: Introduction to soft computing; introduction to fuzzy sets and fuzzy logic systems; introduction to biological and artificial neural network; introduction to Genetic Algorithm.	4	10
02	Fuzzy sets and Fuzzy logic systems: Classical Sets and Fuzzy Sets and Fuzzy relations : Operations on Classical sets, properties of classical sets, Fuzzy set operations, properties of fuzzy sets, cardinality, operations, and properties of fuzzy relations. Membership functions : Features of membership functions, standard forms and boundaries, different fuzzification methods.	18	30

	Fuzzy to Crisp conversions: Lambda Cuts for fuzzy sets, fuzzy Relations, Defuzzification methods. Classical Logic and Fuzzy Logic: Classical predicate logic, Fuzzy Logic, Approximate reasoning and Fuzzy Implication Fuzzy Rule based Systems: Linguistic Hedges, Fuzzy Rule based system – Aggregation of fuzzy Rules, Fuzzy Inference System- Mamdani Fuzzy Models – Sugeno Fuzzy Models. Applications of Fuzzy Logic: How Fuzzy Logic is applied in Home Appliances, General Fuzzy Logic controllers, Basic Medical Diagnostic systems and Weather forecasting.		
03	Neural Network Introduction to Neural Networks: Advent of Modern Neuroscience, Classical AI and Neural Networks, Biological Neurons and Artificial neural network; model of artificial neuron. Learning Methods :Hebbian, competitive, Boltzman etc., Neural Network models: Perceptron, Adaline and Madaline networks; single layer network; Back-propagation and multi layer networks. Competitive learning networks: Kohonen self organizing networks, Hebbian learning; Hopfield Networks. Neuro-Fuzzy modelling: Applications of Neural Networks: Pattern Recognition and classification .	6	10
04	Genetic Algorithms: Simple GA, crossover and mutation, Multi-objective Genetic Algorithm (MOGA). Applications of Genetic Algorithm: genetic algorithms in search and optimization, GA based clustering Algorithm, Image processing and pattern Recognition.	4	10
05	Other Soft Computing techniques: Simulated Annealing, Tabu search, Ant colony optimization (ACO), Particle Swarm Optimization (PSO).	4	10
	<b>Sub Total:</b>	<b>36</b>	<b>70</b>
	<b>Internal Assessment Examination &amp; Preparation of Semester Examination</b>	<b>4</b>	<b>30</b>
	<b>Total:</b>	<b>40</b>	<b>100</b>

**Practical:**

**Skills to be developed:**

1. Able to apply Soft Computing techniques to solve a number of real life problems.

**Assignments: : Assignment from theory**

**List of Books**

**Text Books:**

Name of Author	Title of the Book	Edition/ISSN/ISBN	Name of the Publisher
Timothy J. Ross, John Wiley and Sons	Fuzzy logic with engineering applications		
S. Rajasekaran and G.A.V.Pai	Neural Networks, Fuzzy Logic and Genetic Algorithms		PHI
S N Sivanandam, S. Sumathi, John	Principles of Soft Computing		
<b>Reference Books:</b>			



George J. Klir and Bo Yuan	Fuzzy Sets and Fuzzy Logic: Theory and Applications		Prentice Hall
Simon Haykin	Neural Networks: A Comprehensive Foundation		Prentice Hall.

**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
<b>A</b>	<b>ALL</b>	<b>10</b>	<b>10</b>	<b>5</b>	<b>3</b>	<b>15</b>	<b>70</b>
<b>B c</b>	<b>All All</b>			<b>5</b>	<b>3</b>	<b>45</b>	

- 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
<b>A</b>	<b>ALL</b>	<b>1</b>	<b>10</b>	<b>10</b>
<b>B</b>	<b>ALL</b>	<b>5</b>	<b>5</b>	<b>3</b>
<b>C</b>	<b>ALL</b>	<b>15</b>	<b>5</b>	<b>3</b>



