BACHELORS OF TECHNOLOGY
INFORMATION TECHNOLOGY

CHOICE-I
7 TH SEMESTER

Students of 7th Semester will undergo 6 Month Industrial/Institutional Training

CHOICE-I
8 TH SEMESTER

Subject Name: Comprehensive Laboratory
Subject Code: PRIT-106

Programme: B.Tech.(IT)	**L:** 0 **T:** 0 **P:** 2
Semester:8th	**Teaching Hours:** 24 Hours
Theory/Practical: Practical	**Credits:1**
Internal Marks: 20	**Percentage of Numerical/Design/Programming Problems: 100**
External Marks:30	**Duration of End Semester Exam(ESE):**
Total Marks:50	**Course Status:** Seminar/Project

On completion of the course the student will have the ability to:

CO #	Course Outcomes
1.	Students are to be made confident in fundamental aspects of any engineering problem/situation
2.	To assess the comprehensive knowledge gained in basic courses relevant to Information Technology.
3.	To explore the application avenues for the core engineering concepts of IT
4.	To comprehend the questions asked and answer them with confidence.
5	To provide a holistic view about core and advanced computing principles
6	To re-iterate and explore the basic concepts of core Information Technology

Prerequisites: Advanced programming skills, Networking skills, database management skills

Contents:

1. Assessment of Data structures and programming methodology

2. Assessment of tools for software engineering.

3. Assessment of basic organization and Architecture of computer system

4. Assessment of Data base design and models

5. Assessment of various functions and process involved in operating system

6. Mastering the concepts, protocols involved in computer networks.

Programme: B.Tech.	**L:** 3 **T:** 0 **P:** 0
Semester: 8 (Choice- I)	**Teaching Hours:** 36 Hours
Theory/Practical: Theory	**Credits:** 3
Internal Marks: 40	**Percentage of Numerical/Design Problems:** 30%
External Marks: 60	**Duration of End Semester Exam(ESE):** 3hours
Total Marks: 100	**Elective Status:** Professional Elective-III

Prerequisites: Basics of Networking, Operating System, Virtualization

Additional Material Allowed in ESE: NIL

Course Outcomes:
After completing this course students will be able
1. To assess existing hosting platforms and computing paradigms currently being used in industry and academia.
2. To comprehend need of data centre, its virtualization techniques and types of clouds.
3. To demonstrate the implementation of cloud by using commercial and open source cloud platforms and its virtualization.
4. To implement cloud-based data storage by considering issues of task partitioning, data partitioning, data synchronization, distributed file system, data replication etc.
5. To teach the distributed computing fundamentals in the context of cloud infrastructure
6. To provide an insight into managing and scheduling of various cloud resources

Detailed Contents:

Part-A

Defining Cloud Computing: Utility Computing, Cloud Types, Examining the characteristics of Cloud Computing, Cloud Computing vs. Cluster computing vs. Grid computing, Assessing the roles of Open Standards   [6]
Virtualization: Using virtualization Technologies, Load balancing and Virtualization, Understanding Hypervisors, Machine Imaging, Porting applications   [5]
Capacity Planning: Defining Baseline and Metrics, Network Capacity, Scaling   [3]
Overview of OpenStack: Architecture of OpenStack, project, services, mode of deployment, workflow.
                                                    [4]
Cloud Storage: Object storage and Block storage   [2]

Part-B

Cloud Network: Software-defined networking with OpenStack, Architecture, Protocols, Network functions virtualization (NFV)   [4]
Cloud Management: Monitoring, Management, Maintenance, Troubleshooting, Backup, Recovery, Service Level Agreement   [4]
Cloud Security: Cloud Security: Role of Security, Types of Attack, Network Security, Survey on Potential Cloud Barriers in adopting Cloud Computing, New Threats related to Cloud Computing, Security Stack, Gartner's Seven Cloud Computing Security Risks. Other Cloud Security Issues: Virtualization, Access Control & Identity Management, Application Security, Data Life Cycle Management. OpenStack security -

Role-Based Access Control (RBAC), Identity service, Application security, data security. [6]

Containers and Edge Computing: Introduction to Edge computing, Containers and Edge Computing with OpenStack [2]

Textbooks:
1. Barrie Sosinsky (2013), Cloud Computing Bible, Wiley India Pvt. Ltd.
2. Raj Kumar Buyya, James Broberg, Andrezei M.Goscinski (2011), Cloud Computing: Principles and paradigms, Wiley India Pvt. Ltd.
3. Anthony Velte, Toby Velte, Robert Elsenpeter (2009), Cloud Computing: A practical Approac, Tata McGrawHill

Reference Books:
1. Michael Miller (2008), Cloud Computing, Que Publishing
2. Anthony Velte, Toby Velte and Robert Elsenpeter (2014), Cloud Computing: A practical Approach by Tata McGrawHill
3. Judith Hurwitz, Robin Bllor, Marcia Kaufman, Fern Halper (2009), Cloud Computing
   for dummies.

Online Courses and Video Lectures

1.Cloud computing By Prof. Soumya Kanti Ghosh | IIT Kharagpur
Available at: https://swayam.gov.in/nd1_noc20_cs20/preview

2.Google Cloud Computing Foundations Course
By Prof. Soumya Kanti Ghosh, Multifaculty | IIT Kharagpur, Google Cloud
Available at : https://swayam.gov.in/nd1_noc20_cs55/preview

Subject Code: LPEIT-115
Subject Name: Cloud Infrastructure and Services Laboratory

Programme: B.Tech.	L: 0 T: 0 P: 2
Semester: 8 (Choice- I)	Teaching Hours: 24 Hours
Theory/Practical: Practical	Credits: 1
Internal Marks: 30	Percentage of Numerical/Design Problems: 100%
External Marks: 20	Duration of End Semester Exam(ESE): 1.5 hours
Total Marks: 50	Elective Status: Professional Elective-III

Pre-requisites: Basic programming skills and computer fundamentals

Course Outcomes:

After studying this course, the student will be able to

1. Apply knowledge of software tools and techniques with hands-on experience for Cloud related applications.

2. Design solutions for the understanding of the virtual machines, networks and managing users in Cloud Infrastructure.

3. To conduct investigation and develop programming skills in Cloud Computing related applications.

4. Use the modern engineering tools/platforms such as Open stack, Hadoop for solving problems related to Cloud Computing

5. Function on multi-disciplinary teams through mini projects for exploring applications of Cloud Computing in different sectors.

Detailed Contents

1. Install VirtualBox/VMware Workstation with different flavors of Linux or windows OS on top Linux/windows.

2. Introduction to OpenStack and its components.

3. Installation of OpenStack using RDO packstack.

4. Creating and launching a basic virtual machine

5. Creating and managing images and templates

6. Creating and managing networks

7. Creating and managing users

8. Managing security groups and policies

9. Connecting to virtual machine/server from local computer

By using various concepts of syllabus students required to prepare a project in a group of two to three students.

