Annexure-III

Eighth Semester

Open Elective-3

Sl. No.	Course Category	Course Code	Course Title	L	T	P	Contact Hours / week	Credit	Full Marks
1.	Open Elective - 3	OE AL 803	Cyber Law and Ethics	3	0	0	3	3	100
2.	Open Elective - 3	OE CE 803	Green Building Technology	3	0	0	3	3	100
3.	Open Elective - 3	OE CS 803	Computer Vision	3	0	0	3	3	100
4.	Open Elective - 3	OE EC 803	Fundamentals of Embedded Systems	3	0	0	3	3	100
5.	Open Elective - 3	OE EE 803	Illumination Engineering	3	0	0	3	3	100
6.	Open Elective - 3	OE ME 803	Basics of Robotics	3	0	0	3	3	100
7.	Open Elective - 3	OE CC 803	Earthquake Engineering	3	0	0	3	3	100
8.	Open Elective - 3	OE ES 803	Cyber Security	3	0	0	3	3	100
9.	Open Elective - 3	OE MI 803	GIS and Remote Sensing	3	0	0	3	3	100

Cyber Laws and Ethics

(Can be opted by students from all branches)

Course Code	OE AL 704
Course Title	Cyber Laws and Ethics
Number of Credits	03 (L: 2, T: 0, P: 0)
Prerequisites	Nil
Course Category	Open Elective
Number of classes	36 hours

Course Outcome:

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

CO Number	CO Description	K-level
CO-1	Understand the importance of professional practice, Law and Ethics in their personal lives and professional careers	K2
CO-2	learn the rights and responsibilities as an employee, team member and a global citizen.	K3
CO-3	Understand Organizational and Human Security	K2
CO-4	know Corporate policies- Tier 1, Tier 2 and Tier3 policies	K2

Course Content:

Module 1: Introduction (8)

Introduction to Computer Security: Definition, Threats to security, Government requirements, Information Protection and Access Controls, Computer security efforts, Standards, Computer Security mandates and legislation, Privacy considerations, International security activity.

Module 2: (8)

Secure System Planning and administration, Introduction to the orange book, Security policy requirements, accountability, assurance and documentation requirements, Network Security, The Red book and Government network evaluations

Module 3: (8)

Information security policies and procedures: Corporate policies- Tier 1, Tier 2 and Tier3 policies - process management-planning and preparation-developing policies-asset classification policy developing standards.

Module 4: Information and Organizational Security (12)

Information security: fundamentals-Employee responsibilities- information classification Information handling- Tools of information security- Information processing-secure program administration.

Organizational and Human Security: Adoption of Information Security Management Standards, Human Factors in Security- Role of information security professionals.

References / Suggested Learning Resources:

1. Debby Russell and Sr. G. T Gangemi, "Computer Security Basics (Paperback)", 2nd Edition, O' Reilly Media, 2006.

2. Thomas R. Peltier, "Information Security policies and procedures: A Practitioner's Reference", 2nd Edition Prentice Hall, 2004.

3. Kenneth J. Knapp, "Cyber Security and Global Information Assurance: Threat Analysis and Response Solutions", IGI Global, 2009.

4. Thomas R Peltier, Justin Peltier and John blackley," Information Security Fundamentals", 2nd Edition, Prentice Hall, 1996

5. Jonathan Rosenoer, "Cyber law: the Law of the Internet", Springer-verlag, 1997

6. James Graham, "Cyber Security Essentials" Averbach Publication T & F Group.

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Green Building Technology

(Can be opted by students from all branches except CE and the students who had undergone similar course as program core or program elective)

Course Code	OE CE 803
Course Title	Green Building Technology
Number of Credits	3(L:3, T:0, P:0)
Prerequisites	Nil
Course category	OE
Number of classes	36 hours

Course Outcome:

After completion of this course the student will be able to:

CO number	**CO Description**	**K-level**
CO1	Explain various eco-friendly building materials and its applications.	K-2
CO2	Develop a concept on Sustainable site planning.	K-3
CO3	Explain Environmental impact assessment.	K-2
CO4	Find the various appropriate technologies for making energy efficient buildings.	K-1

Course Contents:

Module 1: Introduction to Green Building Technology 9 Hours

Materials and its applicability, Indoor Environmental Quality, Reuse and Recycle of Construction Waste. Eco Friendly building materials, their composition, availability, production, physical properties etc.Application of the Eco Friendly/ Green Building materials for different components of the buildings at different level, both internally and externally. Indoor environmental quality, Low VOC materials: Adhesives - Sealants, Paints- Coatings etc. Construction Waste as a Resource- Resource Economics, Disposable Materials, Recovery, Recycling, Collection, Processing, Governmental Role in Waste Management, Potential for Reuse.