<b>Name of the Course: B.Sc. in Information Technology (Artificial Intelligence)</b>			
<b>Subject:</b> Network & Wireless Security			
<b>Course Code:</b> BITAI 504B	<b>Semester: V</b>		
<b>Duration:</b> 36 Hrs.	<b>Maximum Marks: 100</b>		
<b>Teaching Scheme</b>	<b>Examination Scheme</b>		
<b>Theory: 3</b>	<b>End Semester Exam: 70</b>		
<b>Tutorial: 0</b>	<b>Attendance : 5</b>		
<b>Practical: 0</b>	<b>Continuous Assessment: 25</b>		
<b>Credit: 3</b>			
<b>Aim:</b>			
<b>Sl. No.</b>			
1.	Ability to Understand how security is defined and proven at the cryptographic level.		
<b>Objective:</b>			
<b>Sl. No.</b>			
1.	A strong grasp of the basic concepts underlying classical and modern cryptography, and the fundamentals.		
2.	Understand how security is defined and proven at the cryptographic level.		
<b>Pre-Requisite:</b>			
<b>Sl. No.</b>			
1.	Fundamentals of Networking		
2.	Basic Programming Language		
<b>Contents</b>			<b>Hrs./week</b>
<b>Chapter</b>	<b>Name of the Topic</b>	<b>Hours</b>	<b>Marks</b>
01	<b>Foundations of Network Security</b>  Principles of Network Security, Network Security Terminologies , Network Security and Data Availability, Components of Network Security, Network Security Policies.	2	3
02	<b>Advanced TCP/IP</b> TCP/IP Concepts , Subnet Masks, Variable Length Subnet Masks, Unicast, Broadcast and Multiple Concepts , The Three way Handshake, The Process of DHCP and APIPA, Internet Protocol version 6.	3	4
03	<b>Packet Structure and Analysis</b>  Capture and Identify IP Datagrams, Capture and Identify ICMP Messages, Capture and Identify TCP Headers , Capture and Identify UDP Headers , Packet Fragmentation, The Three way Handshake	3	7
04	<b>Routing and Access Control Lists</b>	3	7



	Arp Process , Cisco Routing Modes , Routing Process , Routing Tables, Access Control Lists ,Implement Access Control Lists, Limitations , DNS and Its Role .		
05	<b>Securing Windows</b>  Windows NT 4.0 Fundamental Security , Windows NT Resource Security, Windows 2000 Infrastructure, Windows 2000 Authentication, Windows 2000 User and Group Security , Windows 2000 Resource Security , Windows 2000 Network Security.	3	7
06	<b>Securing Linux</b>  Key Concepts, Linux Administration and Security, Key Linux Network Files, Key Linux Network Process, Key Linux Network Commands, Hardening Linux, Network File System and Linux, Network Information Service and Linux .	4	7
07	<b>Security on the Internet and World Wide Web</b>  Components of Internet , Weak Points of Internet, Techniques of Web Hacking, Methods of Attacking Users.  <b>Attack Techniques</b>  Network Reconnaissance , Mapping and sweeping the Network , Scanning the Network , Viruses, Worms and Trojan Horses, Gaining Control on Systems, Record Keystrokes, Crack Encrypted Passwords, Reveal Hidden Passwords, Gain Unauthorised Access, Hide evidence of Attack , Perform a Denial of Service attack	5	7
08	<b>Network Defense Fundamentals</b>  Concepts, & Key Issues , Identify Defensive Technologies, Objectives of Access Control , Identify Impact of Defense , Concepts of Network Auditing <b>Designing and Configuring Fire wall Systems</b> Firewall Components , Creating a FW Policy, Rule Sets and Packet Filters, Proxy Server , Bastion Host and Honey pot , FW Implementation Practices , Installing and Configuring FW, Monitor FW , Installing and configuring ISA Server 2000 , Monitor ISA Server , IP Chains Concepts, Implementing FW Technologies .	5	7
09	<b>Configuring VPNs</b>  VPN Fundamentals , IP Security Protocol, VPN Design and	4	7



