Semester-VII

Course Code: PE-ECS701A		Category: Professional Elective
Course Name: Cryptography & Cyber Security		Semester:7
L-T-P: 2-0-0		Credit:2
Total Lectures: 28		
Pre-Requisites: Computer Networks, Linear Algebra.		
MODULE	**DESCRIPTION OF TOPIC**	**HRS/UNIT**
1	Foundations of Computer Security: Computer Security Concepts, OSI Security Architecture, Security Attacks, Security Services, Security Mechanisms, Model for Network Security	6
2	Cryptography and Information Security: Classical Encryption Techniques, Symmetric Cipher Model, Substitution Techniques, Transposition Techniques, Rotor Machines, Steganography, Cryptographic Tools, Confidentiality with Symmetric Encryption, Message Authentication, Hash Functions, Public-Key Encryption, Digital Signatures, Key Management, Random and Pseudorandom Numbers, Encryption of Stored Data	8
3	Authentication and Access Security: User Authentication, Means of Authentication, Password-Based Authentication, Token-Based Authentication, Biometric Authentication, Remote User Authentication, Security Issues for User Authentication	6
4	Malware and System Security: Malicious Software, Viruses, Worms, SPAM, Trojans, Zombies, Bots, Keyloggers, Phishing, Spyware, Backdoors, Rootkits, Countermeasures	4
5	Network Defense Mechanisms: Firewalls, Need for Firewalls, Firewall Characteristics, Types of Firewalls, Firewall Basing, Firewall Locations and Configurations, Intrusion Prevention Systems	4

Text books:

1. Cryptography and Network Security: Principles and Practice by William Stallings 6th Edition published by PHI (2011)

2. Computer security principles and practice, William Stallings, Lawrie Brown, third edition, Prentice-Hall, 2011

3. Cryptography and Network Security, V.K. Jain, Khanna Publishing House

On completion of the course students will be able to	
CO-1	Explain the principles of computer security, security architecture, attacks, services, and security mechanisms.
CO-2	Apply cryptographic techniques including symmetric-key, public-key, hashing, digital signatures, and steganography to secure data and communications.
CO-3	Analyze various user authentication techniques and evaluate their effectiveness in securing information systems.
CO-4	Identify different types of malware, analyze their behavior and propagation mechanisms, and propose suitable countermeasures.
CO-5	Apply firewall technologies and intrusion prevention systems to design secure network infrastructures and mitigate security threats.

Course Code: OE-ECS701B	Category: Open Elective I	
Course Name: Operation Research	Semester:7	
L-T-P: 2-0-0	Credit:2	
Total Lectures: 28		
Pre-Requisite: Fundamental understanding of probability, linear algebra, matrices and mathematical reasoning.		
MODULE	**DESCRIPTION OF TOPIC**	**HRS/UNIT**
1	**Introduction** - Overview of Operation research - Nature - Scope and characteristics of OR - Features of OR - Stages in OR - Limitations of Operational research.	3
2	**Linear Programming Problem (LLP):** 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.	13
3	**Network Analysis:** Shortest Path: Floyd Algorithm; Maximal Flow Problem (Ford-Fulkerson); PERTCPM (Cost Analysis, Crashing, Resource Allocation excluded).	7
4	**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

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

5. P.R. Vittal & V. Malini, Operation Research, Margham Publications, Chennai, 17

6. P.K.Gupta & Man Mohan, Problems in Operation Research, Sultan Chand & Sons, New Delhi.

7. V.K. Kapoor, Introduction to Operation Research, Sultan Chand & Sons, New Delhi.

8. Handy A Taha, Operation Research, An Introduction Prentice Hall of India – New Delhi.

9. P. Gupta, N. Aruna Rani, M.Haritha (2018) Operation Research and Quantitative Techniques, First Edition, Himalaya publishing House.

On completion of the course students will be able to	
CO-1	Explain the fundamental concepts, scope, characteristics, and applications of Operations Research in solving real-world decision-making problems.
CO-2	Formulate and solve Linear Programming Problems using graphical, simplex, Big-M, and duality methods, including transportation and assignment models.
CO-3	Apply network optimization techniques such as shortest path, maximum flow, and PERT/CPM for planning, scheduling, and resource optimization.
CO-4	Analyze and solve decision-making problems using game theory concepts, including two-person zero-sum games, graphical methods, and the principle of dominance.

