## NOTIFICATION

No. 187 /2022                                                                                   Date: 10 /11/2022

**Subject : (I)  Minor changes in the existing syllabi of the subjects of Semester V & VII and implementation of new syllabus of Open Elective Subjects of Semester V & VI of B.E. (Information Technology) (CB.C.S.)**

**(II) Chances /Equivalence & Absorption for the Old Course failure students of B.E. Sem. V & VI (CBCS)**

Ref'ce :   i) Notification No. 135/2021 dtd. 02.12.2021.
            ii) Notification No. 64/2022 dtd. 18.06.2022.

It is notified for general information of all concerned that the authorities of the University have accepted to implement as under:

(I)      Minor changes in the existing syllabi of some subjects of Semester V & VII and implementation of new syllabus of Open Elective Subjects of Semester V & VI of B.E. (Information Technology) (CB.C.S.)

## 5IT01  DATABASE MANGEMENT SYSTEMS

**Course Objectives:**

1. Identify role of database system, find out its applications and learn about database file systems.
2. Understand concept of designing database schema and its mapping to relational table.
3. Apply the concepts of database integrity and security, encryption, authorization and Normalization.
4. Evaluate query expression, query cost, query optimization and different operation.
5. Understand the concept of transaction management and its properties.
6. Understand concept of concurrency control and various type of protocol.

**Course Outcomes:**

1. To understand concept of database system.
2. To understand and apply the concept related with data model
3. Apply concepts of database querying, integrity and security using SQL.
4. To understand query processing and query optimization.
5. To understand concept of transaction management and its properties.
6. To understand the concept of Concurrency control and study of various database protocols.

**Unit I**:  **Introduction:**
Database, types of databases, DBMS, Purpose of DBMS & its Applications, RDBMS, File System, DBMS Architecture & its types. **Data Models:** Types of data Models: network, relational, object based data model; Data model schema, Data dependence, types of database languages. E-R Model Concepts, E-R diagram Notations, Mapping Constraints, DBMS Keys, E-R diagram to Table conversion.

**Unit-II**: **Relational Data Model:**

Concepts, Relational algebra, Join operation, Integrity constraint and its type, relational calculus, Normalization: functional dependencies, Decomposition, Domain & data dependency, types of Normal forms: 1NF, 2NF, 3NF, BCNF, 4NF, 5NF;

**Unit-III**: **SQL Introduction:**

**SQL:** Characteristic, advantages, data types, operators, wildcard operators, expressions, **Database commands:** create, drop, select and show database,  Create table, drop table, Query with Select statements, Insert statement, Update statement, Delete statement with use of where, and, or clauses, Use of like and top clause, Alter command,  Distinct Command, View in SQL, Create view using one or multiple table, delete view, Index creation & Drop, Null Values, SQL sub queries rules, sub queries using select, insert, update, delete statements, **SQL clauses:** having, group by, order by, join, **SQL Aggregate functions:** Count, sum average, max, min; Date function, **SQL Join:** inner, left, right, full.

**Unit-IV**: **Transaction processing:** Operations on transaction**,** Properties: Atomicity, Consistency, Isolation and Durability, States, schedule, deadlock in DBMS.

**Unit-V**: **Concurrency Control:**
Lock based protocol, Timestamp based schedulers, Validation based protocol, Serializability of scheduling, multiple granularity, and Concurrency Control schemes.

**Unit-VI**: **Database Security:**

Authentication, Authorization and access control, DAC, Mandatory Access Control and Role-Based Access Control models, Intrusion detection, SQL injection.

**Text Book**:  Korth, Sudarshan : Database System Concept , Mc Graw Hill, 6th Edition

**Reference Books**:
1. Raghu Ramkrishnan : 'Database system'.
2. C.J.Date : 'Database System', 7th edn.
3. Connolly & Begg : "Database System", Low Price Ed.

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## 7IT04   (Prof. Elect.-III) (i) Machine  Learning

**Course Objectives:**

1. To imbibe the concepts, techniques and building blocks of machine learning.
2. To understand mathematics for modeling and evaluation.
3. To Learn various algorithms of classification & regression for supervised machine learning.
4. To Learn various algorithms of clustering for unsupervised machine learning.
5. To Introduce the concept of Reinforcement Learning.
6.  To Learn the Concept of Neural network.