The group of students must submit a project report of 8 to 10 pages (approximately) and the team will

have to demonstrate the project as well as must give a presentation of the same.

Note: It is recommended that mini project allocation to students be done within two-three weeks of the start of the semester. This is only the suggested list of Practical's. Instructor may also frame additional Practical's relevant to the course contents (if required)

Subject Code: PEIT-116
Subject Name: Mobile Application Development

Programme: B.Tech.	**L:** 3 **T:** 0 **P:** 0
Semester: 8 (Choice- I)	**Teaching Hours:** 36 Hours
Theory/Practical: Theory	**Credits:** 3
Internal Marks: 40	**Percentage of Numerical/Design Problems:** 30%
External Marks: 60	**Duration of End Semester Exam(ESE):** 3hours
Total Marks: 100	**Elective Status:** Professional Elective-III

On Completion of the course, the student will have the ability to:

CO#	Course Outcomes
1.	Understanding the basic mobile platforms and mobile development environments
2.	Make use of Android SDK to setup Android Development Environment
3.	Apply conceptual knowledge of User Interface Designing to design UI in Android SDK
4.	Develop Interactivity based Android Applications using Fragment, Intents and Event Processing
5.	Develop Database oriented Android Applications using Persistent Data Storage
6.	Improve the Android Application Performance using Android Services and Threads Analyze and Solve the bugs using Android Security and Debugging features

Prerequisites: Programming in Java.
Additional Material Allowed in ESE: NIL (Mention anything like graph, calculator etc, if required in exam)

Detailed Contents:

Part-A
Introduction to Mobile Development: Brief History of Mobile: Beginning and evolution, Mobile ecosystem: Operator, Network, Devices, Platforms, Operating System, Application Frameworks, Types of Mobile applications, Seven rules for developing mobile strategy. **[4L]**
Android Development Environment: Introduction to android, Advantage of Android over other development environment, Android execution environment, Components of android application, Android activity and service life-cycle, Android 7.0 nougat and comparison with older version, Assembling android 7 development workstation, Downloading and installing Android Studio2, Introduction to Android Studio IDE. **[6L]**
Android User Interface Design: XML Naming scheme, XML syntax, XML Referencing, XML constants, XML Styles, XML Colors, View Group Class, View Class, Activity Class, UI Design from scratch: Checkbox, Text View, Button element to interface, Error elimination using XML Editor, Working with Relative, Linear, Table and Grid Layouts, Understanding Activity Life Cycle. **[7L]**
Part-B
Apps Interactivity in Android: Android Fragment: Fragment Class, Fragment Life Cycle, Android Intent Class: Intent types, Intent Filters, Instantiating Intent Object, Android Context Class, Event Processing: Events, Event Listener, Event Handler. **[5L]**
Persistent Data Storage: SQLite: Android Built in SQLite content provider, Modifying data using your android application, Creating basic activity, Configuring manifest, Packaging and managing SQLite with android app. **[4L]**
Android Services and Threads: Android service class: Controlling services, Spawning process, Process Life Cycle, Thread Caveats, Background Processing Services. **[5L]**

Android Security and Debugging: Requesting permissions, Creating custom Permissions, Securing application for publication and execution, Tools for debugging, Eclipse Java Editor: Java errors, Debugger, Logcat, Android Debug Bridge (adb), DDMS: Dalvik Debug monitor service, Traceview.**[4L]**

Text Books:
1. Brian Fling, "Mobile Design and Development", First Edition, O'Reilly, 2009.
2. Rick rogers, John Lombardo, Zigurd Mednieks and Blake Meike, "Android Application Development", First Edition, O'Reilly, 2009.
3. Wallace Jackson, "Android Apps for absolute beginners", Apress, 4th Edition, 2017.

Reference Books:
1. Grant Allen, "Beginning Android Get Started building apps for android platform", Apress, Fifth Edition 2014.
2. Raimon Raflos Montane, Laurence Dawson, "Learning Android Application Development", Packt Publishers, 2014.
3. Jerome F. DiMarzio, "Beginning Android Programming with Android Studio", 4th edition, Wrox Publishers, 2016.
4. Antonio Pachon Ruiz, "Mastering Android Application Development", Packt Publishers, Edition 2015

E-Books and online learning material:

1. Android Studio Development Essentials by Neil Smyth
   https://www.onlineprogrammingbooks.com/android-studio-development-essentials-javaedition/
   Accessed on June. 20, 2020
2. Android Tutorial by TutorialsPoint
   https://www.tutorialspoint.com/android/android_tutorial.pdf   Accessed on June. 20, 2020
3. Android Programming Cookbook by Chryssa
   http://enos.itcollege.ee/~jpoial/allalaadimised/reading/Android-Programming-Cookbook.pdf
                                                                    Accessed on June. 20, 2020

Online Courses and Video Lectures:

1. https://developer.android.com/courses   Accessed on June. 20, 2020
2. https://www.edx.org/learn/android-development   Accessed on June. 20, 2020
3. https://www.lynda.com/Android-training-tutorials/947-0.html   Accessed on June. 20, 2020
4. https://www.coursera.org/projects/build-app-android-studio-java Accessed on June. 20, 2020
5. https://nptel.ac.in/noc/courses/noc16/SEM2/noc16-cs13/   Accessed on June. 20, 2020
6. https://nptel.ac.in/courses/106/106/106106147/   Accessed on June. 20, 2020
7. https://web.stanford.edu/class/cs193a/lectures.shtml   Accessed on June. 20, 2020

Subject Name: Mobile Application Development Laboratory

Programme: B.Tech.	**L:** 0 **T:** 0 **P:** 2
Semester: 8 (Choice- I)	**Teaching Hours:** 24 Hours
Theory/Practical: Practical	**Credits:** 1
Internal Marks: 30	**Percentage of Numerical/Design Problems:** 100%
External Marks: 20	**Duration of End Semester Exam(ESE):** 1.5 hours
Total Marks: 50	**Elective Status:** Professional Elective-III

On Completion of the course, the student will have the ability to:

CO#	Course Outcomes
1.	Demonstrate an understanding of design aspects of different mobile development environments
2.	Install, setup and make use of Android SDK 2 to study basic components involved in Android Mobile Application Development
3.	Study and Design using basic designing components, different type of layouts for a UI based on XML in Android Studio2
4.	Develop a basic module using Android development environment involving elements of interactivity
5.	Develop persistent database oriented application module using Android development environment
6.	Integrating the concept of mutithreading, resource requests for application performance improvement
7.	Test and solve the bug related issues using tools like` Logcat, Android Debug bridge
8.	Function on diverse teams to identify, formulate and design static web project using XML oriented Designs, Persistent Data Storage and embedded with features like services, threads and debugging in multi-disciplinary environment

Prerequisites: Programming in Java, Web Technologies.