Course Code: PE-ECS701C	**Category:** Professional Elective-I
Course Name: Soft Computing	**Semester:7**
L-T-P: 2-0-0	**Credit:2**

Unit	content	Hrs
1	Introduction to Soft Computing: Concept, characteristics, and comparison with hard computing Components of Soft Computing: Fuzzy Logic, Artificial Neural Networks, Evolutionary Computing, Swarm Intelligence Applications of Soft Computing in engineering and real-world problem solving Fuzzy Sets: Crisp vs. Fuzzy Sets, Membership Functions, Linguistic Variables Basic Fuzzy Set Operations and Properties	4
2	Fuzzy Relations and Operations T-Norms, S-Norms, Aggregation Operators Fuzzy Implications, Extensions, Projections, and Compositions Approximate Reasoning Compositional Rule of Inference (CRI) Fuzzification and Defuzzification Methods Design of Fuzzy Rule-Based Systems	4
3	Mamdani Fuzzy Inference System Takagi–Sugeno (TS) Fuzzy Model Tsukamoto Fuzzy Model Design and Implementation of Fuzzy Controllers Applications in Control Systems, Decision Support, Pattern Recognition, Medical Diagnosis, and Industrial Automation	4
4	Introduction to Evolutionary Algorithms Genetic Algorithms: Representation, Fitness Function Selection Techniques Crossover and Mutation Operators Elitism and Termination Criteria Parameter Tuning and Constraint Handling Applications of Genetic Algorithms in Optimization and Machine Learning	4

5	Artificial Neural Networks: Fundamentals and Learning Paradigms Fuzzy-Neural and Neuro-Fuzzy Systems Fuzzy-Genetic Hybrid Systems Introduction to Swarm Intelligence (Particle Swarm Optimization, Ant Colony Optimization) Soft Computing Applications in Data Mining, IoT, Robotics, Healthcare, Smart Manufacturing, and Intelligent Decision Support Recent Trends in Soft Computing and Explainable AI	6
6	Design of Fuzzy Membership Functions using MATLAB/Python Implementation of Mamdani and Sugeno Fuzzy Inference Systems Optimization using Genetic Algorithms Development of Neuro-Fuzzy Models Comparative analysis of Soft Computing techniques on real-world datasets	6

Text books: 1. Dirankov and Hellendrom Fuzzy logic control, Narosa

2. Rajsekhar and Pai, Neural Networks, Fuzzy logic and Genetic Algorithm: Synthetic and Applications, Pearson Education

3. Goldberg - Genetic algorithm, Pearson 2003

4. Freeman - Neural Networks, Pearson 2003 5. Jang - Neuro-fuzzy and soft Computing, Pearson 2003

1. **Course Outcome:**

After this course student will be able to

CO1	Explain the fundamentals of soft computing, its constituent components, fuzzy sets, and the significance of fuzzy logic in solving real-world problems.
CO2	Apply fuzzy set operations, T-norms, S-norms, aggregation operators, fuzzy relations, implications, projections, extensions, and compositions to model uncertain systems.
CO3	Analyze fuzzy inference mechanisms, including approximate reasoning, compositional rule of inference, fuzzification, rule-based systems, and defuzzification techniques for decision-making applications.
CO4	Design and implement Mamdani (MA) and Takagi–Sugeno (TS) fuzzy models to solve engineering and practical problems using fuzzy rule-based systems.
CO5	Explain the principles of Genetic Algorithms, including encoding, selection, crossover, mutation, and adaptation, and apply them to optimization problems.

CO6	Evaluate hybrid soft computing techniques such as Fuzzy-Neural, Neuro-Fuzzy, and Fuzzy-Genetic Algorithm systems, and assess their applications in intelligent system design.