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

1. Understand the concept of Machine Learning
2. Understand how to evaluate models generated from data.
3. Implement the variety of algorithms for Supervised Learning
4. Implement the variety of algorithms for Unsupervised Learning
5. Implement the variety of algorithms for Reinforcement Learning
6. Understand the concept of  Neural Network

**Unit I:** Machine Learning: The three different types of machine learning, Introduction to the basic terminology and notations, A roadmap for building machine learning systems, Using Python for machine learning, Training Simple Machine Learning Algorithms for Classification, Artificial neurons – a brief glimpse into the early history of machine learning, Implementing a perception learning algorithm in Python, Adaptive linear neurons and the convergence of learning.

**Unit II:** A Tour of Machine Learning Classifiers Using scikit-learn, Choosing a classification algorithm, First steps with scikit-learn – training a perceptron, Modeling class probabilities via logistic regression, Maximum margin classification with support vector machines, Solving nonlinear problems using a kernel SVM, Decision tree learning, K-nearest neighbors – a lazy learning algorithm.

**Unit III:** Data Preprocessing, Hyperparameter Tuning: Building Good Training Sets, Dealing with missing data, Handling categorical data, Partitioning a dataset into separate training and test sets, Bringing features onto the same scale, Selecting meaningful features, Assessing feature importance with random forests, Compressing Data via Dimensionality Reduction, Unsupervised dimensionality reduction via principal component analysis, Supervised data compression via linear discriminant analysis, Using kernel principal component analysis for nonlinear mappings, Learning Best Practices for Model Evaluation and Hyperparameter Tuning, Streamlining workflows with pipelines, Using k-fold cross-validation to assess model performance.

**Unit IV: Regression Analysis**: Predicting Continuous Target Variables, Introducing linear regression, Exploring the Housing dataset, Implementing an ordinary least squares linear regression model, Fitting a robust regression model using RANSAC, Evaluating the performance of linear regression models, Using regularized methods for regression, Turning a linear regression model into a curve – polynomial regression.

**Unit V:** Dealing with nonlinear relationships using random forests, Working with Unlabeled Data – Clustering Analysis, Grouping objects by similarity using k-means, Organizing clusters as a hierarchical tree, Locating regions of high density via DBSCAN.

**Unit VI:** Multilayer Artificial Neural Network and Deep Learning: Modeling complex functions with artificial neural networks, Classifying handwritten digits, Training an artificial neural network, About the convergence in neural networks, A few last words about the neural network implementation, Parallelizing Neural Network Training with Tensor Flow, Tensor Flow and training performance.

**Text Book:** Sebastian Raschka, and Vahid Mirjalili ―Python Machine Learning: Machine Learning and Deep Learning with Python, scikit-learn, and Tensor Flow.

**Reference Books:**

1. Andriy Burkov ― The Hundred - Page 'Machine Learning Book'.
2. Aurélien Géron ―'Hands-on Machine Learning' with Scikit-Learn, Keras, and Tensor Flow: Concepts, Tools, and Techniques to Build Intelligent Systems.
3. Andreas C. Müller & Sarah Guido ―Introduction to Machine Learning with Python: A Guide for Data Scientists.
4. Chris Albon ―Machine Learning with Python Cookbook: Practical Solutions from Preprocessingto Deep Learning.

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**5IT05 / 5KSO5  Open Elective – I (ii)  COMPUTATIONAL BIOLOGY**      [L-3, T-0, C-3]

**Course Pre-requisite**: To introduce basic genomic and transcriptomic sequence processing algorithms and concepts and impart skills regarding the use of popular software tools in this area.

**Course Objectives**: Throughout the course, students will be expected to demonstrate their understanding of Computational Biology by being able to do each of the following:
1. To familiarize the students with most basic and useful algorithms for sequence analysis
2. To aware the students with basic file formats
3. To transform the basic molecular data for interpreting their patterns for various analysis
4. To compare genomes of different species, gene finding, and gene regulation.

**Course Outcomes** (Expected Outcome): On completion of the course, the students will be able to-
1. Understand what types of biological questions can be investigated using computers, and what limitations computational methods impose on the understanding of biology.
2. Describe the properties of DNA, RNA, and proteins, the relationships among these molecules.
3. Analyze how to convert a biological question into a computational problem that can be solved using computers.
4. Explain general approaches for solving computational problems, and will be able to apply these approaches to new problems you encounter.
5. Understand how implement the algorithms by writing computer programs.