	Architecture, VPN Security ,Configuring a VPN . <b>Cryptography Fundamentals</b>  What is Cryptography? , History of Encryption , Symmetric versus Asymmetric, Combined Solutions, Private Key versus Public Key, Data Encryption Standard (DES) , Advanced Encryption Standard (AES), RSA, Diffie-Hellman , MD4, MD5, SHA-1		
10	<b>Digital Signatures</b>  Definition and Characteristics,How Digital Signatures function , Message Digest Functions, Digital Signatures with Message Digest , E-Signature Law and Legal Issues, Key Length (56, 112, and 128 bit) , RSA and DSS Signature Standards <b>Secure EMail Implementation</b>  Secure use of Netscape Messenger, Secure use of Microsoft Outlook ,Secure use of Microsoft Outlook Express ,PGP Implementation,Sending Signed E-Mail Messages,E-Mail encryption and Decryption Methods .	2	7
11	<b>Secure and resilient data aggregation</b>  Key pre-distribution and management, Encryption and authentication, Security in group communication, Trust establishment and management, Denial-of-service attacks, Energy-aware security mechanisms <b>Internet Security</b>  Denial-of-Service Attacks,Internet Worms, IP Traceback,BGP security.	2	7
	<b>Sub Total:</b>	<b>36</b>	<b>70</b>
	<b>Internal Assessment Examination &amp; Preparation of Semester Examination</b>	<b>4</b>	<b>30</b>
	<b>Total:</b>	<b>40</b>	<b>100</b>
<p><b>Practical:</b>  <b>Skills to be developed:</b>  <b>1.</b> Able to apply techniques to solve a number of real life problems.  <b>Assignments: : Assignment from theory</b>  <b>List of Books</b>  <b>Text Books:</b></p>			
Name of Author	<b>Title of the Book</b>	<b>Edition/ISSN/ISBN</b>	<b>Name of the Publisher</b>
Tyler Wrightson	Wireless Network Security A Beginner's Guide	ISBN: 9780071760942	McGraw-Hill



<b>End Semester Examination Scheme.</b>		<b>Maximum Marks-70.</b>		<b>Time allotted-3hrs.</b>			
<b>Group</b>	<b>Unit</b>	<b>Objective Questions</b> (MCQ only with the correct answer)		<b>Subjective Questions</b>			
		No of question to be set	Total Marks	No of question to be set	To answer	Marks per question	Total Marks
<b>A</b>	<b>ALL</b>	<b>10</b>	<b>10</b>	<b>5</b>	<b>3</b>	<b>15</b>	<b>70</b>
<b>B</b>	<b>All</b>			<b>5</b>	<b>3</b>	<b>45</b>	
<b>c</b>	<b>All</b>						
<ul style="list-style-type: none"> <li>Only multiple choice type question (MCQ) with one correct answer are to be set in the objective part.</li> <li>Specific instruction to the students to maintain the order in answering objective questions should be given on top of the question paper.</li> </ul>							
<b>Examination Scheme for end semester examination:</b>							
<b>Group</b>	<b>Chapter</b>	<b>Marks of each question</b>	<b>Question to be set</b>	<b>Question to be answered</b>			
<b>A</b>	<b>ALL</b>	<b>1</b>	<b>10</b>	<b>10</b>			
<b>B</b>	<b>ALL</b>	<b>5</b>	<b>5</b>	<b>3</b>			
<b>C</b>	<b>ALL</b>	<b>15</b>	<b>5</b>	<b>3</b>			



<b>Name of the Course: B.Sc. in Information Technology (Artificial Intelligence)</b>			
<b>Subject:</b> Biomedical Informatics			
<b>Course Code:</b> BITAI 504C	<b>Semester:</b> V		
<b>Duration:</b> 36 Hrs.	<b>Maximum Marks:</b> 100		
<b>Teaching Scheme</b>	<b>Examination Scheme</b>		
<b>Theory:</b> 3	<b>End Semester Exam:</b> 70		
<b>Tutorial:</b> 0	<b>Attendance :</b> 5		
<b>Practical:</b> 0	<b>Continuous Assessment:</b> 25		
<b>Credit:</b> 3			
<b>Aim:</b>			
<b>Sl. No.</b>			
1.	Apply informatics in bio-medical field		
<b>Objective:</b>			
<b>Sl. No.</b>			
1.	To develop in-depth understanding of Medical Informatics (MI).		
<b>Pre-Requisite:</b>			
<b>Sl. No.</b>			
1.	Basic programming skills		
2.	Good understanding of information technology (hardware, software, networking)		
<b>Contents</b>			<b>Hrs./week</b>
<b>Chapter</b>	<b>Name of the Topic</b>	<b>Hours</b>	<b>Marks</b>
01	<b>Introduction</b>  What is Medical Informatics? What Medical Informatics is not Why Medical Informatics? The Goals of Medical Informatics Taxonomy of Medical Informatics , Why computers in healthcare? A Brief History of Medical Informatics , The Organization (or lack of same) of Medicine, System Design Considerations for the Clinical User, Standards in Medical Informatics	12	20
02	<b>Health Information Systems in Clinical Settings</b>  Hospital Information Systems, Clinic Information Systems, Laboratory Information Systems, Radiology Information Systems, Pharmacy Information Systems.	6	20
03	<b>Systems in Public Health</b>  Disease Surveillance, Disease State Monitoring and Rostering ,Epidemiology,Health Indicators, Statistical Reporting	9	20
04	<b>eHealth</b>	9	10