Special Instruction related to resources requirement: Software like Android Studio.
1. Android Development Environment: To study design aspects of development environment like Android, iOS.
2. Android Development Environment: To setup Android studio2 and study its basic components.
3. Android User Interface Design: To study various XML files needed for interface design.
4. Android User Interface Design: To implement different type of layouts like relative, grid, linear and table.
5. Apps Interactivity in Android: To incorporate element of interactivity using Android Fragment and Intent Class.
6. Persistent Data Storage: To perform database connectivity of android app using SQLite.
7. Android Services and Threads:To implement the concept of multithreading using Android Service class.
8. Android Security and Debugging: To implement concept of permission and perform request for permission to access different hardware components of mobile.

9. Android Security and Debugging: To perform debugging and testing of android app using tools like Logcat, Android debug bridge, DDMS.

Mini Project: - Student has to do a project assigned from course contents in a group of two or three students. The group of students must submit a project report of 8 to 10 pages (approximately) and the team will have to demonstrate as well as have to give a presentation of the same.

Reference Books:
1. Beginning Android Get Started building apps for android platform by Grant Allen, Apress, Fifth Edition 2014.

2. Practical Android: 14 Complete Projects on Advanced Techniques and Approaches by MarkWickham, Apress 2018.

Subject Code: PEIT-117
Subject Name: Augmented Reality and Virtual Reality

Programme: B.Tech.	**L:** 3 **T:** 0 **P:** 0
Semester: 8 (Choice- I)	**Teaching Hours:** 36 Hours
Theory/Practical: Theory	**Credits:** 3
Internal Marks: 40	**Percentage of Numerical/Design Problems:** 30%
External Marks: 60	**Duration of End Semester Exam(ESE):** 3hours
Total Marks: 100	**Elective Status:** Professional Elective-III

On Completion of the course, the student will have the ability to:

CO#	Course Outcomes
1.	To understand the basic concepts of Augmented and Virtual Reality.
2.	Assess and compare technologies in the context of AR and VR systems design.
3.	To apply Environment Modelling in Virtual Reality
4.	Develop interactive augmented reality applications for PC and Mobile based devices using a variety of input devices.
5.	To learn and implement application of VR in Digital Entertainment:
6.	Demonstrate the knowledge of the research literature in augmented reality for both compositing and interactive applications.

Prerequisites: Working knowledge of geometry, 3D space, and Linear algebra
Additional Material Allowed in ESE: NIL (Mention anything like graph, calculator etc, if required in exam)
Detailed Contents:

Part-A
Introduction of Virtual Reality: Fundamental concept and components of Virtual Reality, primary features and present development on Virtual Reality. **[4L]**
Multiple Modals of Input and Output Interface in Virtual Reality: Input -- Tracker, Sensor, Digital Glove, Movement Capture, Video-based Input, 3D Menus & 3DScanner etc. Output -- Visual /Auditory / Haptic Devices **[6L]**
Visual Computation in Virtual Reality: Fundamentals of computer graphics, software and hardware technology on stereoscopic display, advanced techniques in CG: Management of large scale environments & real time rendering **[6L]**
Environment Modeling in Virtual Reality: Geometric Modeling, Behavior Simulation, Physically Based Simulation. **[4L]**

Part-B
Interactive Techniques in Virtual Reality: Body Track, Hand Gesture, 3D Menus, Object Grasp. Introduction of Augmented Reality (AR): System structure of Augmented Reality, key technology in AR. **[6L]**
Development Tools and Frameworks in Virtual Reality: Frameworks of software development tools in VR, X3D Standard, Vega, MultiGen, Virtools etc. **[6L]**
Application of VR in Digital Entertainment: VR technology in film & TV production, VR technology in physical exercises and games, demonstration of digital entertainment by VR **[4L]**

Text Books:

1. Doug A. B., Kruijff E., LaViola J. J. and Poupyrev I. , 3D User Interfaces: Theory and Practice , Addison-Wesley (2005,2011p) 2nd ed.
2. Parisi T., Learning Virtual Reality, O'Reilly (2016) 1st ed.
3. Schmalstieg D. and Hollerer T., AugmentedAnd Virtual Reality, Addison-Wesley (2016).

Reference Books:
1. Whyte J., Virtual Reality and the Built Environment, Architectural Press (2002).
2. Aukstakalnis S., Practical Augmented Reality: A Guide to the Technologies, Applications, and Human Factors for AR and VR, Addison-Wesley (2016).

Subject Code: LPEIT-117
Subject Name: Augmented Reality and Virtual Reality Laboratory

Programme: B.Tech.	L: 0 T: 0 P: 2
Semester: 8 (Choice- I)	Teaching Hours: 24 Hours
Theory/Practical: Practical	Credits: 1
Internal Marks: 30	Percentage of Numerical/Design Problems: 100%
External Marks: 20	Duration of End Semester Exam(ESE): 1.5 hours
Total Marks: 50	Elective Status: Professional Elective-III

On Completion of the course, the student will have the ability to:

CO#	Course Outcomes
1.	Gain first-hand experience with using virtual environment technology, including 3D rendering software, tracking hardware, and input/output functions for capturing user data.
2.	Assess and compare open source tools in the context of AR and VR systems design.
3.	Learn the fundamental aspects of designing and implementing rigorous empirical experiments using VR
4.	Design of Google Cardboard for cost effective VR experience
5.	To learn and implement application of VR in Digital Entertainment:
6.	Demonstrate the knowledge of VR to the conduct of scientific research, training, and industrial design.

Tools: Unity 3D, Blender, and various Open source tools

Detailed Contents:
1. Introduction to various Open sources VR Tools
2. Introduction to Unity: Interface overview and navigation
3. Creating a new project, importing standard assets, adding a player character, Objects, lighting, scenes, prefabs, asset store in Unity
4. Scripting in Unity: Creating a New Script, (naming) Syntax, Functions, Variables, Key / Mouse Input, Unity Support
5. Object-Oriented Scripting in Unity , Public variables, the inspector
6. Working of Hololens, Google Glass
7. Intro to Maya:, Basic concepts of 3D modeling, Bevel, Cone, Extrude, Smooth, Booleans
8. Workings on apps related to AR and VR

Mini Project: How to design Google cardboard in laboratory for VR experience

Subject Name: Software Process and Quality Assurance

Programme: B.Tech.	L: 3 T: 0 P: 0
Semester: 8 (Choice- I)	Teaching Hours: 36 Hours
Theory/Practical: Theory	Credits: 3
Internal Marks: 40	Percentage of Numerical/Design Problems: 40%
External Marks: 60	Duration of End Semester Exam(ESE): 3hours
Total Marks: 100	Elective Status: Professional Elective-III

On Completion of the course, the student will have the ability to:

CO#	Course Outcome
1.	Identify and explain contemporary software life cycle processes, activities, and work products.
2.	Plan tasks, plan task dependencies, estimate effort, and estimate other needed resources.
3.	Recognize and categorize risks, intellectual property, and legal issues of software projects.
4.	Effectively manage changes during the software life cycle including deviations and waivers in software configuration control.
5.	Apply various metrics and measurements to assess the product and the process quality.
6.	Apply standard quality assurance techniques to ensure that requirements are verifiable, traceable, measurable, testable, accurate, unambiguous, consistent, and complete.

