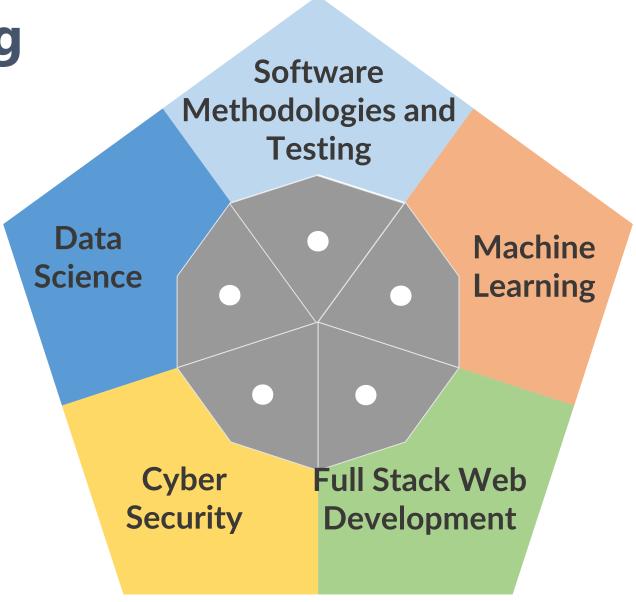


What are Engineering Minors?

- A set of six courses in an engineering stream to develop a competency within or outside the discipline area (e.g. a Computer Science Engineering student choosing Cyber Security or Machine Learning or a Mechanical Engineering student taking courses from Computer Science Engineering as his/her Engineering Minor Area).
- These Engineering Minors are being offered so that each student would have at least one major skills by the end of 8th term.



How Engineering Minors can help the students?

Engineering minors (EM) are the elective courses in engineering to enhance competency in the technical and/or emerging domain.

A student can chose an Engineering minor basket comprising of six courses from his/her own school or multi-disciplinary area can also be chosen.

The Engineering Minors allows a student to gain interdisciplinary experience and exposure to concepts and perspectives that may not be a part of their degree programs thus widening their understanding of the engineering.

Engineering minors also provides the freedom to students for designing their degree program, choose their course curriculum and decide their future career.

Additional Certificate as Minor

A student completing the set of six courses chosen as Engineering minor and earning 18 credits would be eligible for an additional certificate as minor.

Students can study the specialized courses as per their interest/requirements of industry leading to attaining of specialized skill set, and the additional minor certificate earned alongwith the degree would give an edge to the students and would also be beneficial in enhancing employability opportunities.

Note: Link for the UMS pathway and LPU Touch App will be shared with the announcement for Engineering Minor(s) polling in the near future.