	Connectivity" Creating a Virtual Healthcare Delivery System ,Information for the Physician , Information for the Patient		
	<b>Sub Total:</b>	<b>36</b>	<b>70</b>
	<b>Internal Assessment Examination &amp; Preparation of Semester Examination</b>	<b>4</b>	<b>30</b>
	<b>Total:</b>	<b>40</b>	<b>100</b>

**Practical:**

**Skills to be developed:**

1. Able to apply informatics to solve a bio-medical problems.

**Assignments: : Assignment from theory**

**List of Books**

**Text Books:**

Name of Author	Title of the Book	Edition/ISSN/ISBN	Name of the Publisher
Edward H. Shortliffe	Biomedical Informatics		

**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
<b>A</b>	<b>ALL</b>	<b>10</b>	<b>10</b>	<b>5</b>	<b>3</b>	<b>15</b>	<b>70</b>
<b>B</b>	<b>All</b>						
<b>c</b>	<b>All</b>			<b>5</b>	<b>3</b>	<b>45</b>	

- 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
<b>A</b>	<b>ALL</b>	<b>1</b>	<b>10</b>	<b>10</b>
<b>B</b>	<b>ALL</b>	<b>5</b>	<b>5</b>	<b>3</b>
<b>C</b>	<b>ALL</b>	<b>15</b>	<b>5</b>	<b>3</b>

**Practical:**

**List of Practical:  
Based on theory**

**Assignments: Based on theory**

**List of Books**

<b>Text Books:</b>							
<b>Name of Author</b>		<b>Title of the Book</b>		<b>Edition/ISSN/ISBN</b>		<b>Name of the Publisher</b>	
Daniel Jurafsky and James H Martin		Speech and Language Processing				Pearson Education	
<b>Reference Books:</b>							
<b>List of equipment/apparatus for laboratory experiments:</b>							
Sl. No.							
1		computer					
<b>End Semester Examination Scheme. Maximum Marks-70. Time allotted-3hrs.</b>							
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	ALL	10	10				70
B	ALL			5	3	15	
C	ALL			5	3	45	
<ul style="list-style-type: none"> <li>Only multiple choice type question (MCQ) with one correct answer are to be set in the objective part.</li> <li>Specific instruction to the students to maintain the order in answering objective questions should be given on top of the question paper.</li> </ul>							
<b>Examination Scheme for end semester examination:</b>							
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			
<b>Examination Scheme for Practical Sessional examination:</b>							
<b>Practical Internal Sessional Continuous Evaluation</b>							
<b>Internal Examination:</b>							
Continuous evaluation						40	
<b>External Examination: Examiner-</b>							
Signed Lab Assignments		10					
On Spot Experiment		40					
Viva voce		10				60	



<b>Name of the Course: B.Sc. in Information Technology (AI)</b>	
<b>Subject: Industrial Training and Internship</b>	
<b>Course Code: BITAI 581</b>	<b>Semester: V</b>
<b>Duration: 12Hrs.</b>	<b>Maximum Marks: 100</b>
<b>Teaching Scheme</b>	<b>Examination Scheme</b>
<b>Theory: 0</b>	<b>End Semester Exam: 100</b>
<b>Tutorial: 0</b>	<b>Attendance: 0</b>
<b>Practical: 2 hrs./week</b>	<b>Continuous Assessment: 0</b>
<b>Credit: 1</b>	<b>Practical Sessional internal continuous evaluation: 40</b>
	<b>Practical Sessional external examination: 60</b>
<b>Contents</b>	
Students will do projects on application areas of latest technologies and current topics of societal relevance.	

<b>Name of the Course: B.Sc. in Information Technology (AI)</b>	
<b>Subject: Major Project I</b>	
<b>Course Code: BITAI 582</b>	<b>Semester: V</b>
<b>Duration: 24Hrs.</b>	<b>Maximum Marks: 100</b>
<b>Teaching Scheme</b>	<b>Examination Scheme</b>
<b>Theory: 0</b>	<b>End Semester Exam: 100</b>
<b>Tutorial: 0</b>	<b>Attendance: 0</b>
<b>Practical: 4 hrs./week</b>	<b>Continuous Assessment: 0</b>
<b>Credit: 2</b>	<b>Practical Sessional internal continuous evaluation: 40</b>
	<b>Practical Sessional external examination: 60</b>
<b>Contents</b>	
Students will do projects on application areas of latest technologies and current topics of societal relevance.	