**Unit I**: Cellular and Molecular Biology Fundamentals, the structure of DNA & RNA, Gene Structure and control, Tree of Life and evolution, Primary & Secondary Structure of Protein, Implications for Bioinformatics Protein fold to form compact structures. Dealing with Databases: Structure of databases, Types of databases, Data Quality. (Hours: 6)

**Unit II**: Sequence Alignments  Principles of sequence alignments, scoring alignments, substitution matrices, Inserting gaps, Types of Alignments, Searching Databases, Searching with Nucleic Acid or protein sequences, Protein Sequences Motifs or Patterns, Searching using Motifs and patterns, Patterns & protein function. (Hours: 6)

**Unit III**: Pairwise Sequence Alignments & Database Searching  Substitution Matrices and scoring, Dynamic Programming Algorithms, Indexing Techniques & Algorithmic approximations, Alignments score significance, aligning complete genome sequences.  (Hours: 6)

**Unit IV**: Patterns Profiles and Multiple Alignments  Profile & sequence logos, Profile Hidden Markov Models, Aligning Profiles, Multiple Sequence Alignment by Gradual Sequence Addition, Sequence Pattern Discovery. (Hours: 6)

**Unit V**: Revealing Genome Features Preliminary examination of Genome Sequence, Gene Predictions, Splice site Detection, Prediction of Promoter Regions, Confirming Predictions, Genome Annotation, Large Genome Comparisons. (Hours: 6)

**Unit VI**: Gene Detection and Genome Annotation  Detection of Functional RNA Molecules using Decision Trees, Algorithms for Gene Detection in Prokaryotes, Features used in Eukaryotic Gene Detection, Predicting Eukaryotic Gene Signals, Predicting Exon/Intron Structure, Beyond the Prediction of Individual Genes.  (Hours: 6)

**Text Books:**
1. Understanding Bioinformatics , Marketa Zvelbil and Jeremy O. Baum, Garland Sceincem Taylor & Francis Group, LLC
2. Bioinformatics: Principles and Applications, Bal, H. P. (2005), Tata McGraw-Hill.

**Reference Books:**

1. Bioinformatics Algorithms – Design and Implementation in Python, Miguel Rocha & Pedro Ferreira, Academic Press, Elsevier Inc.
2. Bioinformatics Algorithms: An Active Learning Approach, Edition 2, Volume 1. Phillip Compeau & Pavel Pevzner.
3. Bioinformatics computing, Bergeron, B. P. (2003), Prentice Hall Professional.
4. Bioinformatics Technologies, Chen, Y. P. P. (Ed.). (2005). Springer.
5. Bioinformatics for dummies, Claverie, J. M., & Notredame, C. (2011), John Wiley & Sons.
6. Fundamental Concepts of Bioinformatics, Dan. E. Krane, & Raymer, M. L. (2003), Pearson Education International.

### 6IT05 / 6KSO5 Open Elective – II (i) CYBER LAWS & ETHICS    [L-3,T-0,C-3]

**Course Pre-requisite**: Basic Knowledge of Internet Course Objectives:

Throughout the course, students will be expected to demonstrate their understanding of Cyber Laws & Ethics by being able to do each of the following:

1. Understand Cyber Space, Cyber Crime, Cyber Laws, Information Technology, Internet, Internet Services
2. Know Legal Aspects of Regulation concerned with Cyber Space, Technology and Forms of Cyber Crimes
3. Understand Computer Crimes and Cyber Crimes, Cyber Crime in Global and Indian Response.
4. Understand Criminal Liability, Cyber Crime implications and challenges.
5. Learn Precaution & Prevention of Cyber Crimes, Human Rights perspective of Cyber Crime

**Course Outcomes** (Expected Outcome): On completion of this course, the students should be able to:

1. Understand Cyber Space, Cyber Crime, Information Technology, Internet & Services.
2. List and discuss various forms of Cyber Crimes
3. Explain Computer and Cyber Crimes
4. Understand Cyber Crime at Global and Indian Perspective.
5. Describe the ways of precaution and prevention of Cyber Crime as well as Human Rights.