Important points to remember during polling process

Interfaces to be followed

 Polling for Engineering Minor can be done through both UMS and LPU touch App

1. UMS

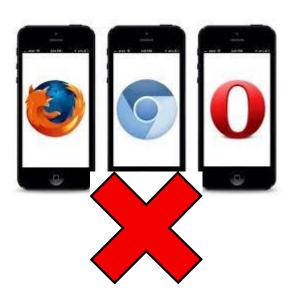


2.LPU Touch App



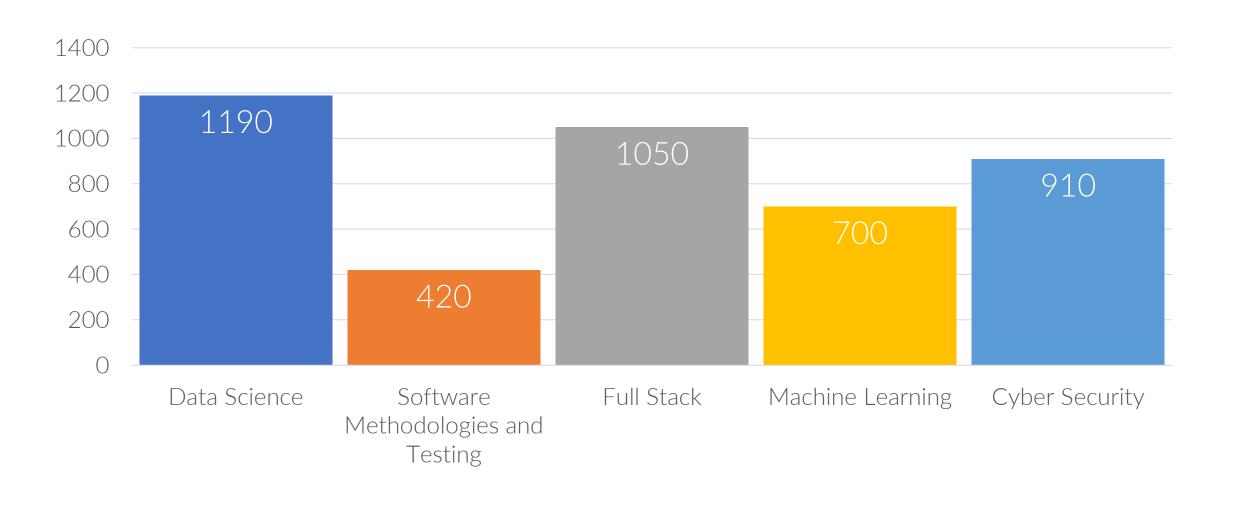
Interface **not** to be followed

Never use UMS through mobile browser for polling process as it may result in change in preferences

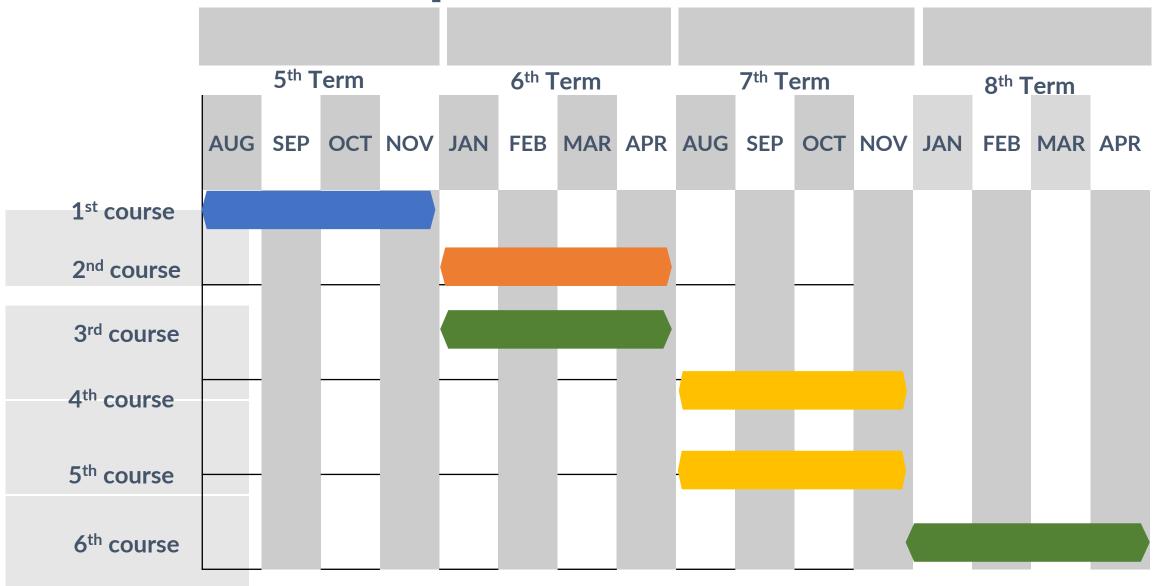


Number of Seats

To be allotted on the basis of preference number and CGPA



6 Courses Spanned across 4 semesters



Data Science

Data Analytics (DA) refers to the set of quantitative and qualitative approach in order to derive valuable insights from data. It involves many processes that include extracting data, categorizing it in order to analyze the various patterns, relations, connections and other such valuable insights from it. DA is the key technology behind the success of Google, Amazon and Flipkart.

INT217

Introduction to Data Management

INT232

Data Science Toolbox : R Programming

INT233

Data Visualization

INT234

Predictive Analytics

INT312

Big Data Fundamentals

INT315

Cluster Computing

INT217: INTRODUCTION TO DATA MANAGEMENT

This course introduces different ways by which an organization can manage, store and retrieve data using different database management tools. This course will enhance the skills of using spreadsheet by implementing various analytical functions and presenting in graphical way.

- Apply the various techniques and functions over spreadsheet for getting various insides of data.
- Understand the data representation methods like pivot table and power pivoting.
- Understand the need of the graphical representation in the spreadsheet by using various graphs and charts.
- Comprehend the concepts of multidimensional data and topics like OLAP, OLTP and data cube.

