Maulana Abul Kalam Azad University of Technology, West Bengal
(Formerly West Bengal University of Technology)
Syllabus for B. Tech in Computer Science and Engineering
(Internet of Things,Cyber Security including Block Chain Technology)
(Applicable from the academic session 2020-2021)

Semester-VIII

Subject: Security Assessment and Risk Analysis	
Course Code:PECICB801A	**Semester: VIII**
Duration: 36 Hrs.	**Maximum Marks: 100**
Teaching Scheme	**Examination Scheme**
Theory:3	**End Semester Exam: 70**
Tutorial:	**Attendance : 5**
Practical: 0	**Continuous Assessment: 25**
Credit: 3	**Practical Sessional internal continuous evaluation: NA**
	Practical Sessional external examination: NA

Aim:

Sl. No.	
1.	It will provide a background in the many aspects of security management associated with today's modern communications and networks
2.	It includes the fundamentals of Risk Analysis, Risk Management, Security Policy, Security Operations, Legal issues, Business issues and Secure Systems Development.

Objective:

Sl. No.	
1.	Understand the role of Security Management in information technology
2.	Quantify the properties of Information Security systems
3.	Develop project plans for secure complex systems with knowledge of SANS 20 critical controls
4.	Demonstrate understanding of the role of firewalls, guards, proxy servers and intrusion detection in networks on a Linux OS with traffic analysis
5.	Evaluate the residual risk of a protected network

Pre-Requisite:

Sl. No.	
1.	Application of cryptography

Contents	**3 Hrs./week**

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Chapter	Name of the Topic	Hours	Marks
01	**Risk Assessment** Understand the principles and terminology of risk; Probability, Likelihood, Threat, Vulnerability, Impact , Threat actor, Risk owner, Understand and describe the five key steps in risk management: Identify assets Identify threats and vulnerabilities, Assess the impact of threats and vulnerabilities on an organisation Identify ways to manage those threats and vulnerabilities, Monitor and report on risk management action, Discuss qualitative and quantitative approaches to risk assessment; Quantitative approaches (such as loss expectancy approaches (SLE/ARO)), Quantitative scalar approaches (such as High/Medium/Low), Illustrate how the results of an assessment can be presented; Financial impact, Dashboards, Heat maps, RAG.	**12**	**23**
02	**Risk Assessment: Threat and Vulnerabilities** Define and state the differences between: Threat, Vulnerability, Exploit, Attack, Describe and explain the following: Categories of threats The concept of a threat lifecycle The use of threat intelligence in an organisation. The uses of attribution, Discuss vulnerabilities, especially those relating to people and staff. Apprentices will understand how they can be exploited to attack an organisation; Phishing, Social engineering, Blended attacks, Describe common methods for finding vulnerabilities; Penetration testing Phishing simulators Social engineering attacks	**12**	**23**
03	**Risk Assessment: Standards** Explain that risk assessment can be carried out using several methodologies or frameworks, but that it is better to select one methodology or framework for consistent and comparable results, List the common risk assessment methodologies or frameworks; ISO/IEC 27005, NIST, Risk Management, Framework, OCTAVE, FAIR, Compare common risk methodologies/frameworks; highlighting similarities and differences. Demonstrate how to select and then apply a risk methodology/framework in an organisation.	**12**	**24**
	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**
Mark Ryan M. Talabis and Jason L. Martin	Information Security Risk Assessment Toolkit: Practical Assessments through Data Collection and Data Analysis		Syngress, 2012

Reference Books:

Douglas J. Landoll	The Security Risk Assessment Handbook: A Complete Guide for Performing Security Risk Assessments		CRC Press, 2011

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**	**10**	**10**				
B	**1,2,3**			**5**	**3**	**5**	**60**
C	**1,2,3**			**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 questionsshould be given on top of the question paper.

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Subject: Deep Learning	
Course Code: PECICB801C	**Semester: VIII**
Duration: 36 Hrs.	**Maximum Marks: 100**
Teaching Scheme	**Examination Scheme**
Theory: 3 hrs./week	End Semester Exam: 70
Tutorial: 0	Attendance : 5
Practical:	Continuous Assessment:25
Credit: 3	

Aim:

Sl. No.	
1.	To improve the performance of a Deep Learning model
2.	to the reduce the optimization function which could be divided based on the classification andthe regression problems

Objective:

Sl. No.	
1.	To acquire knowledge on the basics of neural networks.
2.	To implement neural networks using computational tools for variety of problems.
3.	To explore various deep learning algorithms.