**Unit I**: **Information Technology & Cyber Crimes**: Introduction, Glimpses, Definition and Scope, Nature and Extent, Know no Boundaries, Rapid Transmission and Accuracy, Diversity and Span of Victimization, Cyber World, Inadequacy of Law, Influence of Teenagers Information Technology: Definition & Perspective, Growth & Future, Various Facets & Dimensions. Regulatory Perspective on Technology: Impact of Information and Technology, Regulation of Cyber Space, Legal Aspects of Regulation.                         (Hours:6)

**Unit II**: **Technology & Forms of Cyber Crimes**: Influence of Technology on Criminality, Forms of Cyber Crimes. Computer Crimes & Cyber Crimes: A Criminological Analysis Computer Crimes and Cyber Crimes: Terminological Aspects, Opportunities to Cyber Criminals, Motives of Offenders, Problems Affecting Prosecution, Cyber Crimes: Challenges of Prevention and Control, Need and Prospects (~f Criminological Research.   (Hours:6)

**Unit III: Cyber Crimes 'and Global Response**: Global Perspective, Country wise Legal Response, Country wise Analysis. Cyber Crimes and Indian Response: Introduction, The Indian Information Technology Act 2000, Preamble & Coverage, Nature of Offences and Penalties, Miscellaneous and Subsidiary Provisions Certain Shortcomings, Future Prospects and Needs.                         (Hours:6)

**Unit IV: Mens Rea & Criminal Liability**: Introduction, Historical Perspectives, Mens Rea in Indian Criminal Law, Mens Rea in English Criminal Law, Abetment of Offence, Criminal Liability and Role of Mens Rea in Indian Information Technology Act, 2000 Investigation in Cyber Crimes: Implications and Challenges: : Introduction, Procedural Aspects, Issues, Complications and Challenges Concerning Cyber Crimes, Problems and Precautionary measures for Investigation.                         (Hours:6)

**Unit V: Cyber Crimes**: Discovery and Appreciation of Evidences: Introduction, Law of Evidence, Evidences in Cyber Crimes : Challenges and Implications, Computer Generated Evidence and their Admissibility, Judicial Interpretation of Computer related Evidence Prevention of Cyber Crimes :National and International Endeavors: Introduction, International Services on Discovery and Recovery of Electronic and Internet Evidence, International Organisation on Computer Evidence (IOCE), OECD Initiatives, Efforts of G-7 and G-8 Groups, Endeavors of Council of Europe, Measures of United Nations, Efforts of WTO, Measures of World Intellectual Property Organisation (WIPO),Interpol and its Measures, Efforts in India, Need of International Assistance and Appropriate Amendments, U.S. Laws on Cyber Crimes, U.S. Case-law on Cyber Evidences and Related Issues. (Hours:7)

**Unit VI: Human Rights Perspectives Cyber Crimes**: Introduction, Ideological Aspects, Fundamental Rights and Civil Liberties, Various Issues and Challenges. Cyber Crimes : Precaution and Prevention: Introduction, Awareness and Law Reforms, Improving Criminal Justice Administration, Increasing International Cooperation, Curricular Endeavors and Checking Kids' Net Addiction, Role of Guardians, Mobile Pornography: No Nearer Solution in Sight, Self-regulation in Cyber Space.                         (Hours:7)

**Text Book**: Dr. Pramod Kr.Singh, "Laws on Cyber Crimes [Along with IT Act and Relevant Rules]" Book Enclave Jaipur India.

**Reference Books:**

1. Craig B, "Cyber Law: The Law of the Internet and Information Technology". Pearson Education.
2. Pawan Duggal, "Cyber Laws" Universal Law Publishing.
3. K.Kumar," Cyber Laws: Intellectual property & E Commerce, Security", First Edition, Dominant Publisher, 2011.
4. Rodney D. Ryder, "Guide to Cyber Laws", Second Edition, Wadhwa And Company, New Delhi, 2007.
5. Vakul Sharma, "Handbook of Cyber Laws" Macmillan India Ltd, Second Edition, PHI, 2003.
6. Justice Yatindra Singh, "Cyber Laws", Universal Law Publishing, First Edition, New Delhi, 2003.
7. Sharma, S.R., "Dimensions of Cyber Crime", Annual Publications Pvt. Ltd., First Edition, 2004.
8. Augastine, Paul T., "Cyber Crimes and Legal Issues", Crecent Publishing Corporation, 2007.