INT232: DATA SCIENCE TOOLBOX: R PROGRAMMING

Covers the basics of data cleaning and how to make data presentable by using analysis techniques. The course will also cover the components of a complete data set including raw data, processing instructions, codebooks, and processed data.

- Analyze and configure R software for statistical programming environment and describe generic programming language concepts implemented in a high-level statistical language.
- Establish Program in R environment to create custom analytical models to meet the dynamic business needs evaluate and verify the analysis findings by conducting various statistical tests used for hypothesis testing.
- Review advanced data science concepts using predictive analytics fundamentals.
- Visualize the various graphical packages for creating various types of graphs, plots and charts

INT233: DATA VISUALIZATION

This course is specifically focused on how data analysis is used in business and provide basic grounding in concepts such as over fitting, and error rates, analyzing data of customer, product and sales to make effective decision for business growth.

- Experience the role of visualization for analytics in an organization.
- Use data visualization principles to help you to design dashboards that enlighten and support business decisions.
- Acquire knowledge of data representation and sub-setting techniques for real time datasets.
- Use and customize the various graphical packages for creating various types of graphs, plots and charts.
- Analyze real life business problems by using various visualization techniques.
- Integrate data to provide mashed-up dashboards.

INT234: PREDICTIVE ANALYTICS

The course is about breaking down the data, assess trends over time, compare one sector/measurement to another and even ask questions about the future.

- Review the art and science of predictive analytics to define clear actions that result in improved decisions and business results.
- Evaluate the use of analytic tools and assist in the selection of industry standard analytics tools.
- Construct and format data to be most effective to ensure the predictive model meets the business goals.

INT312: BIG DATA FUNDAMENTALS

This course provides basic concepts and terminologies of Big Data and its real-life applications across industries. One will gain insights on how to improve business productivity by processing large volumes of data and extract valuable information from them.

- Recognize the need and importance of fundamental concepts and principles of Big Data
- Examine internal functioning of different modules of Big Data and Hadoop
- Conceptualize the big data ecosystem and appreciate its key components
- Review quantitative and qualitative understanding of methods and algorithms for processing big data

INT315: CLUSTER COMPUTING

This course provides an introduction to one of the most common frameworks, Spark that has made big data analysis easier and more accessible -- increasing the potential for data to transform our world!

- Review Spark hardware requirements and estimate cluster size
- Gain insight from real-world production use cases
- Tighten security, schedule resources, and fine-tune performance
- Overcome common problems encountered using Spark in production

Career Opportunities

Big Data Engineer

Big Data Architect

Data Administrator

Data Warehouse Manager

Database Manager

Data Modeller

Business Intelligence Analyst



Data Science is best tool for decision making. It is widely used in industries for targeted Advertising and re-targeting, Recommender Systems, Image Recognition, Speech Recognition, Gaming, Price Comparison Websites, Airline Route Planning, Fraud and Risk Detection and Self Driving Cars.

Special Requirements

Laptop

Basic knowledge of Databases

2 hours class scheduling

Doubts?

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Dr. Amritpal Singh | amritpal.17673@lpu.co.in | 34-204



Software Methodologies and Testing

This Engineering Minor enables the students to learn the concepts of Advance Software Engineering, the basics of Software Testing along with types of testing and to apply the testing techniques successfully on the software projects.

The courses of this minor emphasis on providing the training in testing of the softwares. After completing all the courses of this minor, students can start their carrier in the field of software testing.

CSE374

Advance Software Engineering

CSE376

Automated Testing

CSE375

Software Testing

CSE377

Advance Testing Technologies

CSE378

Web Services **API** Automation based Testing

CSE3759

Mobile Automated Testing

CSE374: ADVANCE SOFTWARE ENGINEERING

This is the first course of EM which includes the advance topics of software engineering. This course palys an improtant role in making the students aware about advance concepts of software engineering.

Course Outcome:

• Students will be able to learn and explain various advance concepts of software engineering.

CSE375: SOFTWARE TESTING

This is the second course of EM which includes the basic concepts of software testing and various types of software testing. This course helps the students in understanding the testing concepts which can be applied while testing the software.

- Students will be able to learn and explain the basics of software testing.
- Students will be capable of designing the test cases.

CSE376: AUTOMATED TESTING

This is the third course of EM which includes hands-on practices on various software testing tools like Eclipse, Selinium etc. Students will test various applications using the tools.