Module 2: Sustainable Site planning 9 Hours

wind / sun path, water management, material use, landscape, topography. Climate Responsive Architecture: orientation, solar- wind, Building envelope. Thermal comfort indices. Heat flow through building materials. Thermal properties of common building materials available in India. Thermal performance of building envelope. Air movement and buildings. Ventilation and buildings. Wind and Stack effect. Mechanical ventilation. HVAC System, Day lighting. Passive and sustainable architecture. Passive and active systems.

Module 3: Energy Management **9 Hours**

Embodied Energy, Life Cycle Assessment, Environmental Impact Assessment, Energy Audit and Energy Management. Embodied energy of various construction materials. Introduction to the Concept: "Life Cycle assessment of materials". EIA : Introduction to EIA., Process of EIA and its application through a case study., EIA as a strategic tool for sustainable development.

Module 4: Technologies for Conservation **9 Hours**

Appropriate Technologies / Approaches for: Water conservation / efficiency, Sanitation, Treatments , Biogas , Composting , Solar energy and its applicability through panels, photovoltaic cells etc , Use of " LED, CFL, Fresnel Lens" etc. Wind energy and its uses, Orientation aspects in site planning to achieve maximum daylight and natural ventilation, Clean Development Mechanism, Kyoto Protocol, Energy Conservation Building Code. Rating Systems: - Leadership in Energy and Environmental Design (LEED), Green Globes, LEED India, Comprehensive Assessment System for Built Environment Efficiency (CASBEE).

Reference Books and Additional Reading Material:

1. Energy Efficient Buildings in India by MilliMujumdar
2. Green Building Materials by Ross Spiegel and Dru Meadows
3. Solar Energy in Architecture and Urban Planning by Herzog Thomas
4. Solar Heating, Design Process by Kreider Jan F
5. Renewable Energy & Environment - A policy analysis for India (CEE publications)
6. Sustainable Building Design Manual-Volume I and II –TERI Publication
7. Mechanical and Electrical Systems in Construction and Architecture-by Frank R Dagostino
8. Principles of Air conditioning-By V.Paul Lang

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Computer Vision

(Can be opted by students from all branches except CSE and the students who had undergone similar course as program core or program elective)

Course Code	OE CS 803
Course Title	Computer Vision
Number of Credits	3 (L: 3, T: 0, P: 0)
Prerequisites	Digital Image Processing
Course Category	Open Elective-3
Number of classes	38 hours

Course Outcome:

After completing this course, the student should be able to-

CO Number	CO Description	K-level
CO-1	Understand fundamental image processing techniques required for computer vision.	K2
CO-2	Apply shape analysis, boundary tracking techniques, chain codes and other region descriptors.	K3
CO-3	Apply Hough Transform for line, circle, and ellipse detections.	K3
CO-4	Apply 3D vision techniques, motion related techniques, and Develop applications using computer vision techniques.	K3

Course Content:

Module 1: Image Processing Foundations (8hours)

Review of image processing techniques – classical filtering operations – thresholding techniques – edge detection techniques – corner and interest point detection – mathematical morphology – texture-Camera model and Camera Calibration.

Module 2: Shapes and Regions (10 hours)

Binary shape analysis – connectedness – object labeling and counting – size filtering – distance functions – skeletons and thinning – deformable shape analysis – boundary tracking procedures – active contours – shape models and shape recognition – centroidal profiles – handling occlusion – boundary length measures – boundary descriptors – chain codes – Fourier descriptors – region descriptors – moments.