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**5IT05 / 5KSO5   Open Elective –I (i)   DATA STRUCURES & ALGORITHMS     [L-3,T-0,C-3]**

**Course Objectives**:
1. To understand the Data Structures and its memory representations
2. To perform different operations on Data Structures such as insertion, deletion, searching and traversing.
3. To understand various data searching and sorting methods with its complexity.
4. To introduce various sorting and searching techniques for representation of the data in the real world.

**Course Outcomes** (Expected Outcome): On completion of the course, the students will be able to-
1. Describe basics of Data Structures and algorithms.
2. Explain Data Structures array and link list.
3. Illustrate with example stack and queues operations.
4. Examine the binary tree traversal methods.
5. Construct Graph and shortest path algorithm in graph.
6. Inspect various sorting and searching techniques.

**Unit I**: **Introduction to algorithms and Data Structures**: Introduction, Algorithms,    Asymtotic Notation, Introduction to Data Structures, Types of Data Structures, Data Structure Operations.

**Unit II**: **Arrays**: Introduction, Types of Arrays, Representation of One-Dimensional Array in Memory,   Array Traversal, Insertion and Deletion, Sorting and Searching, Representation of Multi-Dimensional Array in memory, Realizing matrices using Two-Dimensional Arrays, Matrix Operations, **Linked List**: Introduction, Linked List – Basic Concept, Types of Linked List.

**Unit III**: **Stacks**: Introduction to Stacks, Stack Operations, Queues: Introduction, Queues- Basic Concept, Queue Operations, Basics of Circular Queues and Priority Queues.

**Unit IV**: **Trees**: Introduction, basic concept, Binary Tree, Binary Tree Representation, Binary Tree Traversal, Binary Search Tree, Tree Variants.

**Unit V**: **Graphs**: Introduction, Basic Concept, Graph Terminology, Graph Implementation, Shortest Path Algorithm, Graph Traversal.

**Unit VI**: **Sorting and Searching**: Introduction, Sorting Techniques, Selection Sort, Insertion Sort, Bubble Sort, Quick Sort, Merge Sort, Bucket Sort, Searching Techniques; Linear Search, Binary Search, Hashing.

**Text Book:** E. Balagurusay, "Data Structures using C", McGraw Hill Education, 2018.

**Reference Books:**
1. Seymour Lipschutz, "Data Structures with C", Schaum's Outline Series.
2. Forouzan, Gilberg, "Data Structures and algorithms**"**, CENGAGE Learning.
3. Reema Thareja, "Data Structures using C", Oxford University Press, 2011.
4. Arpita Gopal, "Magnifying Data Structures:, PHI (EEE), 2010.
5. Ellis Horowitz and Sartaj Sahani, " Fundamentals of Data Structures", CBS Publications.

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**5IT05 / 5KSO5   Open Elective –I (ii)   COMPUTATIONAL BIOLOGY     [L-3,T-0,C-3]**

**Course Pre-requisite:**
**Course Objectives**: Throughout the course, students will be expected to demonstrate their understanding of Computational Biology by being able to do each of the following:
1. To familiarize the students with most basic and useful algorithms for sequence analysis
2. To aware the students with basic file formats
3. To transform the basic molecular data for interpreting their patterns for various analysis
4. To compare genomes of different species, gene finding, and gene regulation

**Course Outcomes** (Expected Outcome): On completion of the course, the students will be able to:
1.  Understand what types of biological questions can be investigated using computers, and what limitation computational methods impose on the understanding of biology.
2. To know the properties of DNA, RNA, and proteins, the relationships among these molecules.
3. To know how to convert a biological question into a computational problem that can be solved using computers.
4. To know how to read and understand solutions to computational problems, which will be formalized as a series of tasks (an algorithm).
5. To know how implement the algorithms by writing computer programs.