Course Outcome:

• Students will be able to perform the software testing using Selinium and Eclipse.

CSE377: ADVANCE TESTING TECHNOLOGIES

This is the fourth course of EM which includes advance technologies related to software testing.

Course Outcome:

• Students will be able to understand various advance testing technologies and apply them for testing the software.

CSE378: WEB SERVICES API AUTOMATION TESTING

This is the fifth course of EM which includes the techniques of webservices API testing. RESTful API services will also be the main part of the course contents

Course Outcome:

Students will be able to perform web services API testing

CSE379: MOBILE AUTOMATED TESTING

This is the sixth course of EM in which techniques of mobile automated testing will be taught. The testing will include both Android and IOS apps. Students will get hands-on practice on Appium.

Course Outcome:

Students will be able to perform mobile automated testing using Appium

Career Opportunities

QA Analyst

Software Tester

Software Test Engineer

Industrial Applications

The courses of this EM are applicable in all software development companies because testing is one of the important phase of development life cycle and this Engineering Minor track trains the students on different testing tools.

Special Requirements

Laptop

Software Engineering course

2 hours class scheduling

Doubts?

Mr. Sudhanshu P. Tiwari | sudhanshu.15813@lpu.co.in | 34-207



The selection criteria for allocation of Engineering Minor will be based on:

- a) First come First Serve basis
- b) Order of preferences and CGPA
- c) Test

FULL Stack Web Development

The tem full stack web development means complete website development including front-end, back-end and database. On this track students will learn different technologies related to web development like HTML, CSS, JavaScript, Node.js, React.js, PHT, Laravel, flask etc

- Can you believe your life without Internet?
- Are you fascinated after seeing websites which tempt you to buy from online market places?
- This Minor offers all stuff to build efficient and effective websites. Design your own website!.

INT219

Front End Web Developer

INT222

Advanced Web Development

INT220

Server Side Scripting

INT221

MVC Programming

INT253

Web Development in Python using DJANGO



INT252

Web App Development With REACTJS

INT219: FRONT END WEB DEVELOPER

Introduces an open source language for building and enhancing the performance of web applications on the server side along with other client side technologies like HTML5, JAVASCRIPT, CSS and web hosting.

- Design dynamic website using HTML5, CSS and Advanced JavaScript.
- Explore the enhanced techniques used by web professionals for creating dynamic web pages.
- Apply the principles and tools that are used to develop Web applications.
- Implement JavaScript, jQuery, AngularJS and Bootstrap in web pages.

INT222: ADVANCED WEB DEVELOPMENT

Covers the concepts of Node.js for building web sites with better user interface and responsive web pages. A hands on exposure on Node.js technology will be offered in a form of project.

- Understand the role of server side JavaScript in web application development.
- Explore, how Node.js is architectured to allow high scalability wth asynchronous code build an HTTP Server using the core modules in Node.js.
- Create basic web based applications using Node.js.
- work with MongoDB database using Node.js.

INT252: WEB APP DEVELOPMENT WITH REACTJS

This course serves as an introduction to modern web application development with JavaScript. The main focus is on building single page applications with ReactJS.

Course Outcome:

Through this course students should be able to

- understand advanced javascript concepts and create a pure react app
- develop JSX components and use props in React app
- compose and manipulate states and should develop an understanding of events & Hooks
- use forms with state and validating the form for errors and display errors
- make a react app by using HTTP methods and routing the pages
- validate or debug the react app and deploy app onto the server

INT220: SERVER SIDE SCRIPTING

Introduces basic concepts of PHP & MySQL technology for building and enhancing the performance of web applications on server-side along with other client-side technologies like HTML5, JAVASCRIPT, CSS etc.

- Understand process of executing a PHP-based script on a web server
- Process the data provided on the form by a user in a PHP-based script
- Utilize paradigm for dealing with form-based data and how they are accessed inside a PHPbased script.
- Implement the syntax and use of PHP object-oriented classes.

INT221: MVC PROGRAMMING

Covers in depth knowledge of MVC framework which is an advanced framework based technology with three components that are database components (Models), client-side frames (View) and Server-Side components (Controller) which are used in web building.

- Design flexible, user-friendly and clean web applications.
- Develop highly versatile and stable web programs based on Laravel structure framework.
- Provide well-organized, reusable and maintainable code.