Prerequisites: Software Engineering.
Additional Material Allowed in ESE: NIL (Mention anything like graph, calculator etc, if required in exam)

Detailed Contents:

Part-A

Software Process: Software engineering process infrastructure (e.g., personnel, tools, and training), Modeling and specification of software processes, Measurement and analysis of software processes, Software engineering process improvement (individual, team, and organization), Quality analysis and control (e.g., defect prevention, review processes, quality metrics, and root cause analysis of critical defects to improve processes and practices). **[7L]**

Process Implementation: Levels of process definition (e.g., organization, project, team, and individual) Life-cycle model characteristics (e.g., plan-based, incremental, iterative, and agile), Individual software process (model, definition, measurement, analysis, and improvement), Team process (model, definition, organization, measurement, analysis, and improvement), Process tailoring, Effect of external factors (e.g., contract and legal requirements, standards, and acquisition practices) on software process **[7L]**

Project planning and tracking: Requirements management (e.g., product backlog, priorities, dependencies, and changes), Effort estimation (e.g., use of historical data and consensusbased

estimation techniques), Work breakdown and task scheduling, Resource allocation, Project tracking metrics and techniques (e.g., earned value,velocity, burndown charts, defect tracking, and management

of technical debt) , Team self-management (e.g., progress tracking, dynamic workload allocation, and response to emergent issues) **[6L]**

Part-B

Software configuration management: Revision control, Release management, Configuration management tools, Build processes and tools. **[4L]**

Software Quality: Definitions of quality, Society's concern for quality, The costs and impacts of bad quality, A cost of quality model, Quality attributes for software (e.g., dependability, usability, and safety), Roles of people, processes, methods, tools, and technology **[6L]**

Process Assurance and Product Assurance: Nature of process assurance, Quality planning, Process assurance techniques,   nature of product assurance,   Distinctions between assurance and Verification &Validation, Quality product models, Root cause analysis and defect prevention, Quality product metrics and measurement, Assessment of product quality attributes (e.g., usability, reliability, and availability) **[6L]**

Text Books
1. Ralf Kneuper, "Software Processes and Life Cycle Models", Springer, 2018.
2. Murali Chemuturi, Mastering Software Quality Assurance – Best Practices, Tools and Techniques for Software Developers", J. Ross Publishing, 2011.
3. Daniel Galin, "Software Quality Assurance – from theory to implementation", Pearson Education, 2009.
4. Roger S Pressman, "Software Engineering: A practitioner's approach", 7th Edition,McGraw Hill Education, 2010.

Reference Books

1. Ivan Mistrik, Richard M Soley, Nour Ali, "Software Quality Assurance – in Large Scale and Complex Software Intensive Systems", Morgan Kaufmann, 2015
2. Yingxu Wang, Graham King, "Software Engineering Processes - Principles and Applications", CRC Press, 2000.
3. Ian Sommerville, "Software Engineering", 10th Edition, Pearson India, 2018.
4. Grady Booch, "Object-Oriented Analysis and Design with Applications", Pearson India, 3rd Edition, 2015.

Subject Name: Software Process and Quality Assurance Laboratory

Programme: B.Tech.	**L:** 0 **T:** 0 **P:** 2
Semester: 8 (Choice- I)	**Teaching Hours:** 24 Hours
Theory/Practical: Practical	**Credits:** 1
Internal Marks: 30	**Percentage of Numerical/Design Problems:** 100%
External Marks: 20	**Duration of End Semester Exam(ESE):** 1.5 hours
Total Marks: 50	**Elective Status:** Professional Elective-III

On Completion of the course, the student will have the ability to:

CO#	Course Outcome
1.	Design of software process.
2.	Implement a software process in a typical environment.
3.	Plan a project and track its progress.
4.	Effectively manage changes during the software lifecycle including deviations and wavers in software configuration control.
5.	Verify and validate a software module when the requirement specifications are given.
6.	Perform software audit and improve the quality of code.

Prerequisites: Software Engineering

Sr. No.	Name of Practical	No. of Hours
1	Design software process for any case study.	1
2	Implement the software process in an environment (e. g. agile, iterative, plan-based).	1
3	Plan a project involving work breakdown structures, task scheduling.	2
4	Track the progress of the project by using burndown charts.	2
5	Apply software configuration control to manage change and revisions.	2
6	Write a software module and conduct static verification.	2
7	Write a program involving loops and perform white box testing of the program (i.e. dynamic verification).	2
8	Write a software module and perform unit testing (i.e. dynamic verification).	2
9	Write two small software modules. Integrate these modules and test the defects in the interaction between these software modules when they are integrated (i.e. dynamic verification).	2
10	Design a software module as per the requirement specifications and validate it.	2
11	Perform Software Audit including checklist and templates for the software	2

	developed and improve the Code Quality.	

Subject Code: PEIT-119
Subject Name: Cyber Security

Programme: B.Tech.	L: 3 T: 0 P: 0
Semester: 8 (Choice- I)	Teaching Hours: 36 Hours
Theory/Practical: Theory	Credits: 3
Internal Marks: 40	Percentage of Numerical/Design Problems: 30%
External Marks: 60	Duration of End Semester Exam(ESE): 3hours
Total Marks: 100	Elective Status: Professional Elective-III

On Completion of the course, the student will have the ability to:

CO#	Course Outcomes
1.	Understand the concept of Cyber Security
2.	Implement appropriate security technologies and policies to protect computers and digital information.
3.	Evaluate Information Security threats and vulnerabilities in Information Systems and apply security measures to real time scenarios
4.	Determine computer networks and examine secure software practices.
5.	Classify the principles of web security.
6.	Demonstrate the use of standards and cyber laws to enhance information security in the development process and infrastructure protection

Prerequisites: Basic knowledge of Computer Networks
Additional Material Allowed in ESE: NIL (Mention anything like graph, calculator etc, if required in exam)

Detailed Contents:

PART-A

Cyber Security Concepts: History of cyber space, Cyber Crime, Information Security, Computer Ethics and Security for users, Familiarization with secure web browser and guidelines to choose, Role of Antivirus, Guidelines for Secure password, Two-steps authentication, Introduction to Password Manager, Wi-Fi Security. **[9L]**

Cyber Security Vulnerabilities& Safe Guards: 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. **[9L]**

PART-B

Security in Evolving Technology: Biometrics, Mobile Computing and Hardening on android and ios, IOT Security, Web server configuration and Security. Introduction, Basic security for HTTP Applications and Services, Basic Security for Web Services like SOAP, REST etc., Identity Management and Web Services, Authorization Patterns, Security Considerations, Challenges. **[9L]**

Social Engineering: Threat Landscape and Techniques: Social Engineering, Types of Social Engineering, How Cyber Criminal Works, How to prevent for being a victim of Cyber Crime, Cyber

Security Threat Landscape, Emerging Cyber Security Threats, Cyber Security Techniques, Firewall, Cyber Security Regulations**[9L]**

Text Books:
1. William Easttom II (2016) Computer Security Fundamentals, 4th edition, Pearson.
2. Sunit Belapure and Nina Godbole (2011) Cyber Security, 1st edition, Wiley.
3. Christopher Hadnagy (2018) Social Engineering: The Science of Human Hacking, 2nd edition, John Wiley & Sons.
4. Thomas A. Johnson (2015) Cyber Security, 1st edition, CRC Press.