**Unit I**: **Cellular and Molecular Biology Fundamentals**: The structure of DNA & RNA, Gene Structure and control, Tree of Life and evolution, Primary & Secondary Structure of Protein, Implications for Bioinformatics Protein fold to form compact structures. Dealing with Databases: Structure of databases, Types of databases, Data Quality. (Hours: 6)

**Unit II**: **Sequence Alignments**: Principles of sequence alignments, scoring alignments, substitution matrices, Inserting gaps, Types of Alignments, Searching Databases, Searching with Nucleic Acid or protein sequences, Protein Sequences Motifs or Patterns, Searching using Motifs and patterns, Patterns & protein function. (Hours: 6)

**Unit III**: **Pair wise Sequence Alignments & Database Searching**: Substitution Matrices and scoring, Dynamic Programming Algorithms, Indexing Techniques & Algorithmic approximations, Alignments score significance, aligning complete genome sequences. (Hours: 6)

**Unit IV**: **Patterns Profiles and Multiple Alignments**: Profile & sequence logos, Profile Hidden Markov Models, Aligning Profiles, Multiple Sequence Alignment by Gradual Sequence Addition, Sequence Pattern Discovery. (Hours: 6)

**Unit V**: **Revealing Genome Features**: Preliminary examination of Genome Sequence, Gene Predictions, Splice site Detection, Prediction of Promoter Regions, Confirming Predictions, Genome Annotation, Large Genome Comparisons. (Hours: 6)

**Unit VI**: **Gene Detection and Genome Annotation**: Detection of Functional RNA Molecules using Decision Trees, Algorithms for Gene Detection in Prokaryotes, Features used in Eukaryotic Gene Detection, Predicting Eukaryotic Gene Signals, Predicting Exon / Intron Structure, Beyond the Prediction of Individual Genes. (Hours:6)

**Text Books:**

1. Understanding Bio-informatics , Marketa Zvelbil and Jeremy O. Baum, Garland Sceincem Taylor & Francis Group, LLC
2. Bioinformatics: Principles and Applications, Bal, H. P. (2005), Tata McGraw-Hill.

**Reference Books:**

1. Bioinformatics Algorithms – Design and Implementation in Python, Miguel Rocha & Pedro Ferreira, Academic Press, Elsevier Inc.
2. Bioinformatics Algorithms: An Active Learning Approach, Edition 2, Volume 1. Phillip Compeau & Pavel Pevzner.
3. Bioinformatics computing, Bergeron, B. P. (2003), Prentice Hall Professional.
4. Bioinformatics Technologies, Chen, Y. P. P. (Ed.). (2005). Springer.
5. Bioinformatics for dummies, Claverie, J. M., & Notredame, C. (2011), John Wiley & Sons.
6. Fundamental Concepts of Bioinformatics, Dan. E. Krane, & Raymer, M. L. (2003), Pearson Edu. International.

**Additional Resources:**

1. Bioinformatic Methods I, conducted by University of Toronto, https:// www.Coursera.org/course/ bioinfo methods 1
2. Bioinformatics algorithms (Part-I), conducted by University of California San Diego. http:www.coursera.org/course/bioinformatics
3. Bioinformatics: introduction and methods conducted by Peking University, https://www/coursera.org/course/pkubionfo
4. http://www.ncbi.nlm.nih.gov/education/tutorials/
5. htttp://www.ncbi.nlm.nih.gov/books/NBK143764/
6. Bioinformatics: introduction and method, conducted by Peking University. https://www.coursera.org/course/pkubioinfo
7. Bioinformatics: life sciences on your computer, conducted by Johns Hopkins. University. https://www.coursera.org/course/pkubioinfo
8. Emergence of life, conducted by University of Illinois Urbana-Champaign campus. https://www.coursera.org/course/emergenceoflife
9. Genes and the human condition (from behaviour to biotechnology), conducted by University of Maryland. https://www.coursera.org/course/genes.
10. Introduction to biology – the secret of life, conducted by Massachusetts Institute of Technology. https://www.edx.org/course/mitx-7-00x-introduction -biology-secret-1768
11. Origins – formation of the universe, solar system, earth  and life, conduted by University of Copenhagen. https://www.coursera.org/course/origins
12. Preparation for introductory biology: DNA to organisms, conducted by University of California. https://www.coursera.org/course/introbilogy.