Course Code: OE-ECS701	Category: Open Elective-I
Course Name: Optical Communication	Semester:7
L-T-P: 2-0-0	Credit:2
Total Lectures: 28	
Pre-Requisite: Basic concept of optics and Fundamentals of Electromagnetic theory	

MODULE	DESCRIPTION OF TOPIC	HRS/UNIT
1	**Basic Optical Processes in Semiconductors:** Equilibrium and Non-equilibrium conditions, Excess Carriers, Direct and indirect band-gap semiconductors- Absorption and Recombination.	5
2	**Optical Emitters**: LED- principle, structure, materials, performance characteristics (L-I curve, efficiency, modulation, etc.); Semiconductor Laser-Principle, Structure, Performance characteristics (Threshold current, Power Output, Bandwidth, modes) **Optical Receivers:** Front-end photo receivers, Photo detectors: types, structures, principles, performance characteristics- Quantum efficiency/Responsively, bandwidth, gain; preamplifiers-biasing, performance; Noise.	9
3	**Optical Fiber:** Structure, Light guiding mechanism, Numerical Aperture, Attenuation characteristics, Types of fiber, Losses and Dispersion, Dispersion Compensation. **Optical Amplifiers:** Stimulated Emission, Spontaneous Emission, Semiconductor Optical Amplifier, Erbium Doped Fiber Amplifier -- principles, structures and performance characteristics.	10
4	**Point-to-point Link:** Building blocks; Intensity Modulation/Direct Detection system; Direct and External Modulation.	4

Text book and Reference books:

1. Semiconductor optoelectronic Devices, P. Bhattacharya, 6th Edition, PHI, New Delhi, 2002.
2. Fiber-optic Communication, G. Keiser, Tata McGraw Hill Publishing Company Limited, 4th Reprint, New Delhi, 2008.
3. Optoelectronics and Photonics: Principles and Practices, S. O. Kasap; Pearson (EEE), New Delhi, 2009.
4. Optical Networks: A Practical Perspective, Ramaswami, Sivarajan, and Sasaki, Elsevier, Morgan Kaufmann, Third Edition, 2010.

On completion of the course students will be able to	
CO-1	Understand basic optical processes in semiconductors, including carrier transport and bandgap types.
CO-2	Deep knowledge on optical device principles and their applications, enabling them to analyse, design, and optimize optical systems for various real-world applications.
CO-3	Possess a comprehensive understanding of optical fiber technology, enabling them to design, analyse, and optimize fiber optic communication systems.
CO-4	Understand and analyse point-to-point link components for fiber optic communication.

Course Code: OE-ECS701B	Category: Open Elective I	
Course Name: Operation Research	Semester:7	
L-T-P: 2-0-0	Credit:2	
Total Lectures: 28		
Pre-Requisite: Fundamental understanding of probability, linear algebra, matrices and mathematical reasoning.		
MODULE	**DESCRIPTION OF TOPIC**	**HRS/UNIT**
1	**Introduction** - Overview of Operation research - Nature - Scope and characteristics of OR - Features of OR - Stages in OR - Limitations of Operational research.	3
2	**Linear Programming Problem (LLP):** 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.	13
3	**Network Analysis:** Shortest Path: Floyd Algorithm; Maximal Flow Problem (Ford-Fulkerson); PERTCPM (Cost Analysis, Crashing, Resource Allocation excluded).	7
4	**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

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

5. P.R. Vittal & V. Malini, Operation Research, Margham Publications, Chennai, 17

6. P.K.Gupta & Man Mohan, Problems in Operation Research, Sultan Chand & Sons, New Delhi.

7. V.K. Kapoor, Introduction to Operation Research, Sultan Chand & Sons, New Delhi.

8. Handy A Taha, Operation Research, An Introduction Prentice Hall of India – New Delhi.

9. P. Gupta, N. Aruna Rani, M.Haritha (2018) Operation Research and Quantitative Techniques, First Edition, Himalaya publishing House.

On completion of the course students will be able to	
CO-1	Explain the fundamental concepts, scope, characteristics, and applications of Operations Research in solving real-world decision-making problems.
CO-2	Formulate and solve Linear Programming Problems using graphical, simplex, Big-M, and duality methods, including transportation and assignment models.
CO-3	Apply network optimization techniques such as shortest path, maximum flow, and PERT/CPM for planning, scheduling, and resource optimization.
CO-4	Analyze and solve decision-making problems using game theory concepts, including two-person zero-sum games, graphical methods, and the principle of dominance.