INT253: WEB DEVELOPMENT IN PYTHON USING DJANGO

Covers the Web Development in Python using Django. Python Django is a web framework that allows to quickly create efficient web pages.

Course Outcomes:

Through this course students should be able to

- Describe Python Programming, Flask Framework And Django Framework
- Discuss the concepts of views, models and session for the framework.
- Use variables to store, retrieve and calculate information
- Explain the core programming tools such as functions and loops
- Assess and build a data model in Django and Flask, applying model query and template tags/code



Career Opportunities

MEAN Stack Trainer

MEAN Stack Web Developer

Web Developer

Web Designer

Entrepreneur



Industrial Applications

Publishing

Advertising

E-Commerce

Social Networking Sites

Websites



Special Requirements

Laptop

Basic knowledge of Computers

2 hours class scheduling

Only for CSE students



Doubts?

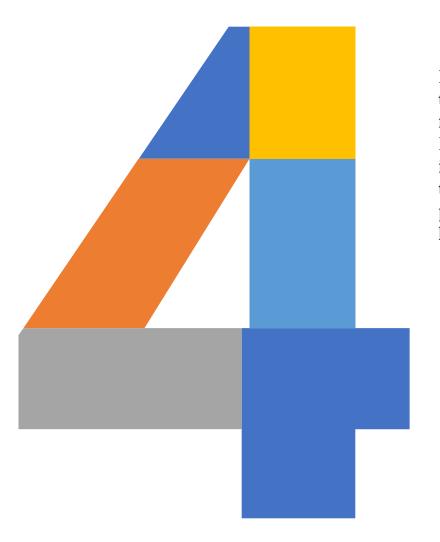
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Dr. Balwinder Kaur | balwinder.25673@lpu.co.in | 33-205



What are the interfaces through which the student can participate in giving preferences of Engineering minor(s)?

- a) Only through UMS
- b) Only through LPU Touch
- c) Both through UMS and LPU Touch
- d) Through any mobile browser



Machine Learning

Machine Learning (ML) is an application of Artificial Intelligence (AI) that provides systems the ability to automatically learn and improve from experience without being explicitly programmed. Machine Intelligence represents a key evolution in the fields of artificial intelligence, data analysis, and software engineering. This area will teach you ABC of Machine Learning, and help you in applying predictive models to massive data sets in fields like finance, healthcare, education, and more.

INT254

Fundamentals of Machine Learning

INT344

Natural Language Processing

INT354

Machine Learning-I

INT345

Computer Vision

INT423

Machine Learning-I

INT422

Deep Learning

INT254: FUNDAMENTALS OF MACHINE LEARNING ALGORITHMS

This course focuses on mathematical concepts of ML such as how linear algebra relates to data and Multivariate Calculus optimizes fitting functions to get good fits to data. Hands on practice will be done using python libraries for analyzing and visualization of the data and performing feature engineering so that ML models can be applied over it. It also covers different swarm intelligence algorithms that are inspired by natural systems and genetic algorithms.

- describe the soft computing techniques in building the intelligent machines.
- explain different neural networks for classification and clustering problems.
- use fuzzy logic and reasoning to handle uncertainty and solve engineering problems.
- compare and contrast genetic algorithms and swarm intelligence for optimization problems.
- justify the performance and time complexity of hybrid systems.
- develop the optimal models using available soft computing tools to solve real world problems.

INT354: MACHINE LEARNING-I

In this course, students will create classifiers such as like logistic regression, decision tree, boosting, SVM that provide state-of-the-art performance on a variety of tasks. This course is hands-on, action-packed, and full of visualizations and illustrations of how these techniques will behave on real data. Evaluate models using precision-recall metrics and tune hyper parameters of the models. Also, various regression models will be discussed to predict continuous values.

- describe the concepts of classification and regression algorithms.
- examine meaningful features from a given dataset by learning preprocessing skills
- apply the validated machine learning models in given situation for an available dataset
- identify the dimensionality reduction using Ida, pca and kpca.
- evaluate the problem that categorize into supervised, unsupervised and reinforcement learning
- develop a machine learning model to solve a real-world problem

INT344: NATURAL LANGUAGE PROCESSING

This course introduces Natural Language Processing through the use of python and the Natural Language Tool Kit. It mainly focuses on text classification, language modelling, sequence tagging, word embeddings etc. Through a practical approach, students will get hands on experience working with and analyzing text. Students will be able to formulate solutions to text-based problems.