Reference Books:
1. Nina Godbole (2017) Information Systems Security: Security Management, Metrics, Frameworks and Best Practices, Wiley, 2nd edition.
2. Jon Erickson (2008) The art of Exploitation, Starch Press, 2nd edition.

E-Books and online learning material:
1. Cyber Attacks and Counter Measures: http://uou.ac.in/progdetail?pid=CEGCS-17Meilir Page-Jones: Fundamentals.
2. Introduction to Cyber Security available at http://uou.ac.in/foundation-course.
3. Cyber Security Techniques http://uou.ac.in/progdetail?pid=CEGCS-17.
4. https://www.cybersecurity.ox.ac.uk/resources/videos

Online Courses and Video Lectures:
1. https://nptel.ac.in/courses/106/106/106106129/ Accessed on June 11, 2021
2. https://www.utep.edu/information-resources/iso/security-awareness/videos/security-awareness-videos.html Accessed on June 11, 2021
3. https://www.utep.edu/technologysupport/ServiceCatalog/SEC_EmailEncryption.html Accessed on June 11, 2021
4. https://nptel.ac.in/courses/106/105/106105031/ Accessed on June 11, 2021

Guru Nanak Dev Engineering College, Ludhiana
Department of Information Technology
B. Tech (IT) Scheme 2018

Subject Code: LPEIT-119
Subject Name: Cyber Security Laboratory

Programme: B.Tech.	**L:** 0 **T:** 0 **P:** 2
Semester: 8 (Choice- I)	**Teaching Hours:** 24 Hours
Theory/Practical: Practical	**Credits:** 1
Internal Marks: 30	**Percentage of Numerical/Design Problems:** 100%
External Marks: 20	**Duration of End Semester Exam(ESE):** 1.5 hours
Total Marks: 50	**Elective Status:** Professional Elective-III

On completion of the course the student will have the ability to:

CO#	Course Outcomes
1.	Understand the different components of Cyber Security
2.	Analyze the different threats in windows and web security
3.	Identify the use of appropriate tool for the security threat
4.	Implement the security measures in a PC using different tools
5.	Identify the web vulnerabilities.
6.	Evaluate the severity of security threat and generate report

Perquisites: Basic knowledge of Computer Networks
Detailed Contents:

1. Study of different wireless network components and features of any one of the Mobile Security Apps.
2. Implementation of Windows security using firewall and other tools
3. Steps to ensure Security of any one web browser (Mozilla Firefox/Google Chrome).
4. Implementation to gather information from any PC's connected to the LAN using whois, port scanners, network scanning, Angry IP scanners etc.
5. Implementation of MITM- attack using wireshark/ network sniffers
6. Implementation to identify web vulnerabilities, using OWASP project
7. Implementation of IT Audit, malware analysis and Vulnerability assessment and generate the report.
8. Implementation of OS hardening and RAM dump analysis to collect the Artifacts and otherinformation.

   Mini Project: Students are required to prepare a project based on the course contents in a group of three students. The group of students must submit a project report of 8 to 10 pages (approximately) and the team will have to demonstrate as well as have to give a presentation of the same.

Subject Code: PEIT-120
Subject Name: Software Defined Networking

Programme: B.Tech.	L: 3 T: 0 P: 0
Semester: 8 (Choice- I)	Teaching Hours: 36 Hours
Theory/Practical: Theory	Credits: 3
Internal Marks: 40	Percentage of Numerical/Design Problems: 30%
External Marks: 60	Duration of End Semester Exam(ESE): 3hours
Total Marks: 100	Elective Status: Professional Elective-III

On Completion of the course, the student will have the ability to:

CO#	Course Outcomes
1.	Understand Software Defined Networking
2.	Analyze the evolution of Software Defined Networks
3.	Identify the various components of SDN and their uses
4.	Provide the SDN Solutions for Data Center Network
5.	Explain the use of SDN in the current networking scenario
6.	Design and develop various applications of SDN

Prerequisites: Computer Networks
Additional Material Allowed in ESE: Scientific Calculator
Detailed Contents:

Part-A

Introduction: History of Software Defined Networking (SDN) , Modern Data Center , Traditional Switch Architecture, Need of SDN, SDN implications for Research and Innovation, Evolution of SDN, Network Virtualization, How SDN Works, SDN Devices, SDN Applications.**[9L]**

Open Flow & SDN Controllers: Open Flow Specification, Drawbacks of Open SDN, SDN via APIs, SDN via Hypervisor-Based Overlays, SDN via Opening up the Device, Networks Functions Virtualization, SDN Controllers, General Concepts. **[9L]**

Part-B

Data Center: Multitenant and Virtualized Multitenant Data Center, SDN Solutions for the Data Center Network, VLANs – EVPN – VxLAN – NVGRE**[9L]**

Sdn Programming: Programming SDNs: Northbound Application Programming Interface, Current Languages and Tools, Composition of SDNs – Network Functions Virtualization (NFV) and Software Defined Networks: Concepts, Implementation and Applications   **[9L]**

Text Books:
1. Paul Goransson and Chuck Black (2016) *Software Defined Networks: A Comprehensive Approach*, Second Edition, Morgan Kaufmann.
2. Thomas D. Nadeau, Ken Gray (2013) SDN: Software Defined Networks, O'Reilly Media.
3. SiamakAzodolmolky (2013) Software Defined Networking with OpenFlow, Packt Publishing, 2013

Reference Books:
1. Siamak Azodolmolky (2013) *Software Defined Networking with Open Flow*, Packet Publishing.
2. Vivek Tiwari (2013) *SDN and Open Flow for Beginners*, Amazon Digital Services, Inc.
3. Fei Hu (2014) *Network Innovation through Open Flow and SDN: Principles and Design*, CRC Press.