Course Code: OE-ECS702A	Category: Open Elective-II
Course Name: Quantum Computing	Semester:7
L-T-P: 3-0-0	Credit:3
Total Lectures: 36	
Pre-Requisite: Basic concept of Physics, linear algebra,	

MODULE	DESCRIPTION OF TOPIC	HRS/UNIT
1	Introduction to Quantum Computation: 8L Quantum bits, Bloch sphere representation of a qubit, multiple qubits. Background Mathematics and Physics: Hilber space, Probabilities and measurements, entanglement, density operators and correlation, basics of quantum mechanics, Measurements in bases other than computational basis.	10
2	Quantum Circuits: 6L Single qubit gates, multiple qubit gates, design of quantum circuits	6
3	Quantum Information and Cryptography: 6L Comparison between classical and quantum information theory. Bell states. Quantum teleportation Quantum Cryptography, no cloning theorem.	10
4	Quantum Algorithms: Classical computation on quantum computers. Relationship between quantum and classical complexity classes. Deutsch's algorithm, Deutsch's-Jozsa algorithm, Shor factorization, Grover search. Noise and error correction: 8L Graph states and codes, Quantum error correction, fault-tolerant computation.	10

Course Outcomes (COs):

After Successful completion of the course, students will be able to

CO1	Understand the basic idea of quantum computing including background of mathematics and physics required for developing and solving complex engineering problem in the domain of quantum computing possibly using modern engineering tools.
CO2	Understand and explain the concept of quantum circuits using single and multiple qubit gates and also designing of quantum circuits for solving engineering problem including societal and environmental issues
CO3	Compare between classical and quantum information theory and explain and apply Bell states, Quantum teleportation, Quantum Cryptography and no cloning theorem in solving engineering problem possibly in a team maintain proper ethics of professional collaboration

CO4	Understand, explain and apply different quantum algorithms including classical computation on quantum computers like Deutsch's algorithm, Deutsch's-Jozsa algorithm, Shor factorization, Grover search and also relate between quantum and classical complexity classes forsolving engineering problem.
CO5	Understand noise and error correction including graph states and codes, quantum error correction, fault-tolerant computation and apply it in designing and solving complex engineering problems leading to their lifelong learning.

1. Quantum Computation and Quantum Information, M. A. Nielsen and I. L. Chuang, Cambridge University Press, 10th Anniversary Edition, 2010.
2. Principles of Quantum Computation and Information, G. Benenti, G. Casati and G. Strini, Vol. I: Basic Concepts; Vol. II: Basic Tools and Special Topics, World Scientific, 1st Edition, 2004.

Reference Books:

1. An Introduction to Quantum Computing, P. Kaye, R. Laflamme and M. Mosca, Oxford University Press, 1st Edition, 2007.

2. Quantum Computing: A Gentle Introduction, E. G. Rieffel and W. H. Polak, MIT Press, 1st Edition, 2011.

1. Quantum Computation and Quantum Information, M. A. Nielsen and I. L. Chuang, Cambridge University Press, 10th Anniversary Edition, 2010.
2. Principles of Quantum Computation and Information, G. Benenti, G. Casati and G. Strini, Vol. I: Basic Concepts; Vol. II: Basic Tools and Special Topics, World Scientific, 1st Edition, 2004.
3. An Introduction to Quantum Computing Algorithms, A. O. Pittenger, Springer, 1st Edition, 1999.
4. Quantum Computing from the Ground Up, R. T. Perry, World Scientific Publishing, 1st Edition, 2012.
Reference Books:
1. An Introduction to Quantum Computing, P. Kaye, R. Laflamme and M. Mosca, Oxford University Press, 1st Edition, 2007.
2. Quantum Computing: A Gentle Introduction, E. G. Rieffel and W. H. Polak, MIT Press, 1st Edition, 2011.
3. Quantum Computing for Computer Scientists, N. S. Yanofsky and M. A. Mannucci, Cambridge University Press, 1st Edition, 2008.
4. Quantum Computing Since Democritus, S. Aaronson, Cambridge University Press, 1st Edition, 2013.
5. Introduction to Optical Quantum Information Processing, P. Kok and B. W. Lovett, Cambridge University Press, 1st Edition, 2010.