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### 6IT05 / 6KSO5 (Open Elective – II) (i) CYBER LAWS & ETHICS [L-3,T-0,C-3]

**Course Prerequisite**: Basic Knowledge of Internet

**Course Objectives**: Throughout the course, students will be expected to demonstrate their understanding of Cyber Laws & Ethics by being able to do each of the following:
1. Understand Cyber Space, Cyber Crime, Cyber Laws, Information Technology, Internet, Internet Services
2. Know Legal Aspects of Regulation concerned with Cyber Space, Technology and Forms of Cyber Crimes
3. Understand Computer Crimes and Cyber Crimes, Cyber Crime in Global and Indian Response.
4. Understand Criminal Liability, Cyber Crime implications and challenges. 5. Learn Precaution & Prevention of Cyber Crimes, Human Rights perspective of Cyber Crime.

**Course Outcomes** (Expected Outcome): On completion of this course, the students should be able to:
1. Understand Cyber Space, Cyber Crime, Information Technology, Internet & Services.
2. List and discuss various forms of Cyber Crimes
3. Explain Computer and Cyber Crimes
4. Understand Cyber Crime at Global and Indian Perspective.
5. Describe the ways of precaution and prevention of Cyber Crime as well as Human Rights.

**Unit I**: **Information Technology & Cyber Crimes**: Introduction, Glimpses, Definition and Scope, Nature and Extent, Know no Boundaries, Rapid Transmission and Accuracy, Diversity and Span of Victimization, Cyber World, Inadequacy of Law, Influence of Teenagers.
**Information Technology**: Definition & Perspective, Growth & Future, Various Facets & Dimensions.
**Regulatory Perspective on Technology**: Impact of Information and Technology, Regulation of Cyber Space, Legal Aspects of Regulation. (Hours: 6)

**Unit II**: **Technology & Forms of Cyber Crimes**: Influence of Technology on Criminality, Forms of Cyber Crimes.
**Computer Crimes & Cyber Crimes: A Criminological Analysis**: Computer Crimes and Cyber Crimes: Terminological Aspects, Opportunities to Cyber Criminals, Motives of Offenders, Problems Affecting Prosecution, Cyber Crimes: Challenges of Prevention and Control. (Hours: 6)

**Unit III**: **Cyber Crimes 'and Global Response**: The Indian Information Technology Act 2000, Preamble & Coverage, Nature of Offences and Penalties, Miscellaneous and Subsidiary Provisions Certain Shortcomings, Future Prospects and Needs.
**Cyber Law and related Legislation**: Patent Law, Trademark Law, Copyright. (Hours: 6)

**Unit IV**: **Mens Rea & Criminal Liability**: Introduction, Mens Rea in Indian Criminal Law, Abetment of Offence, Criminal Liability and Role of Mens Rea in Indian Information Technology Act, 2000.
**Investigation in Cyber Crimes**: **Implications and Challenges**: Introduction, Procedural Aspects, Issues, Complications and Challenges Concerning Cyber Crimes, Problems and Precautionary measures for Investigation. (Hours:6)

**Unit V**: **Cyber Crimes : Discovery and Appreciation of Evidences: Introduction**, Law of Evidence, Evidences in Cyber Crimes : Challenges and Implications, Computer Generated Evidence and their Admissibility, Judicial Interpretation of Computer related Evidence
**Prevention of Cyber Crimes :National and International Endeavors**: Introduction, International Services on Discovery and Recovery of Electronic and Internet Evidence, International Organization on Computer Evidence (IOCE), OECD Initiatives, Efforts of G-7 and G-8 Groups, Efforts of WTO, Measures of World Intellectual Property Organization (WIPO), Interpol and its Measures. (Hours:6)

**Unit VI**: **Human Rights Perspectives Cyber Crimes:** Fundamental Rights and Civil Liberties, Various Issues and Challenges.
**Cyber Crimes : Precaution and Prevention**: Awareness and Law Reforms, Improving Criminal Justice Administration, Increasing International Cooperation, Curricular Endeavors and Checking Kids' Net Addiction, Role of Guardians, Mobile Pornography: Self-regulation in Cyber Space.
Cyber Ethics: Importance and significance of Cyber Ethics, Need for Cyber regulation and ethics. (Hours:6)