Online Courses and Video Lectures:

1. Udemy: Software Defined Networking (SDN) Made Simple by Vipin Gupta
   https://www.udemy.com/course/sdn-made-simple/
2. Coursera: Software Defined Networking by Dr. Nick Feamster,
   https://www.coursera.org/learn/sdn?aid=true

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Subject Code: LPEIT-120
Subject Name: Software Defined Networking Laboratory

Programme: B.Tech.	**L:** 0 **T:** 0 **P:** 2
Semester: 8 (Choice- I)	**Teaching Hours:** 24 Hours
Theory/Practical: Practical	**Credits:** 1
Internal Marks: 30	**Percentage of Numerical/Design Problems:** 100%
External Marks: 20	**Duration of End Semester Exam(ESE):** 1.5 hours
Total Marks: 50	**Elective Status:** Professional Elective-III

On completion of the course the student will have the ability to:

CO#	Course Outcomes
1.	Understand and install Mininet
2.	Configure Mininet for different solutions
3.	Create SDN applications without using controller
4.	Customize Mininet Topologies
5.	Create different applications with Mininet
6.	Develop SDN projects

Prerequisites: Computer Networks
Additional Material Allowed in ESE: Scientific Calculator

Detailed Contents:

1. Overview of Mininet
2. Setting up the Environment and Implementation of Controllers in Mininet
3. Creating Hub Application without using controller
4. Creating Switch Application without using controller
5. Creating firewall application without using controller
6. Mininet Custom Topologies in POX, ODL, Floodlight
7. Using Wireshark with Mininet and OpenFlow.

Mini Project: Students are required to prepare a project based on the course contents in a group of three students. The group of students must submit a project report of 8 to 10 pages (approximately) and the team will have to demonstrate as well as have to give a presentation of the same.

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Subject Code: PEIT-123
Subject Name: Business Enterprise Application

Programme: B.Tech.	L: 3 T: 1 P: 0
Semester: 8 (Choice- I)	Teaching Hours: 36 Hours
Theory/Practical: Theory	Credits: 4
Internal Marks: 40	Percentage of Numerical/Design Problems: 10%
External Marks: 60	Duration of End Semester Exam(ESE): 3hours
Total Marks: 100	Elective Status: Professional Elective-IV

On Completion of the course, the student will have the ability to:

CO#	Course Outcomes
1.	Understand the basics of enterprise applications
2.	Acquire knowledge of enterprise architecture
3.	Analyze the process of inception of enterprise architecture.
4.	Develop and understanding ways of constructing enterprise applications
5.	Acquire the basic knowledge of testing and rolling out enterprise applications.
6.	Knowledge of advanced topics for developing enterprise applications.

Prerequisites: Software Engineering
Additional Material Allowed in ESE: Scientific Calculator
Detailed Contents:
Introduction to enterprise applications: Introduction to enterprise applications and their types, integration with legacy systems, life cycle of raising an enterprise application, integration with partners, heterogeneous environment, introduction to skills required to build an enterprise application, key determinants of successful enterprise applications, and measuring the success of enterprise applications, ETL, direct data integration, middleware requirements**[7L]**
Inception of enterprise applications: Inception of enterprise applications, enterprise analysis, business modeling, requirements elicitation, use case modeling, prototyping, non functional requirements, requirements validation, planning and estimation **[4L]**
Concept of architecture: Concept of architecture, views and viewpoints, enterprise architecture, logical architecture, technical architecture - design, different technical layers, best practices, data architecture and design – relational, XML, and other structured data representations, Infrastructure architecture and design elements - Networking, Internetworking, and Communication Protocols, IT Hardware and Software, Middleware, Policies for Infrastructure Management, Deployment Strategy, Documentation of application architecture and design **[7L]**
Construction readiness of enterprise applications: Construction readiness of enterprise applications - defining a construction plan, defining a package structure, setting up a configuration management plan, setting up a development environment, introduction to the concept of Software Construction Maps, construction of technical solutions layers, methodologies of code review, static code analysis, build and testing, dynamic code analysis – code profiling and code coverage **[6L]**
Types and methods of testing an enterprise application: Types and methods of testing an enterprise application, testing levels and approaches, testing environments, integration testing, performance testing, penetration testing, usability testing, globalization testing and interface testing, user acceptance testing, rolling out an enterprise application**. [6L]**
Advanced Topics: Integration Patterns, Service oriented integration-Web services, Service Choreography and Orchestration, BPMN, BPEL, Messaging based integration- Synchronous and

Asynchronous Messaging, message structure, JAVA messaging services, Enterprise service bus routing, scalable connectivity and protocol, Global and Brokered ESBs, Support to SOA**[8L]**

Text Books:

1. Anubhav Pradhan, Satheesha B. Nanjappa et. al., "Raising Enterprise Applications", Wiley India, 2016.
2. George Mentzas and Andreas Frezen (Eds), "Semantic Enterprise Application Integration for Business Processes: Service - oriented Frameworks", Business Science Reference,2015.

Reference Books:

1. Waseem Roshen, "SOA Based Enterprise Integration", Tata McGrawHill, 2015.
2. Martin Fowler, "Patterns of Enterprise Application Architecture", Addison - Wesley, 2015.
3. Kapil Pant and Matiaz Juric, "Business Process Driven SOA using BPMN and BPEL: From Business Process Modeling to Orchestration and Service Oriented Architecture", Packt Publishing, 2016.

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Subject Code: PEIT-124
Subject Name: ICT in Agriculture and Rural Development

Programme: B.Tech.	**L:** 3 **T:** 1 **P:** 0
Semester: 8 (Choice- I)	**Teaching Hours:** 36 Hours
Theory/Practical: Theory	**Credits:** 4
Internal Marks: 40	**Percentage of Numerical/Design Problems:** 0%
External Marks: 60	**Duration of End Semester Exam(ESE):** 3hours
Total Marks: 100	**Elective Status:** Professional Elective-IV

On Completion of the course, the student will have the ability to:

CO#	Course Outcomes
1.	Identify the use of Information Communication and Technology in rural development.
2.	Have an understanding of modern agricultural practices and the scope of ICT in agriculture.
3.	Apply the services of Mobile Devices in Agriculture and Rural Development.
4.	Know how to increase productivity and deal with marketing practices for Agri-Business through ICT.
5.	Utilize and provide knowledge on various ICT Based rural development programs run by different units.
6.	Identify the impact of ICT on rural development through sustainable agricultural practices.