Module 3: HOUGH Transform (10hours)

Line detection – Hough Transform (HT) for line detection – foot-of-normal method – line localization – line fitting – RANSAC for straight line detection – HT based circular object detection – accurate center location – speed problem – ellipse detection – Case study: Human Iris location – hole detection – generalized Hough Transform (GHT) – spatial matched filtering – GHT for ellipse detection – object location – GHT for feature collation.

Module 4: 3D Vision and Motion (10 hours)

Methods for 3D vision – projection schemes – shape from shading – photometric stereo – shape from texture – shape from focus – active range finding – surface representations – point-based representation – volumetric representations – 3D object recognition – 3D reconstruction – introduction to motion – triangulation – bundle adjustment – translational alignment – parametric motion – spline-based motion – optical flow – layered motion.

Applications: Face detection – Face recognition – Eigen faces – combining views from multiple cameras – human gait analysis-Video Summarization.

References / Suggested Learning Resources:

1. D. L. Baggio et al., ―Mastering OpenCV with Practical Computer Vision Projects‖, Packt Publishing, 2012.
2. E. R. Davies, ―Computer & Machine Vision‖, Fourth Edition, Academic Press, 2012.
3. Jan Erik Solem, ―Programming Computer Vision with Python: Tools and algorithms for analyzing images‖, O'Reilly Media, 2012.
4. Mark Nixon and Alberto S. Aquado, ―Feature Extraction & Image Processing for Computer Vision‖, Third Edition, Academic Press, 2012.
5. R. Szeliski, ―Computer Vision: Algorithms and Applications‖, Springer 2011.
6. Simon J. D. Prince, ―Computer Vision: Models, Learning, and Inference‖, Cambridge University Press, 2012.
7. Computer Vision - A modern approach, by D. Forsyth and J. Ponce, Prentice Hall
8. Robot Vision, by B. K. P. Horn, McGraw-Hill.
9. Introductory Techniques for 3D Computer Vision, by E. Trucco and A. Verri, Publisher: Prentice Hall.

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Fundamentals of Embedded Systems

(Can be opted by students from all branches except ECE and the students who had undergone similar course as program core or program elective)

Course Code	OE EC 803
Course Title	Fundamentals of Embedded Systems
Number of Credits	3 (L: 3, T: 0, P: 0)
Prerequisites	Microcontrollers, Computer Architecture
Course Category	Open Elective (OE)
Number of classes	38 hours

Course Outcome:-

On completion of the syllabus, the Students will be able to:-

CO Number	CO Description	K-level
C.O.1	Illustrate the concept of Embedded systems.	K2
C.O.2	Outline the operation of ARM-7.	K2
C.O.3	Explain the available architecture of embedded systems.	K2
C.O.4	Outline the Basic concept of RTOS.	K2

Course Content:

Module I- Introduction to Embedded Systems (10 Hours)

Introduction to embedded systems. Definition of Embedded System, Embedded Systems Vs General Computing Systems, Classification, Major Application Areas, Purpose of Embedded Systems, Features of embedded systems. Characteristics of Embedded Systems. Classification of embedded systems. Examples of embedded systems.

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Module II- Architecture of Embedded System (10 Hours)

Architecture of embedded systems. Brief introduction to embedded microcontroller cores CISC, RISC, ARM, DSP and SoC. Memory organisation.

Module III – Introduction to ARM-7 (10 Hours)

ARM 7 Architecture, Instruction set: Data processing, Data transfer, Control flow. Addressing modes. Writing simple assembly language programs, Pipelining, Brief introduction to exceptions and interrupts handling.

Module IV – Introduction to RTOS (08 Hours)

Real time systems, examples of real time systems. Types of real time systems. Introduction to RTOS, difference between RTOS and General-purpose OS. Need for RTOS in embedded systems. kernel and its functions.