**Text Book**: Dr. Pramod Kr.Singh, "Laws on Cyber Crimes [Along with IT Act and Relevant Rules]" Book Enclave Jaipur India.
**Reference Books:**
1. Craig B, "Cyber Law: The Law of the Internet and Information Technology". Pearson Education.
2. Pawan Duggal, "Cyber Laws" Universal Law Publishing.
3. K.Kumar," Cyber Laws: Intellectual property & E Commerce, Security", First Edition, Dominant Publisher, 2011.
4. Rodney D. Ryder, "Guide to Cyber Laws", Second Edition, Wadhwa And Company, New Delhi, 2007.
5. Vakul Sharma, "Handbook of Cyber Laws" Macmillan India Ltd, Second Edition, PHI, 2003.
6. Justice Yatindra Singh, "Cyber Laws", Universal Law Publishing, First Edition, New Delhi, 2003.
7. Sharma, S.R., "Dimensions of Cyber Crime", Annual Publications Pvt. Ltd., First Edition, 2004.
8. Augastine, Paul T., "Cyber Crimes and Legal Issues", Crecent Publishing Corporation, 2007.

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### 6IT05 / 6KSO5 (Open Elective – II) (ii)  DATA COMMUNICATION & INTERNET   [L-3,T-0,C-3]

**Course Prerequisite**: Basic Knowledge about Computer Fundamentals

**Course Objectives**: Throughout the course, students will be expected to:

1. To develop an understanding of computer networking basics.
2. To develop an understanding of different components of data communication, various protocols.
3. To focus on information sharing and networks.
4. To introduce flow of data, categories of network, different topologies.
5. To study signals, transmission media, errors in media communications and their correction.
6.  To understand the building blocks of digital communication system.

**Course Outcomes** (Expected Outcome): On completion of this course, the students should be able to:
1. Describe the general principles of Data Communication.
2. Independently understand basic computer network technology.
3. Understand and explain Data Communication  System and its components.
4. Identify the different types of network topologies and protocols.
5. Identify the different types of network devices and their functions within a network.

**Unit I**: **Introduction**:  Data Communication Networks, The Internet, Protocols and Standards.     (Hours: 6)

**Unit II**: **Network Models**: Layered Tasks, The OSI Model, Layers in the OSI Model, TCP / IP Protocol Suite, Addressing.                                                                                            (Hours: 6)

**Unit III**: **Data and Signals**: Analog and Digital, Periodic Analog Signals, Digital Signals, Transmission Impairment, Data rate limits, performance.                  (Hours: 6)

**Unit IV**: **Digital Transmission and Analog Transmission:** Digital Transmission, Digital-to- Digital Conversion, Analog-to Digital Conversion, Transmission Modes.
**Analog Transmission:** Digital-to- Digital Conversion, Analog-to Digital Conversion.     (Hours:6)

**Unit V**: **Bandwidth Utilization and Transmission Media:** Bandwidth Utilization, Multiplexing, Spread Spectrum.
**Transmission Media:** Guided Media, Unguided Media, Wireless**.**     (Hours:6)

**Unit VI**: **Switching, Using Telephone and Cable Networks for Data Transmission:**
**Switching: Circuit-switched networks for Data Transmission:** Telephone Network, Dial-up Modems, Digital Subscriber Line, Cable TV Networks, Cable TV for Data Transfer.                  (Hours:6)

**Text Book**: Behrouz A. Forouzan: "Data Communication and Networking", 4th Edition, Mc-graw Hill.

**Reference Books:**
1.  Andrew S. Tanenbaum, David J. Wetherall, "Computer Networks", fifth Edition, Pearson Education.
2. William L. Schweber: "Data Communication", Mc-graw Hill.
3. J.Freey: "Computer Communication & Networks", AEW Press.
4. D.Corner: "Computer Networks & Internet", Pearson Education.

Evaluation: Continuous Assessment (30%) and Assignments/ Quizzes /Projects (20%) Term End Examination (50%) – suggested.

(II)     As there are minor changes in the existing syllabus of some subjects of Semester V and VI of B.E. ((Information Technology) (C.B.C.S.), the authorities of the University have accepted that there is no need to give chances or Equivalence & Absorption for the old course failure students of Semester V & VI to be implemented from the session 2022-2023 onwards as mentioned below:

Sd/-
(Dr.Tushar Deshmukh)
Registrar
Sant Gadge Baba Amravati University

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