Prerequisites: Fundamentals of Information Technology
Additional Material Allowed in ESE: NIL

Detailed Contents:

Part-A

Introduction: Introduction to ICT, ICT in Agricultural and Rural Development. **[2L]**

ICT Infrastructure, Appliances and Services : Limitations in the use of ICTs in Agriculture, Making ICTs Affordable in Rural Areas, Mobile Money Moves to Rural Areas, M-PESA's : Pioneering Money Transfer Service, Delivering Content for Mobile Agricultural Services. **[5L]**

Impact of Mobile Devices on Agriculture and Rural Development: Key Benefits and Challenges Related to Mobile Phones and Agricultural Livelihoods, General Principles for Using Mobile Phones in Agricultural Projects. **[5L]**

Increasing Productivity through ICT: Increasing Crop, Livestock, and Fishery Productivity Through ICT, Achieving Good Farming Practices through Improved Soil, Nutrient, and Land Management, Preventing Yield Losses through Proper Planning and Early Warning Systems, IT Tools having applications in Dairy Industry. **[6L]**

Part-B

Agricultural Marketing with ICT: Mobile Phones as a Marketing Tool, Improving Logistics and Access to Inputs, Smallholder Inclusion in Commercial Supply Chains. **[6L]**

E-Agriculture and rural development: Importance of Rural Development, Evolution of E-agriculture, Benefits And Challenges in E Agriculture , ICT Based E-Agriculture Programs in India, Smart Mobile Application and E-Agriculture. **[6L]**

Case Studies: Impact of digital revolution on rural society in India, Agricultural knowledge dissemination system, Community radio for development of rural India, Mobile communication and development of rural India, Harnessing ICTs for Indian Agricultural and rural development, Agricultural development through Information Communication Technology (ICT) in India. **[6L]**

Text Books:
1. VK Dubey and Farida Ahmad, "ICT: A 21st Century Agrarian Revolution for Rural Development" Agrotech Publishing Academy, 2014
2. "ICT in agriculture: connecting smallholders to knowledge, networks, and institutions" Updated edition, World Bank Publications, 2017.
3. Tomas Mildorf, Karel Charvat jr, "ICT FOR Agriculture, Rural Development, and Environment", Czech centre for science and society, 2012.

Reference Books:
1. R. Saravanan, C. Kathiresan and T. Indra Devi, "Information and Communication Technology for Agriculture and Rural Development", 1st Edition, New India Publishing Agency, 2011

E-Books and Online Learning Material:
1. ICT in agriculture: connecting smallholders to knowledge, networks, and institutions by World Bank Publications
https://openknowledge.worldbank.org/handle/10986/27526(Accessed on June 01, 2021)
2. ICT FOR Agriculture, Rural Development, and Environment by Tomas Mildorf, Karel Charvat jr
https://www.researchgate.net/publication/233920880_ICT_FOR_AGRICULTURE_RURAL_DEVELOPMENT_AND_ENVIRONMENT_-_Where_we_are_Where_we_will_go(Accessed on June 01, 2021)

Online Courses and Video Lectures
1. https://nptel.ac.in/courses/126/104/126104006/(Accessed on June 01, 2021)"ICT for Agriculture Development" https://www.youtube.com/watch?v=eRx5eWz1a8o(Accessed on June 01, 2021)

2. "Role of ICT in Dissemination of Agricultural Information among Farmers" https://www.youtube.com/watch?v=ePfMZvQvInM(Accessed on June 01, 2021)

3. "Panel Discussion on ICT Tools for the Resilient Agriculture Education in India" https://icar.org.in/content/webinar-%E2%80%9Cpanel-discussion-ict-tools-resilient-agriculture-education-india%E2%80%9D-organized(Accessed on June 01, 2021)

Guru Nanak Dev Engineering College, Ludhiana
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B. Tech (IT) Scheme 2018

Subject Code: PEIT-125
Subject Name: Research Methodologies

Programme: B.Tech.	**L:** 3 **T:** 1 **P:** 0
Semester: 8 (Choice- I)	**Teaching Hours:** 36 Hours
Theory/Practical: Theory	**Credits:** 4
Internal Marks: 40	**Percentage of Numerical/Design Problems:** 20%
External Marks: 60	**Duration of End Semester Exam(ESE):** 3hours
Total Marks: 100	**Elective Status:** Professional Elective-IV

On Completion of the course, the student will have the ability to:

CO #	Course Outcomes
1.	To develop understanding of the fundamental theoretical ideas and logic of research.
2.	To identify appropriate research topics and define appropriate research problem and parameters
3.	To develop understanding of the issues involved in planning, designing, executing, evaluating and reporting research;
4.	To introduce students to many of the technical aspects of how to do empirical research using some of the main data collection and analysis techniques
5	To write a research report and thesis
6	To write a research proposal (grants)

Prerequisites: Probability
Additional Material Allowed in ESE: Scientific Calculator
Detailed Contents:

Part-A
Concept of Research: Research: Definition, meaning, need, process and types of research (Qualitative and Quantitative). Research design: Definition, types, Principles, identification and formulation of problem, components and criteria.**[4L]**
Research Methods, Techniques and Tools: Research Methods: Scientific, Historical, Descriptive, Survey & Case Study and Experimental Method: their application in Library & Information Science.**[6L]**
Research Techniques and Tools: Questionnaire, Schedule, Interview, Observation, library records and reports. Scales and Check Lists, Library records and reports.**[5L]**
Part-B
Data Analysis and Interpretation: Role of Statistical Methods in Research; Descriptive Statistical –Measurement of Central Tendency; Correlation, Regression. Statistical Techniques: Measures of Mean, Mode, Median. Measures of Dispersion: Mean deviation. Standard deviation. Presentation of Data: Tabular, graphic, bar diagram, pipeline graphics; Testing of Hypothesis and Statistical Inference; Computerized Statistical Packages: Use of SPSS**[6L]**
Nominal and operational definition: Designing research proposal; Literature search: Print and Non-print and Electronic Sources. **[6L]**
Research Reporting: Guidelines of Research Reporting, Style Manuals –MLA, APA, E-Citation and methods of Research Evaluation. Research Reporting, Technique and Precaution of Interpretation, Significance of Report Writing, Layout and Types of Report.**[8L]**

Text Books:
1. C R Kotari, Research Methodology, Vishwa Prakashan.
2. Cooper and Schinder, Business Research Methods, TMH.
3. David Luck and Ronald Rubin, Marketing Research, PHI.
4. Naresh Amphora, Marketing Research, Pearson Education.
5. S. N. Murthy and U. Bhojanna, Business Research Methods, 3rd Edition, Excel Book

Reference Books:
1. Abrams, M.A., Social Surveys and Social Action, London: Heinemann, 1951.
2. Arthur, Maurice, Philosophy of Scientific Investigation, Baltimore: John Hopkins University Press, 1943.
3. Bernal, J.D., The Social Function of Science, London: George Routledge and Sons, 1939. Chase, Stuart, The Proper Study of Mankind: An inquiry into the Science of Human Relations, New York, Harper and Row Publishers, 1958. S. N. Murthy and U. Bhojanna, Business Research Methods, Excel Books

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Subject Code: PEIT-126
Subject Name: Enterprise Resource Planning

Programme: B.Tech.	**L:** 3 **T:** 1 **P:** 0
Semester: 8 (Choice- I)	**Teaching Hours:** 36 Hours
Theory/Practical: Theory	**Credits:** 4
Internal Marks: 40	**Percentage of Numerical/Design Problems:** 10%
External Marks: 60	**Duration of End Semester Exam(ESE):** 3hours
Total Marks: 100	**Elective Status:** Professional Elective-IV

On Completion of the course, the student will have the ability to:

CO#	Course Outcomes
1.	Make basic use of Enterprise software, and its role in integrating business functions
2.	To understand and examine the functional modules of ERP
3.	Illustrate various technologies related to ERP
4.	Analyze the strategic options for ERP identification and adoption.
5.	Design the ERP implementation strategies.
6.	Create re-engineered business processes for successful ERP implementation.