Course Code: OE-ECS702B		Category: Open Elective
Course Name: Cloud Computing		Semester:7
L-T-P: 3-0-0		Credit:3
Total Lectures: 36		
Pre-Requisite:		
MODULE	**DESCRIPTION OF TOPIC**	**HRS/UNIT**
1	**Definition of Cloud Computing and its Basics (Lectures).** Defining a Cloud, Cloud Types – NIST model, Cloud Cube model, Deployment models (Public , Private, Hybrid and Community Clouds), Service Platform as a Service, Software as a Service with examples of services/ service providers, models – Infrastructure as a Service, Cloud Reference model, Characteristics of Cloud Computing – a shift in paradigm Benefits and advantages of Cloud Computing, A brief introduction on Composability, Infrastructure, Platforms, Virtual Appliances, Communication Protocols, Applications, Connecting to the Cloud by Clients, IaaS – Basic concept, Workload, partitioning of virtual private server instances, Pods, aggregations, silos PaaS – Basic concept, tools and development environment with examples SaaS - Basic concept and characteristics, Open SaaS and SOA, examples of SaaS platform Identity as a Service (IDaaS) Compliance as a Service (CaaS)	9
2	**Use of Platforms in Cloud Computing** Concepts of Abstraction and Virtualization technologies : Types of virtualization (access, application, CPU, storage), Mobility patterns (P2V, V2V, V2P, P2P, D2C, C2C, C2D, D2D) Load Balancing and Virtualization: Basic Concepts, Network resources for load balancing, Advanced load balancing (including Application Delivery Controller and Application Delivery Network), Mention of The Google Cloud as an example of use of load balancing Hypervisors: Virtual machine technology and types, VMware vSphere Machine Imaging (including mention of Open Virtualization Format – OVF) Porting of applications in the Cloud: The simple Cloud API and AppZero Virtual Application appliance, Concepts of Platform as a Service, Definition of services, Distinction between SaaS and PaaS (knowledge of Salesforce.com and Force.com), Application development Use of PaaS Application frameworks, Discussion of Google Applications Portfolio – Indexed search, Dark Web, Aggregation and disintermediation, Productivity applications and service, Adwords, Google Analytics, Google Translate, a brief discussion on Google Toolkit (including introduction of Google APIs in brief), major features of Google App Engine service., Discussion of Google Applications Portfolio – Indexed search, Dark Web, Aggregation and	12

	disintermediation, Productivity applications and service, Adwords, Google Analytics, Google Translate, a brief discussion on Google Toolkit (including introduction of Google APIs in brief), major features of Google App Engine service, Windows Azure platform: Microsoft's approach, architecture, and main elements, overview of Windows Azure App Fabric, Content Delivery Network, SQL Azure, and Windows Live services,	
3	**Cloud Infrastructure:** Cloud Management: An overview of the features of network management systems and a brief introduction of related products from large cloud vendors, Monitoring of an entire cloud computing deployment stack – an overview with mention of some products, Lifecycle management of cloud services (six stages of lifecycle). Concepts of Cloud Security: Cloud security concerns, Security boundary, Security service boundary Overview of security mapping Security of data: Brokered cloud storage access, Storage location and tenancy, encryption, and auditing and compliance Identity management (awareness of Identity protocol standards)	7
4	**Concepts of Services and Applications :** Service Oriented Architecture: Basic concepts of message-based transactions, Protocol stack for an SOA architecture, Event-driven SOA, Enterprise Service Bus, Service catalogs, Applications in the Cloud: Concepts of cloud transactions, functionality mapping, Application attributes, Cloud service attributes, System abstraction and Cloud Bursting, Applications and Cloud APIs Cloud-based Storage: Cloud storage definition – Manned and Unmanned Webmail Services: Cloud mail services including Google Gmail, Mail2Web, Windows Live Hotmail, Yahoo mail, concepts of Syndication services	8

Text book and Reference books:

1. Cloud Computing Bible by Barrie Sosinsky, Wiley India Pvt. Ltd, 2013
2. Mastering Cloud Computing by Rajkumar Buyya, Christian Vecchiola, S. Thamarai Selvi, McGraw Hill Education (India) Private Limited, 2013
3. Cloud computing: A practical approach, Anthony T. Velte, Tata Mcgraw-Hill
4. Cloud Computing, Miller, Pearson
5. Building applications in Cloud: Concept, Patterns and Projects, Moyer, Pearson
6. Cloud Computing – Second Edition by Dr. Kumar Saurabh, Wiley India

On completion of the course students will be able to	
CO-1	**Explain** the fundamental concepts, characteristics, architecture, deployment models, and service models of Cloud Computing, including IaaS, PaaS, and SaaS.