***SUGGESTED LEARNING RESOURCES*:**

1. K.J. Ayala, "The 8051 Microcontroller: Architecture, Programming, and Applications", Penram Intl, 1996.
2. J.W. Valvano, "Embedded Microcomputer System: Real Time Interfacing", Brooks/Cole, 2000.
3. Introduction to embedded systems, Shibu K. V., McGraw Hill
4. ARM System on chip Architecture, Steve Furber, Pearson, edition second
5. Embedded systems an integrated approach, Laya B. Das, Pearson, Third impression, 2013
6. ARM system developer‟s guide, Andrew N. Sloss, Dominic Symes, Chris Wright, Morgan Kaufmann Publishers.
7. Embedded system design A Unified hardware/software Introduction, Frank Vahid, Tony Givargis, Wiely .
8. Real Time Operating System-Rajib Mall

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Illumination engineering

(Can be opted by students from all branches except EE and the students who had undergone similar course as program core or program elective)

Course Code	OE EE 803
Course Title	Illumination Engineering
Number of Credits	3 (L: 3, T: 0, P: 0)
Prerequisites	Basic electrical engineering and physics
Course Category	Open Elective-1
Number of classes	38 hours

Course Outcomes: At the end of this course, students will demonstrate the ability to

CO number	CO Description	K-level
OEEE 803:OC.01	Choose a good Illumination based on its operating characteristics for the required application.	K5
OEEE 803:OC.02	Explain the criteria for the selection of lamps and lighting systems for an indoor or outdoor space	K2
OEEE 803:OC.03	Develop a good energy efficient lighting.	K6
OEEE 803:OC.03	Classify different types of lighting designs and applications	K4

MODULE-I: Light Sources (8 hours)

Introduction of Light : Types of illumination, Day lighting, Supplementary artificial lighting and total lighting, Quality of good lighting, Factors affecting the lighting-shadow, glare, reflection, Colour rendering and stroboscopic effect, Methods of artificial lighting, Lighting systems-direct, indirect, semi direct, semi indirect, Lighting scheme, General and localised

MODULE-II: Measurement of Light (8 hours)

Measurement of Light : Definition of luminous flux, Luminous intensity, Lumen, Candle power, Illumination, M.H.C.P, M.S.C.P, M.H.S.C.P, Lamp efficiency, Brightness or luminance, Laws of illumination, Inverse square law and Lambert's Cosine law, Illumination at horizontal and vertical plane from point source, Concept of polar curve, Calculation of luminance and illumination in case of linear source, round source and flat source**.**

MODULE –III: Indoor illumination design (11 Hours)

Design of Interior Lighting : Definitions of maintenance factor, Uniformity ratio, Direct ratio, Coefficients of utilisation and factors affecting it, Illumination required for various work planes, Space to mounting height ratio, Types of fixtures and relative terms used for interior illumination such as DLOR and ULOR, Selection of lamp and luminance, Selection of utilisation factor, reflection factor and maintenance factor Determination of Lamp Lumen output taking into account voltage and temperature variations, Calculation of wattage of each

lamp and no of lamps needed, Layout of lamp luminaire, Calculation of space to mounting height ratio, Indian standard recommendation and standard practices for illumination levels in various areas, Special feature for entrance, staircase, Corridor lighting and industrial building

MODULE-IV: Outdoor illumination design (11 hours)

Design of Outdoor Lighting : Street Lighting : Types of street and their level of illumination required, Terms related to street and street lighting, Types of fixtures used and their suitable application, Various arrangements in street lighting, Requirements of good street lighting, Selection of lamp and luminaire, Calculation of their wattage, Number and arrangement, Calculation of space to mounting height ratio, Calculation of illumination level available on road

Modern trends in illumination; LED luminary designs, Intelligent LED fixtures, Natural light conduiting, Organic lighting system, LASERS, characteristics, features and applications, nonlighting lamps, Optical fiber, its construction as a light guide, features and applications

Text / Reference Book:

1. Lamps and Lighting – Edited by J.R.Coaton and A.M.Marsden, 4th Edition, Arnold
2. Lighting for energy efficient luminous environments- Ronald N.Helms& M Clay Belcher.
3. Lighting-D.C..Pritchard
4. Applied Illumination Engineering, Second Edition, Jack L Lindsey, Prentice Hall
5. Illumination Engineering from Edison lamp to the laser – J.B.Murdoch, Macmillion Publishing company
6. Human Factors in Lighting – P R Boyce

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Basics of Robotics

(Can be opted by students from all branches except ME and the students who had undergone similar course as program core or program elective)