Prerequisites: None
Additional Material Allowed in ESE: Scientific Calculator
Detailed Contents:

Part-A

ERP- Introduction: An Overview, A Brief History of ERP, Advantages of ERP, Business Functions and Business Processes, Roadmap for Successful ERP Implementation, Basic ERP Concepts, ERP Architectures; Risks of ERP: ERP implementation Failures, Minimising Risk, People, Process and Technology Risks; Implementation Issues, Operation and Maintenance Issues, Managing Risk on ERP Projects; Benefits of ERP. **[12L]**

ERP and Related Technologies: Business Intelligence & Analytics, E-Commerce, M-commerce, Data Warehousing, Data Mining, Online Analytical Processing, Product Life Cycle Management, Supply Chain Management, Customer Relationship Management, Geographical Information Systems, Intranets and Extranets , ERP Security.**[8L]**

Part-B

ERP Functional Modules: Financial Module, Manufacturing (Production) Module, Human Resources Management Module, Plant Maintenance Module, Materials Management Module, Quality Management Module, Marketing Module, Sales, Distribution and Service Module; ERP Development Models **[7L]**

ERP Implementation: Technological, Operational and Business Reasons for Implementing, ERP Implementation Life Cycle and its Phases, ERP Package Selection, Implementation Challenges, ERP Implementation Process: Methodologies, Organisation of the ERP Project Team, Strategy, Plan, Risk Assessment, Budget, cost, Performance Measurement, System Issues; ERP Training and Education, Success and failure factors of an ERP Implementation, ERP Operation and Maintenance.**[13L]**

Text Books:
1. Enterprise Resource Planning, Third or Fourth Edition, Alexis Leon, McGraw Hill , 2019.

Reference Books:

1. Daniel E.O'Leary, Enterprise Resource Planning Systems, Cambridge University Press, 2002.
2. ERP in practice – Vaman – TMH, 2008
3. Ellen Monk, Bret Wagner, Concepts in Enterprise resource planning, Cengage learning, Third edition, 2009

Subject Code: PEIT-127
Subject Name: Engineering Entrepreneurship

Programme: B.Tech.	L: 3 T: 1 P: 0
Semester: 8 (Choice- I)	Teaching Hours: 36 Hours
Theory/Practical: Theory	Credits: 4
Internal Marks: 40	Percentage of Numerical/Design Problems: 0%
External Marks: 60	Duration of End Semester Exam(ESE): 3hours
Total Marks: 100	Elective Status: Professional Elective-IV

On Completion of the course, the student will have the ability to:

CO#	Course Outcomes
1.	Inculcate various entrepreneurship skills to students.
2.	Impart knowledge about industry structure and how to start up a company
3.	Analyze how to generate and exploit new opportunities
4.	Locate domestic and international opportunities
5.	Understand various sources of capital for business.
6.	Identify and understand and differentiate various legal issues for the entrepreneur such as patents, law suits, copy rights etc.

Prerequisites: None
Additional Material Allowed in ESE: Scientific Calculator
Detailed Contents:

Part-A

Entrepreneurship and the Entrepreneurial Mind-Set: The nature of entrepreneurship, entrepreneur's thinking, the intention to act entrepreneurially, Entrepreneur background and characteristics, Role models and support systems, sustainable entrepreneurship, corporate Entrepreneurship, establishing corporate entrepreneurship in organization **[3L]**

Generating And Exploiting New Entry Opportunities And Business Ideas: new entry, generation of new entry of opportunity, risk reduction strategies for new entry exploitation. ideas from trend analysis, trends, sources of new ideas, methods of generating ideas, creative problem solving, creativity and entrepreneurship, innovation, entrepreneurial innovation, opportunity recognition, product planning and development process, e-commerce and business startup.**[5L]**

Identifying and Analyzing Domestic and International Opportunities: Opportunity recognition and the opportunity assessment plan, information sources, sources of information for start-up entrepreneurs in India, technical consultancy organizations, government policies for small scale enterprises, Nature of international entrepreneurship, the importance of international business to the firm, international versus domestic entrepreneurship. **[5L]**

Protecting the Idea and Other Legal Issues for the Entrepreneur: Intellectual property, need for a lawyer, selection of a lawyer, legal issues in setting up the organization, patents, business methods patents, startup without a patent, trademarks, copyrights, trade secrets and noncompetition agreements, licensing, product safety and liability, insurance, Sarbanes-Oxley act, Contracts. **[4L]**

The Business Plan: Planning as part of the business operation, writing the business plan, scope and values of the business plan, evaluation of the plan, presenting the plan, information needs, financial information needs, using the internet as a resource tool, using and implementing the business plan, reasons of business plan failure. **[2L]**

The Marketing Plan: Industry Analysis, Marketing research for the new venture, difference between a business plan and a marketing plan. Preparing the marketing plan, characteristics of a marketing plan, the marketing mix, steps in preparing the marketing plan. **[2L]**

PART - B

The Organizational Plan: Developing the management team, legal forms of business, tax attributes of forms of business, the limited liability company versus the S-corporation, designing the organization, building the management team and a successful organization culture, the role of a board of directors, the board of advisors. **[3L]**

The Financial Plan: Operating and capital budgets, forecasting sales, pro forma income statements, pro forma cash flow statement, pro forma balance sheet, break-even analysis, pro forma sources and applications of funds statement, software packages. **[3L]**

Sources of Capital: An overview, personal funds, family and friends, commercial banks, role of Government Agencies in small-business financing, research and development limited partnerships, Government grants, Private placement, bootstrap financing, financing the business, informal risk-capital market, venture capital, valuing your company, going public. **[4L]**

Management of Enterprises: Objectives and functions of management, scientific management, general and strategic management; introduction to human resource management: planning, job analysis, training, recruitment and selection, etc.; marketing and organizational dimension of enterprises; enterprise financing : raising and managing capital, shares, debentures and bonds. **[4L]**

Case Studies: Case studies related to successful entrepreneurs **[5L]**

Text Books:
1. Robert D. Hsirich, Mathew J. Manimala, Michael P. Peters and Dean A. Shepherd, "Entrepreneurship", 9/e, McGraw Hill Education, 2014.
2. Thomas H. Byers, Richard C. Dorf, Andrew J. Melson, "Technology Ventures: From idea to Enterprise", 4/e McGraw Hill, 2014.
3. Saini, J. S., 'Entrepreneurial Development Programmes and Practices', Deep & Deep Publications (P), Ltd, 2008.

Reference Books:
1. Kenji Uchino, "Entrepreneurship for Engineers", CRC Press, 2009.
2. Vasant Desai, "Entrepreneurship Development", PHI, 2011. 3. Anjan Rai Chaudhri, "Managing New Ventures: Concepts and Cases On Entrepreneurship", PHI, 2010.