Pre-Requisite:

Sl. No.	
1.	Calculus, Linear Algebra
2.	Probability & Statistics
3.	Ability to code in R/Python

Contents	**Hrs./week**

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Chapter	Name of the Topic	Hours	Marks
01	**Introduction** Various paradigms of earning problems, Perspectives and Issues indeep learning framework, review of fundamental learning techniques.	**3**	**5**
02	**Feed forward neural network** Artificial Neural Network, activation function, multi-layer neural network, cardinality, operations, and properties of fuzzy relations.	**6**	**10**
03	**Training Neural Network** Risk minimization, loss function, back propagation, regularization,model selection, and optimization.	**6**	**15**
04	**Conditional Random Fields** Linear chain, partition function, Markov network, Belief propagation, Training CRFs, Hidden Markov Model, Entropy.	**9**	**15**
05	**Deep Learning** Deep Feed Forward network, regularizations, training deep models, dropouts, Convolutional Neural Network, Recurrent Neural Network, Deep Belief Network.	**6**	**15**
06	**Deep Learning research** Object recognition, sparse coding, computer vision, natural **language**	**6**	**10**
	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
Rajiv Chopra	Dep Learning (AICTE Recommended	First Edition	Khanna Book Publishing

	Textbook)		
Goodfellow, I.,Bengio,Y., andCourville A.,	Deep Learning		MIT Press
Satish Kumar	Neural Networks: A Classroom Approach		Tata McGraw-Hill
Reference Books:			
Bishop, C. ,M.	Pattern Recognition andMachine Learning		Springer
Yegnanarayana, B.	Artificial Neural Networks		PHI Learning Pvt. Ltd
Golub, G.,H., and VanLoan,C.,F.	Matrix Computations		JHU Press

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Name of the Course:	**Operation Research**		
Course Code: OECICB801A	Semester: VIII		
	Maximum Marks: 100		
Teaching Scheme		**Examination Scheme**	
Theory: 3 hrs./week		Mid Semester exam: 15	
Tutorial: NIL		Assignment and Quiz: 10 marks	
		Attendance: 5 marks	
Practical: NIL		End Semester Exam: 70 Marks	
Credit Points:	3		

Unit	Content	Hrs/Unit	Marks/Unit
1	**Basic LPP and Applications; Various Components of LP Problem Formulation.** Solution of Linear Programming Problems: Solution of LPP: Using Simultaneous Equations and Graphical Method; Definitions: Feasible Solution, Basic and non-basic Variables, Basic Feasible Solution, Degenerate and Non-degenerate Solution, Convex set and explanation with examples Solution of LPP by Simplex Method; Charnes' Big-M Method; Duality Theory. Transportation Problems and Assignment Problems.	17	
2	**Network Analysis**:Shortest Path: Floyd Algorithm; Maximal Flow Problem (Ford-Fulkerson); PERT-CPM (Cost Analysis, Crashing, Resource Allocation excluded). Inventory Control:Introduction to EOQ Models of Deterministic and Probabilistic ; Safety Stock; Buffer Stock.	9	
3	**Game Theory:** Introduction; 2-Person Zero-sum Game; Saddle Point; Mini-Max and Maxi-Min Theorems (statement only) and problems; Games without Saddle Point; Graphical Method; Principle of Dominance	5	

4.	**Queuing Theory:** Introduction; Basic Definitions and Notations; Axiomatic Derivation of the Arrival & Departure (Poisson Queue). Poisson Queue Models: (M/M/1): (∞ / FIFO) and (M/M/1: N / FIFO) and problems.	5	

Text book and Reference books:

1. H. A. Taha, "Operations Research", Pearson
2. P. M. Karak – "Linear Programming and Theory of Games", ABS Publishing House
3. Ghosh and Chakraborty, "Linear Programming and Theory of Games", Central Book Agency
4. Ravindran, Philips and Solberg - "Operations Research", WILEY INDIA

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Name of the Course:	**Remote Sensing and GIS**
Course Code: OECICB801B	Semester:VIII
Duration:6 months	Maximum Marks: 100

Teaching Scheme	**Examination Scheme**
Theory: 3 hrs./week	Mid Semester exam: 15
Tutorial: NIL	Assignment and Quiz : 10 marks
	Attendance: 5 marks
Practical: NIL	End Semester Exam: 70 Marks
Credit Points: 3	

Unit	Content	Hrs/Unit	Marks/Unit
1	Introduction and Overview of Geographic Information Systems Definition of a GIS, features and functions; why GIS is important; how GIS is applied; GIS as an Information System; GIS and cartography; contributing and allied disciplines; GIS data feeds; historical development of GIS.	3	
2	GIS and Maps, Map Projections and Coordinate Systems Maps and their characteristics (selection, abstraction, scale, etc.); automated cartography versus GIS; map projections; coordinate systems; precision and error.	4	
3	Data Sources, Data Input , Data Quality and Database Concepts Major data feeds to GIS and their characteristics: maps, GPS, images, databases, commercial data; locating and evaluating data; data formats; data quality; metadata. Database concepts and components; flat files; relational database systems; data modeling; views of the database; normalization; databases and GIS.	3	
	Spatial Analysis Questions a GIS can answer; GIS analytical functions; vector analysis including topological overlay;	3	