Course Code	OE ME 803
Course Title	Basics of Robotics
Number of Credits	3 (L: 3, T: 0, P: 0)
Prerequisites	Engineering Mathematics
Course Category	Program Elective (PE)
Number of classes	36 hours

Course Outcome:

After successful completion of this course, the students will be able to

CO Number	CO Description	K-level
CO-1	Understand the fundamentals of robotics and robot	K2
CO-2	Demonstrate the classification & specifications of industrial robots	K4
CO-3	Explain robot anatomy & functions of different parts of industrial robot.	K4
CO-4	Evaluate the positions in space of manipulator by kinematic and dynamics of robot arm.	K5
CO -5	Explain the fundamentals of robot control system and programming languages	K4

Course Content:

Module 1: Fundamental of Robotics: (9 hours)

Robotics- Fundamental and definition, Laws of robotics, Robot- definition and functions. Differences between a robot and an automated machine. Advantages and disadvantages of robots. Classification of industrial robots, Understanding the working principles of robot joints and basic motions, Introduction to robot with artificial intelligence.

Module 2: Robot Anatomy: (9 hours)

Robot anatomy- Architecture of industrial robots, Robot actuators- Definition, classification, working principle and problems, Robot sensors - Definition, classification and working principle, Robot specifications – Definition, application and problems.

Module 3: Robot Vision System: **(9 hours)**

Robot arm kinematics – fundamentals and problem analysis, Robot arm dynamics- fundamentals and problem analysis.

Module 4: Robot Control System & Languages: **(9 hours)**

Robot control system – Fundamentals, classification, mathematical model, block diagram and application, Robot languages – Fundamentals, classification and features of some common robot languages.

Suggested Learning Resources- Text/ References

1) M.P. Groover, Industrial Robotics, Mc Graw Hill.
2) Robotic Engineering – An Integrated Approach, Richard D Klafter
3) Control System Engineering, I.J. Nagrath and Gopal
4) Saha, Introduction to Robotics, Mc Graw Hill
5) Tsuneo Yoshiklawa, Foundation of Robotics, MIT Press
6) Spong M.W. and Vidyasagar M., Robot dynamics and Control, John Wiley and Sons

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Earthquake Engineering

(Can be opted by students from all branches except CE&CA and the students who had undergone similar course as program core or program elective)

Course Code	OE CC 803
Course Title	Earthquake Engineering
Number of Credits	3 (L: 3, T: 0, P: 0)
Prerequisites	Structural Analysis, Design of Structures
Course Category	Open Elective (OE)
Number of classes	36 hours

Course Outcome: After completion of the course, students would be able to-

CO Number	CO Description	K-level
CO-1	Explain seismological background	K-2
CO-2	Compare static loads and dynamic loads	K-4
CO-3	Understand SDOF & MDOF systems and its analysis	K-3,K-5
CO-4	Design Earthquake Resistant Structures using IS codes	K-5

Course Contents:

Module 1: **(9 Hours)**

Definitions of basic problems in dynamics, static versus dynamic loads, different types of dynamic loads, un-damped vibration of SDOF system, natural frequency and Hours of vibration, damping in structure, response to periodic loads, response to general dynamic load, response of structure subject to gravitational motion, use of Fourier series for periodic forces. Direct determination of frequencies and mode shapes, orthogonality principle, approximate methods for determination of frequencies and mode shapes, modal error of forced vibration of MDOF system, modal analysis, applications to multistoried rigid frames subject to lateral dynamic loads.

Module 2: **(10 Hours)**

Seismological background: Seismicity of a region, earthquake faults and waves, structure of earth, plate tectonics, elastic-rebound theory of earthquake, Richter scale, measurement of ground motion, seismogram. Characterization of ground motion: earthquake response spectra, factors influencing response spectra, design

response spectra for elastic systems, peak ground acceleration, response spectrum shapes, deformation, pseudo-velocity, pseudo-acceleration response spectra, peak structural response from the response spectrum, response spectrum characteristics.

Module 3: **(10 Hours)**

Deterministic earthquake response: types of earthquake excitation, lumped SDOF elastic systems, translational excitation, lumped MDOF elastic systems, translational excitation time history analysis, multistoried buildings with symmetric plans, multistoried buildings with unsymmetric plans, torsional response of symmetric plan building, distributed-parameter elastic systems, translational excitation, combining maximum modal responses using mean square response of a single mode, SRSS and CQCC combination of modal responses.