CO-2	virtualization technologies, hypervisors, virtual machines, load balancing techniques, application migration, and major cloud platforms used for cloud-based application development.
CO-3	**Evaluate** cloud infrastructure management and security mechanisms, including cloud monitoring, service lifecycle management, data security, encryption, auditing, compliance, and identity management.
CO-4	**Apply** cloud-based services and application concepts such as SOA, cloud APIs, cloud transactions, cloud storage, cloud bursting, and web-based cloud services to suitable computing applications.

Course Code: OE-ECS703B	Category: Open elective-III
Course Name: Digital Marketing	Semester:7
L-T-P: 2-0-0	Credit:2
Total Lectures: 28	
Pre-Requisite: Basic concept of optics and Fundamentals of Electromagnetic theory	

MODULE	DESCRIPTION OF TOPIC	HRS/UNIT
1	**Introduction to Digital Marketing:** Evolution of Marketing, Traditional vs Digital Marketing, Digital Marketing Ecosystem, Customer Journey and Digital Touchpoints, Digital Marketing Channels, Digital Consumer Behaviour, Digital Marketing Strategy Framework.	5
2	**Website, SEO and Content Marketing:** Website fundamentals, User Experience (UX) and Landing Pages, Search Engine Optimization, (SEO), On-page and Off-page SEO, Keyword Research, Content Marketing Strategy, Blogging, Video Marketing, Search Engine Marketing (SEM) overview.	7
3	**Social Media and Online Advertising:** Social Media Marketing, Facebook Marketing, Instagram Marketing, LinkedIn Marketing, YouTube Marketing, X (formerly Twitter) Marketing, Paid Advertising Concepts, PPC Campaigns, Display Advertising, Influencer Marketing. **Case Study:** Analysis of successful social media campaigns.	6
4	**Digital Analytics and Marketing Automation:** Introduction to Web Analytics, Google Analytics Overview, Customer Acquisition Metrics, Traffic Sources, Conversion Funnel, KPIs, Email Marketing, CRM, Marketing Automation, A/B Testing.	6
5	**Emerging Technologies in Digital Marketing:** Artificial Intelligence in Marketing, Machine Learning Applications, Chatbots, Recommendation Systems, Generative AI for Content Creation, IoT-enabled Marketing, Personalization, Voice Search, Ethics and Privacy, Future Trends in Digital Marketing.	6

Course Objectives

After completing this course, students will be able to:

CO1. Understand the concepts, ecosystem, and evolution of digital marketing and its role in modern business.

CO2. Explain major digital marketing channels including websites, search engines, social media, email, and mobile marketing.

CO3. Analyze customer behaviour using digital analytics and marketing metrics.

CO4. Apply digital marketing tools to design integrated online marketing campaigns.

CO5. Examine the role of Artificial Intelligence, automation, and emerging technologies in digital marketing.

Course Outcomes (COs)

Upon successful completion of the course, students will be able to:

CO	Course Outcome	Bloom's Level
CO1	Explain digital marketing concepts, terminology, and ecosystem.	BT2
CO2	Demonstrate the use of various digital marketing channels and tools.	BT3
CO3	Interpret digital marketing metrics using web analytics.	BT4
CO4	Design a basic integrated digital marketing campaign.	BT3
CO5	Evaluate emerging technologies such as AI and marketing automation in business applications.	BT5

Suggested Practical/Assignment Components:

Students may complete one or more of the following:

- SEO audit of a website
- Design a social media campaign
- Keyword research assignment
- Digital marketing plan for a startup
- Analytics report using Google Analytics demo account
- Email marketing campaign design
- AI-assisted content creation using Generative AI
- Case study analysis
- Practical Demonstration: Google Search Console, Google Keyword Planner, Website performance analysis

Suggested Reference Books:

1. Chaffey, D., & Ellis-Chadwick, F. **Digital Marketing: Strategy, Implementation and Practice** (Pearson).
2. Kotler, P., Kartajaya, H., & Setiawan, I. **Marketing 5.0: Technology for Humanity**.
3. Ryan, D. **Understanding Digital Marketing** (Kogan Page).
4. Kingsnorth, S. **Digital Marketing Strategy** (Kogan Page).
5. Dodson, I. **The Art of Digital Marketing** (Wiley).
6. Tuten, T. L., & Solomon, M. R. **Social Media Marketing** (Sage Publications).