4.	raster analysis; statistics; integrated spatial analysis.		
5.	Making Maps Parts of a map; map functions in GIS; map design and map elements; choosing a map type; producing a map formats, plotters and media; online and CD-ROM distribution; interactive maps and the Web.	6	
6.	Implementing a GIS Planning a GIS; requirements; pilot projects; case studies; data management; personnel and skill sets; costs and benefits; selecting a GIS package; professional GIS packages; desktop GIS; embedded GIS; public domain and lowcost packages.	4	
1.	Technology & Instruments involved in GIS & Remote Sensing GIS applications; GIS application areas and user segments; creating custom GIS software applications; user interfaces; case studies. Future data; future hardware; future software; Object-oriented concepts and GIS; future issues – data ownership, privacy, education; GIS career options and how to pursue them.	8	
2.	Remote Sensing Remote sensing of environment, E.M. Principle, Thermal infrared remote sensing, Remote sensing of Vegetation, Remote sensing of water, urban landscape	8L	

Text book and Reference books:

1. “Principles of geographical information systems”, P. A. Burrough and R. A. Mcdonnel, Oxford. 2. “Remote sensing of the environment” , J. R. Jensen, Pearson References:

2. “Exploring Geographic Information Systems”, Nicholas Chrismas, John Wiley & Sons.

3. “Getting Started with Geographic Information Systems”,Keith Clarke, PHI.

4. “An Introduction to Geographical Information Systems”, Ian Heywood, Sarah Cornelius, and Steve Carver. Addison-Wesley Longman.

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Name of the Course:	**Digital Signal Processing**	
Course Code: OECICB801C	Semester: VIII	
	Maximum Marks: 100	
Teaching Scheme		**Examination Scheme**
Theory: 3 hrs./week		Mid Semester exam: 15
Tutorial: NIL		Assignment and Quiz : 10 marks
		Attendance: 5 marks
Practical:		End Semester Exam: 70 Marks
Credit Points:	3	

Unit	Content	Hrs/Unit	Marks/Unit
1	Module 1: Discrete-time signals and systems (6 hours) Discrete time signals and systems: Sequences; representation of signals on orthogonal basis; Representation of discrete systems using difference equations, Sampling and reconstruction of signals - aliasing; Sampling theorem and Nyquist rate.	6	
2	Module 2: Z-transform (6 hours) z-Transform, Region of Convergence, Analysis of Linear Shift Invariant systems using z transform, Properties of z-transform for causal signals, Interpretation of stability in z-domain, Inverse z-transforms.	6	
3	Module 2: Discrete Fourier Transform (10 hours) Frequency Domain Analysis, Discrete Fourier Transform (DFT), Properties of DFT, Convolution of signals, Fast Fourier Transform Algorithm, Parseval's Identity, Implementation of Discrete Time Systems.	10	
4.	Module 3:Designof Digital filters (12 hours) Design of FIR Digital filters: Window method, Park-McClellan's method. Design of IIR Digital Filters: Butterworth, Chebyshev and	12	

	Elliptic Approximations; Low-pass, Band-pass, Band stop and High-pass filters. Effect of finite register length in FIR filter design. Parametric and non-parametric spectral estimation. Introduction to multi-rate signal processing.		
5	Module 4: Applications of Digital Signal Processing (6 hours) Correlation Functions and Power Spectra, Stationary Processes, Optimal filtering using ARMA Model, Linear Mean-Square Estimation, Wiener Filter.	6	

Text book and Reference books:

1. S. K. Mitra, “Digital Signal Processing: A computer based approach”, McGraw Hill, 2011.
2. A.V. Oppenheim and R. W. Schafer, “Discrete Time Signal Processing”, Prentice Hall, 1989.
3. J. G. Proakis and D.G. Manolakis, “Digital Signal Processing: Principles, Algorithms And Applications”, Prentice Hall, 1997.
4. L. R. Rabiner and B. Gold, “Theory and Application of Digital Signal Processing”, Prentice Hall, 1992.
5. J. R. Johnson, “Introduction to Digital Signal Processing”, Prentice Hall, 1992.
6. D. J. DeFatta, J. G. Lucas andW. S. Hodgkiss, “Digital Signal Processing”, John Wiley & Sons, 1988.