Module 4: **(9 Hours)**

I. S. code method of seismic analysis: seismic coefficient method and its limitation, response spectrum method, I. S. code provision for seismic analysis of buildings. Review of damages during past earthquakes and remedial measures, seismic design considerations, allowable ductility demand, ductility capacity, reinforcement detailing for members and joints.

Text/Reference Books:

1. Structural Dynamics-An introduction to Computer Methods, Roy R. Craig.
2. Dynamics of Structures, Anil K. Chopra, Prentice Hall, India.
3. Dynamics of Structures, Cloguh&Penzien, Tata McGraw Hill, New Delhi
4. Structural Dynamics, John M. Biggs, Tata McGraw Hill, New Delhi
5. Fundamentals of Earthquake Engineering, N. M. Newmarks& E. Rosenblueth, Prentice Hall.
6. Earthquake Design Practice for Building, D. Key, Thomas Telford, London, 1988.
7. Earthquake Engineering, R. L. Wiegel, 2nd Edition, Prentice Hall, London, 1989
8. Design of Multistoried Buildings for Earthquake Ground Motions, J. A. Blume, Portland CementAssociation, Chicago, 1961
9. Proceedings on World Conference on Earthquake Engineering, 1956-2000.
10. I. S. codes No. 1893, 4326, 13920. (Latest Editions).

Cyber Security

(Can be opted by students from all branches except ECSE and the students who had undergone similar course as program core or program elective)

Course Code	OE ES 803
Course Title	Cyber Security
Number of Credits	3 (L: 3, T: 0, P: 0)
Prerequisites	Basic knowledge of Computers, Basic knowledge of networking and Internet, Hands on Windows operating system.
Course Category	Open Elective.
Number of classes	38 hours

Course Outcome: After completing the course in Cyber Security, the students will be able to-

CO Number	CO Description	K-level
CO-1	Design and implement appropriate security technologies and policies to protect computers and digital information.	K5
CO-2	Identify & Evaluate Information Security threats and vulnerabilities in Information Systems and apply security measures to real time scenarios.	K6
CO-3	Identify common trade-offs and compromises that are made in the design and development process of Information Systems.	K2
CO-4	Demonstrate the use of standards and cyber laws to enhance information security in the development process and infrastructure protection.	K3

Course Content:

Module 1: Cyber Security Concepts (08 Hours)

Essential Terminologies: CIA, Risks, Breaches, Threats, Attacks, Exploits. Information Gathering (Social Engineering, Foot Printing & Scanning).
Open Source/ Free/ Trial Tools: nmap, zenmap, Port Scanners, Network scanners.

Module 2: Cryptography and Cryptanalysis (10 Hours)

Introduction to Cryptography, Symmetric key Cryptography, Asymmetric key Cryptography, Message Authentication, Digital Signatures, Applications of Cryptography. Overview of Firewalls- Types of Firewalls, User Management, VPN Security, Security Protocols: - security at the Application Layer- PGP and S/MIME, Security at Transport Layer- SSL and TLS, Security at Network Layer-IPSec.

Open Source/ Free/ Trial Tools: Implementation of Cryptographic techniques, Open SSL, Hash Values Calculations MD5, SHA1, SHA256, SHA 512, Steganography (Stools)

Module 3: Infrastructure and Network Security (10 Hours)

Introduction to System Security, Server Security, OS Security, Physical Security, Introduction to Networks, Network packet Sniffing, Network Design Simulation. DOS/ DDOS attacks. Asset Management and Audits, Vulnerabilities and Attacks. Intrusion detection and Prevention Techniques, Host based Intrusion prevention Systems, Security Information Management, Network Session Analysis, System Integrity Validation.
Open Source/ Free/ Trial Tools: DOS Attacks, DDOS attacks, Wireshark, Cain & abel, iptables/ Windows Firewall, snort, suricata, fail2ban.