- explore and gain broad understanding of text data
- analyze sentiments of text document
- use NLP methods to perform topic modeling
- implement projects based on natural language processing

INT423: MACHINE LEARNING-II

This course focuses on various clustering techniques such as K-Means, hierarchal clustering and density-based clustering. Through a practical approach, students will get hands on experience using python on real world dataset. This course also introduces the concept of reinforcement learning and formalizes the problems as Markov decision processes. The students will learn and implement value functions concepts for optimizing decision making processes.

- categorize the machine learning problems based on learning rules.
- apply the key concepts that form the core of machine learning.
- develop the key algorithms for the system that are intelligent enough to make the decisions.
- contrast the statistical, computational and game-theoretic models for learning.

INT345: COMPUTER VISION

This course introduces computer vision, including fundamentals of image formation, camera imaging geometry, feature detection and matching, stereo, motion estimation and tracking, image classification, and scene understanding. Hands on experience will be done using python and openCV.

- understand models and methods in the field of computer vision
- solve problems in image processing and computer vision
- analysis of existing computer vision system
- design and development of a working computer vision-based system

INT422: DEEP LEARNING

The Deep Learning course provides a pathway for student's to take the definitive step in the world of AI by helping them gain the knowledge and skills to level up their career. This course mainly focuses on fundamental of deep learning, convolutional neural network, recurrent neural network, autoencoders, generative adversial networks etc. Hands on experience will be done using Tensorflow and Keras. Students will be able to build and train deep neural networks, identify key architecture parameters, implement convolutional and recurrent neural networks and deep learning to applications

- describe the deep learning algorithms which are more appropriate for various types of learning tasks in various domains.
- compare detection and recognition tasks using convolution and adversarial neural networks.
- use dropout regularization, gradient descent, Batch normalization, and optimization algorithms with convergence
- examine recurrent neural networks for modelling sequential data.
- assess the different learning models and prioritize their appropriate hyper parameters
- construct artificial neural networks with Tensorflow and Keras

Career Opportunities

Machine Learning Engineer

Al Data Analyst

Business Intelligence Developer

Data Scientist

Computational Linguist

Human Centered Machine Learning Designer

Robotics Scientist

Industrial Applications

- ML in Finance
- Dynamic Price Control in Travel Industries
- Machine Learning in social media
- ML for language translation and text generation
- ML in Retail/Logistics
- ML in Automation/Robotics Systems
- ML in Pipelining/Production
- ML in Smart Agriculture/Forecasting
- ML in Academics/Personalized Recommendation

Special Requirements

Laptop

Basic knowledge of Python

2 hours class scheduling

Doubts?

Dr Rahul | rahul.23360@lpu.co.in | 33-203

Ms. Usha Mittal usha.20339@lpu.co.in 33-203

Cyber Security

Cyber security transform into a frightening new reality, one where corporate and government organizations seem helpless to stop cyber incursions that leads to cyber risk. To mitigate the cyber risk we need knowledge of cryptographic techniques, traffic monitoring and ethical hacking knowledge for better understanding of security issues to protect our network.



Cyber Security Essentials

INT250

Digital Evidence Analysis

INT249

System Administration

INT244

Secure Computing Systems

INT245

Penetration Testing

INT251

Malware Analysis and Cyber Defence



INT242: CYBER SECURITY ESSENTIALS

It covers the concepts of cyber security with its importance and identifies various vulnerabilities and security flaws in the operating systems and networks. It helps to analyze risks, security threats, implementing host/software/network security, understanding various types of network attacks and also focuses on network security programming (using python).

Course Outcome:

CO1:: outline the fundamental components of information security and analyze risk

CO2:: examine various threats to information security and conduct security assessments to detect vulnerabilities

CO3:: develop security for hosts, software and networks

CO4:: recommend identity and access for computer systems

CO5:: enumerate cryptographic solutions in the organization and security at the operational level

CO6:: identify security incidents and ensure the continuity of business operations in the event of an

incident



INT249: SYSTEM ADMINISTRATION

This course covers the in-depth practical administration of Windows and Linux server operating systems in which the focus shall be on file and folders management, Disk management, resource management, network management, user management, authentication management and software package management. The tools used are Port scanners, Sniffers, Partitioning tools, Disk property tools etc.