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Name of the Course:	**Numerical Methods**	
Course Code: OECICB802A	Semester: VIII	
	Maximum Marks:100	
Teaching Scheme		**Examination Scheme**
Theory:3 hrs./week		Mid Semester exam: 15
Tutorial: NIL		Assignment and Quiz: 10 marks
		Attendance: 5 marks
Practical: NIL		End Semester Exam:70 Marks
Credit Points:	3	

Unit	Content	Hrs/Unit	Marks/Unit
1	Approximation in numerical computation: Truncation and rounding errors, Fixed and floating- point arithmetic, Propagation of errors.	2	
2	Interpolation: Newton forward/backward interpolation, Lagrange's and Newton's divided difference Interpolation.	8	
3	Numerical integration: Trapezoidal rule, Simpson's 1/3 rule, Expression for corresponding error terms.	3	
4.	Numerical solution of a system of linear equations: Gauss elimination method, Matrix inversion, LU Factorization method, Gauss-Seidel iterative method.	8	
5	Numerical solution of Algebraic equation: Bisection method, Regula-Falsi method, Newton-Raphson method.	3	
6	Numerical solution of ordinary differential equation: Euler's method, Runge-Kutta methods, Predictor-Corrector methods and Finite Difference method.	2	

Text book and Reference books:

1. C.Xavier: C Language and Numerical Methods.
2. R.S. Salaria: Computer Oriented Numerical Methods.
3. Dutta & Jana: Introductory Numerical Analysis.
4. J.B.Scarborough: Numerical Mathematical Analysis.
5. Jain, Iyengar , & Jain: Numerical Methods (Problems and Solution).
6. Balagurusamy: Numerical Methods, Scitech.
7. Baburam: Numerical Methods, Pearson Education.
8. N. Dutta: Computer Programming & Numerical Analysis, Universities Press.

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Name of the Course:	**Multimedia Technology**
Course Code: OECICB802B	Semester: VIII
Duration: 6 months	Maximum Marks:100

Teaching Scheme	**Examination Scheme**
Theory: 3 hrs./week	Mid Semester exam: 15
Tutorial: NIL	Assignment and Quiz: 10 marks
Practical: Nil	Attendance : 5 marks
Credit: 3	End Semester Exam :70 Marks

Unit	Content	Hrs/Unit	Marks/ Unit
1	**Introduction:** Multimedia today, Impact of Multimedia, Multimedia Systems, Components and Its Applications	2	
2	**Text and Audio, Image and Video(14L)** Text: Types of Text, Ways to Present Text, Aspects of Text Design, Character, Character Set, Codes, Unicode, Encryption; Audio: Basic Sound Concepts, Types of Sound, Digitizing Sound, Computer Representation of Sound (Sampling Rate, Sampling Size, Quantization), Audio Formats, Audio tools, MIDI Image: Formats, Image Color Scheme, Image Enhancement; Video: Analogue and Digital Video, Recording Formats and Standards (JPEG, MPEG, H.261) Transmission of Video Signals, Video Capture, and Computer based Animation.	14	
3.	**Synchronization, Storage models and Access Techniques:**Temporal relationships, synchronization accuracy specification factors, quality of service, Magnetic media, optical media, file systems (traditional, multimedia) Multimedia devices – Output devices, CD-ROM, DVD, Scanner, CCD Producer\ Consumer Problem, Semaphores, Event Counters, Monitors, Message Passing, Classical IPC Problems: Reader's & Writer Problem, Dinning Philosopher Problem etc.	8	
4.	**Image and Video Database, Document Architecture and Content Management (17L):** Image representation, segmentation, similarity based retrieval, image retrieval by color, shape and texture; indexing- k-d trees, R-trees, quad trees; Case studies- QBIC, Virage. Video Content, querying, video segmentation, indexing, Content Design and Development, General Design Principles Hypertext: Concept, Open Document Architecture (ODA),	17	

	Multimedia and Hypermedia Coding Expert Group (MHEG), Standard Generalized Markup Language (SGML), Document Type Definition (DTD), Hypertext Markup Language (HTML) in Web Publishing. Case study of Applications Producer\ Consumer Problem, Semaphores, Event Counters, Monitors, Message Passing, Classical IPC Problems: Reader's & Writer Problem, Dinning Philosopher Problem etc.		
5.	**Multimedia Applications(4L):** Interactive television, Video-on-demand, Video Conferencing, Educational Applications, Industrial Applications, Multimedia archives and digital libraries, media editors	4	

Text book and Reference books:

1.Ralf Steinmetz and Klara Nahrstedt , Multimedia: Computing, Communications & Applications , Pearson Ed.

2.Nalin K. Sharda , Multimedia Information System , PHI.

3.Fred Halsall , Multimedia Communications , Pearson Ed.

4.Koegel Buford , Multimedia Systems , Pearson Ed.

5.Fred Hoffstetter , Multimedia Literacy , McGraw Hill.

6.Ralf Steinmetz and Klara Nahrstedt , Multimedia Fundamentals: Vol. 1- Media Coding and Content Processing , PHI.

7.J. Jeffcoate , Multimedia in Practice: Technology and Application , PHI.

8. V.K. Jain, Multimedia and Animation, Khanna Publishing House, New Delhi (AICTE Recommended Textbook – 2018)