Module 4: 4. Cyber Security Vulnerabilities& Safe Guards (10 Hours)

Internet Security, Cloud Computing &Security, Social Network sites security, Cyber Security Vulnerabilities-Overview, vulnerabilities in software, System administration, Complex Network Architectures, Open Access to Organizational Data, Weak Authentication, Authorization, Unprotected Broadband communications, Poor Cyber Security Awareness. Cyber Security Safeguards- Overview, Access control, IT Audit, Authentication. Open Web Application Security Project (OWASP), Web Site Audit and Vulnerabilities assessment.
Open Source/ Free/ Trial Tools: Win Audit, Zap proxy (OWASP), burp suite, DVWA kit.

References / Suggested Learning Resources:

1. William Stallings, “Cryptography and Network Security”, Pearson Education/PHI, 2006.
2. V.K. Jain, “Cryptography and Network Security”, Khanna Publishing House.
3. Gupta Sarika, “Information and Cyber Security”, Khanna Publishing House, Delhi.
4. Atul Kahate, “Cryptography and Network Security”, McGraw Hill.
5. V.K. Pachghare, “Cryptography and Information Security”, PHI Learning
6. Nina Godbole, “Information System Security”, Wiley
7. Bothra Harsh, “Hacking”, Khanna Publishing House, Delhi.

Reference Websites:
http://www.ignou.ac.in/upload/Announcement/programmedetails.pdf

GIS and Remote Sensing

(Can be opted by students from all branches except AMIA and the students who had undergone similar course as program core or program elective)

Course Code	OE MI 803
Course Title	GIS and Remote Sensing
Number of Credits	3 (L: 3, T: 0, P: 0)
Prerequisites	Physics, Mathematics, Computer Knowledge
Course Category	Open Elective (OE)
Number of classes	36 hours

Course Outcome: -

After completion of the course, students will be able:

CO No	CO Description	K-level
CO-1	Demonstrate the concepts of Electro Magnetic energy, spectrum and spectral signature curves.	K-2
CO-2	Apply the concepts of satellite and sensor parameters and characteristics of different platforms.	K-3
CO-3	Apply the concepts of DBMS in GIS. Analyze raster and vector data and modeling in GIS.	K-3

Course Content:-

Module- 1: **(10 Hours)**

Remote Sensing – Principle - Electro-magnetic energy, spectrum - EMR interaction with atmosphere – Atmospheric Windows and its Significance – EMR interaction with Earth Surface Materials Spectral Signature and Spectral Signature curves for water, soil and Earth Surface.

Satellites - Classification – Satellite Sensors – satellite and sensor parameters - Resolution – Types of Remote Sensing - Visual Interpretation of Satellite Images

Module- 2: **(8 Hours)**

Digital Image processing – Characteristics of different platforms: Landsat, SPOT, IRS series, IKONOS, QUICKBIRD – Radar, LIDAR, SAR, MODIS, AMSRE, Sonar remote sensing systems introduction of GPS- data receiving mode- DTM generation-View shed analysis.

Module- 3: **(10 Hours)**

GIS - History of Development - Components of GIS – Hardware, Software and Organizational Context – Data – Spatial and Non-Spatial – Data Input Sources— DBMS – Data Output - Data models - Raster and Vector data structures – Data compression – Raster vs. vector comparison. Analysis using Raster and Vector data – Operations – Overlaying - Buffering – Modelling in GIS - Digital Terrain Modelling, Analysis and application – Products of DEMs and their uses – Sources of errors in GIS and their elimination.

Module- 4: **(8 Hours)**

Applications of Remote Sensing and GIS – Advanced applications of GIS – Disaster management, Water resource, Landuse – Land cover – Urban planning - Intelligent Transport Systems - Development of Resources Information Systems.

Text Books:

1. Burrough P.A. and Rachel A. McDonell, Principles of Geographical Information Systems, Oxford Publication, 2004.

2. C.P. Lo and Albert K. W. Yeung, Concepts and Techniques of Geographical Information Systems, Prentice- Hall India, 2006.
3. Thomas. M. Lillesand and Ralph. W. Kiefer, Remote Sensing and Image Interpretation, John Wiley and Sons, 2003. Department of Civil Engineering, National Institute of Technology, Tiruchirappalli.