Online Learning Resources:

- **Google Digital Garage** (Digital Marketing Fundamentals)
- **Google Skillshop** (Google Ads, Analytics, Tag Manager)
- **Google Analytics Academy**

- **HubSpot Academy**
- **Meta Blueprint**
- **LinkedIn Learning**
- **Coursera** (Digital Marketing Specializations)
- **edX**
- **Semrush Academy**
- **Ahrefs Academy**

Course Code: OE-ECS703C	Category: Open Elective III
Course Name: Multimedia System	Semester:7
L-T-P: 2-0-0	Credit:2
Total Lectures: 28	
Pre-Requisite: Basic concept of computer, operating system, understanding of data representation and computer organization.	

MODULE	DESCRIPTION OF TOPIC	HRS/UNIT
1	**Text and Audio, Image and Video:** Multimedia Systems, Components and Its Applications, Text representation, character sets, Unicode, encryption; Audio fundamentals, digitization, sampling, quantization, audio formats, MIDI; Image formats, color models, image enhancement; Video basics, analog & digital video, JPEG, MPEG, H.261, video capture and animation.	12
2	**Synchronization and multimedia Storage:** Temporal relationships, synchronization accuracy specification factors, quality of service, Magnetic media, optical media, multimedia file systems, Multimedia devices – Output devices, CD-ROM, DVD, Scanner, CCD	5
3	**Image and Video Database, Document Architecture and Content Management:** Image representation, segmentation, content-based retrieval (color, shape, texture), indexing (KD-tree, R-tree, Quad-tree), video indexing and querying, Hypertext, ODA, SGML, DTD, HTML, multimedia content design, case studies (QBIC, Virage).	8
4	**Multimedia Applications:** Interactive television, Video-on-demand, Video Conferencing, Educational Applications, Industrial Applications, Multimedia archives and digital libraries, media editors	3

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)

On completion of the course students will be able to	
CO-1	Explain the fundamentals of multimedia systems, multimedia components, and their applications, including the representation of text, audio, image, and video.
CO-2	Analyze multimedia data formats, synchronization techniques, storage models, multimedia devices, and compression standards used in multimedia systems.
CO-3	Design and develop multimedia documents and web-based multimedia applications using indexing, retrieval and document architecture standards such as ODA, SGML, DTD, HTML, and hypermedia concepts.
CO-4	Evaluate and demonstrate multimedia applications such as interactive television, video-on-demand, video conferencing, digital libraries, educational systems, and industrial multimedia solutions.

Course Code: ECS 781	**Category:** Training
Course Name: Industrial Training/Internship	**Semester:** 7
L-T-S: 0-0-2	**Credit:** 1
Course Objective: A structured, supervised professional work experience within an industry / R&D organization / research laboratory / reputed academic institution, jointly guided by a faculty mentor and an industry professional. Enables students to comprehend real-life working experiences, discover career paths, build networks, and specialize in niche areas.	
Key Guidelines: • Duration: Minimum 4 weeks (full-time) after 6th semester examination (Semester Break)— in one organization. • Requires approval of Head of Department & Placement Coordinator before joining. • Brief Training/internship proposal to be submitted before starting of the Industrial Training/Internship; daily diary to be maintained and signed by industry supervisor. • Comprehensive final report with industry certificate to be submitted at semester end.	
Evaluation: Final demonstration / oral presentation; marks distribution decided by the teacher.	

Course Outcomes(CO):

CO	Course Outcome Statement
CO1	Apply knowledge to solve real-life industrial problems.
CO2	Develop practical skills through industrial projects.
CO3	Demonstrate teamwork and interpersonal skills.
CO4	Communicate industrial practices through technical presentations and reports.
CO5	Understand industrial ethics and adapt to technological changes through lifelong learning.