Course Outcome:

CO1:: install and configure the server operating systems

CO2:: manage users, groups permissions and ownerships

CO3:: manage and implement storage solutions and networking

CO4:: manage server operating systems' boot process and system components

INT250: DIGITAL EVIDENCE ANALYSIS

This course covers the in-depth understanding and practical demonstrations of digital forensic and incident response methods. The course includes incident response handling, forensic duplication, live data collection, network evidence collection and evidence handling. The course also focuses on data analysis from system memory and network-based evidence. The tools used are the FBI toolkit, Netcat, Cryptcat, RAM dump, Encase, TCPdump, FTK imager, FTK, Autopsy etc.

Course Outcome:

CO1:: describe the fundamentals of incident response handling process.

CO2:: discuss the methodology of detecting an incident and responding to it in case of a security breach.

CO3:: examine the process of live data collection and forensic duplication during forensic investigations.

CO4:: outline the network and host-based evidence collection during the evidence handling process.

CO5:: classify various data analysis techniques for network and system evidence data.

CO6:: evaluate the process of extracting critical data from windows systems and routers

INT244: SECURING COMPUTING SYSTEMS

The course covers the basic concepts of penetration testing along with the analysis of various vulnerabilities and security flaws exist in the operating systems, web servers, and network equipment through the techniques used by hackers. The course provides the understanding about cryptography, footprinting, scanning, enumeration, system hacking, malware, sniffers, social engineering, DoS, session hijacking, SQL injection, mobile & cloud device security. It also helps to clarify & learn log management for information assurance and manage information security.

Course Outcome:

CO1:: describe the fundamental concepts of operating systems, cryptography and penetration testing

CO2: discuss the methodology of performing footprinting and scanning the target systems

CO3:: illustrate the process of enumerating and compromising a target

CO4: examine the usage of sniffers, social engineering and denial of service for compromising the targets

CO5: analyze the functionality of session hijacking, web applications and SQL injection in testing the

security of targets

CO6: outline the process of identifying the threats to WiFi, Bluetooth, mobile devices and cloud

INT245: PENETRATION TESTING

It covers the tools and technologies used by ethical hackers in order to identify weaknesses in information system and recommend mitigation measures to increase the resistance of the information technology (IT) infrastructure to unauthorized access.

Course Outcome:

CO1:: recognize how to analyze the outcome from the tools and technologies used by security analyst

CO2:: examine intensive assessments required to effectively identify and mitigate risks to the information security of the infrastructure

CO3:: summarize weaknesses in information system and recommend mitigation measures to increase the resistance of the information technology (IT) infrastructure to unauthorized access

CO4:: analyze the outcomes of vulnerability assessments in the form of penetration testing reports

CO5:: recommend various regulatory compliances related to penetration testing responsibilities

CO6: summarize testing deliverables out of penetration testing reports and identify post corrective actions

INT251: MALWARE ANALYSIS AND CYBER DEFENCE

This course will provide a depth understanding of different types of malwares, like viruses, worms, and Trojans. Students will gain hands-on experience in analyzing malicious files, identifying malicious processes, and more. It also covers new techniques and tools of malware analysis which help speed up analysis and transition students from malware analyst to reverse engineer and how to perform dynamic and static analysis. The tools used are Pestudio, Process Monitor, Wireshark, Autoruns, Cuckoo Sandbox etc.

Course Outcome:

CO1:: understand the tools and techniques to extract metadata information from the malicious binary

CO2: analyze the behavior of the malware and its interaction with the system

CO3 :: understand basics of assembly Language and the necessary skills required to perform code analysis

CO4:: analyze the stealth techniques used by advanced malware to hide from Forensic tools



Career Opportunities

Cyber Security Consultant

Penetration Tester

Malware Analyst

Cyber Threat Management

Cyber Intelligent Analyst

Information Security Analyst

Freelancer

Industrial Applications

- Intelligence agencies
- © Defense
- Automation systems
- © Retail
- Banking
- Internet of Things
- Automotive sector
- © E-commerce



Special Requirements

Laptop

2 hours class scheduling

Basic knowledge of Linux and Networking



Doubts?

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Ms. Harpreet Kaur | harpreet.23521@lpu.co.in | 33-203

Other Engineering Minors – Offered by SECE



Internet of Things – 288



Hardware Security – 72

Mandatory Feedback

Dear Students,

Provide the feedback for this session on Myclass as well as on UMS at below given link:

UMS Navigation----->Feedback & Surveys----->Online Survey Survey on Engineering Minor Presentation

Thank you