

## List of New Courses Introduced in the Academic Year 2019-2020

### EVEN SEM

<b>S.No</b>	<b>Course Code</b>	<b>Name of the Course</b>
1	SCSA3019	Augmented and Virtual Reality
2	SITA3011	Block chain Technologies
3	SCSA1706	Cyber Digital Twin

<b>SCSA3019</b>	<b>AUGMENTED AND VIRTUAL REALITY</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>Credits</b>	<b>Total Marks</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>	<b>100</b>

**COURSE OBJECTIVES**

- To make students to know the basic concepts and framework in virtual reality.
- To teach students the principles and multidisciplinary features in virtual reality.
- To teach students the technology for multimodal user interaction and perception in VR, in particular the visual, audial and haptic interface and behavior.
- To teach students the technology for managing large scale VR environment in real time.
- To provide students with an introduction to the VR system framework and development tools.

**UNIT 1 INTRODUCTION OF VIRTUAL REALITY 9 Hrs.**

Fundamental Concept and Components of Virtual Reality- Primary Features and Present Development on Virtual Reality - VR systems - VR as a discipline-Basic features of VR systems-Architecture of VR systems-VR hardware -VR input hardware: tracking systems, motion capture systems, data gloves-VR output hardware: visual displays.

**UNIT 2 I/O INTERFACE & TECHNIQUES IN VR 9 Hrs.**

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. Interactive Techniques in Virtual Reality: Body Track, Hand Gesture, 3D Manus, Object Grasp.

**UNIT 3 VISUAL COMPUTATION IN VIRTUAL REALITY 9Hrs.**

Fundamentals of Computer Graphics-Software and Hardware Technology on Stereoscopic Display-Advanced Techniques in CG: Management of Large Scale Environments & Real Time Rendering -Development Tools and Frameworks in Virtual Reality: Frameworks of Software Development Tools in VR. X3D Standard; Vega, MultiGen, Virtoolsetc

**UNIT 4 INTRODUCTION OF AUGMENTED REALITY 9Hrs.**

System Structure of Augmented Reality-Key Technology in AR-- AR software development - AR software. Camera parameters and camera calibration. Marker-based augmented reality. Pattern recognition. AR Toolkit

**UNIT 5 APPLICATION OF VR IN DIGITAL ENTERTAINMENT 9Hrs.**

VR Technology in Film & TV Production.VR Technology in Physical Exercises and Games. Demonstration of Digital Entertainment by VR.3D user interfaces - Why 3D user interfaces. Major user tasks in VE.Interaction techniques for selection, manipulation and navigation.3DUI evaluation.

**Max. 45 Hours**

**COURSE OUTCOMES :**

On completion of the course, the student will be able to

- CO1:**Design and implement the VR system.
- CO2:**Implement the Augmented Reality software.
- CO3:**Analyze and design the framework in VR using various software development tools in VR.
- CO4:**Design the multi modal user interface.
- CO5:**Describe the principles and features of VR and AR.
- CO6:**Recognize the technologies used to manage the large scale VR environment in real time.

**TEXT / REFERENCE BOOKS :**

1. Sherman, William R. and Alan B. Craig. Understanding Virtual Reality – Interface, Application, and Design, Morgan Kaufmann, 2002.
2. Fei GAO. Design and Development of Virtual Reality Application System, Tsinghua Press, March 2012.
3. Guanran LIU. Virtual Reality Technology, Tsinghua Press, Jan. 2011.
4. Burdea, G. C. and P. Coffet. Virtual Reality Technology, Second Edition. Wiley-IEEE Press, 2003/2006.

**END SEMESTER EXAM QUESTION PAPER PATTERN**

**Max. Marks: 100**

**Exam Duration:3 Hrs.**

Part A: 10 questions carrying 2 marks each – No choice

20 marks

Part B: 2 questions from each unit of internal choice, each carrying 16 marks

80 marks

<b>SITA3011</b>	<b>BLOCK CHAIN TECHNOLOGIES</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>Credits</b>	<b>Total Marks</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>	<b>100</b>

### **COURSE OBJECTIVES**

- To introduce Bit coin and other crypto currencies.
- To study the algorithms and techniques in block chain.
- To understand the practical aspects in the design of crypto currency
- To understand the function of Block chains as a method of securing distributed ledgers.
- To design, code, deploy and execute a smart contract.

### **UNIT 1 INTRODUCTION TO BLOCKCHAIN**

**9Hrs.**

Basics of blockchain-Public Ledgers-Block Chain as Public Ledgers-Types of Block chains-Pillars of Block chain- Government Initiatives of BlockChain-Bitcoin-SmartContracts

### **UNIT 2 ARCHITECTURE AND CONCEPTUALIZATION OF BLOCK CHAIN, CRYPTO CURRENCIES**

**9Hrs.**

Block in a Block chain-find Transactions-Distributed Consensus-Proof of work, Stake, Space-Attacks on POW-Ethereum- Pos/POW Hybrids-Crypto currency to block chain 2.0, Model of Blockchain-Algorand

### **UNIT 3 CRYPTO PRIMITIVES, SECURING AND INTERCONNECTING PUBLIC AND PRIVATE BLOCK CHAINS**

**9Hrs.**

Hash Function and Merle Tree-Security Properties-Security Considerations for block chain-Digital Signature-Public Key Cryptography-Bit coinblock chain incentive structures- Nash Equilibriums-evolutionary stable strategies,-and Pareto efficiency (game theory) Weaknesses and news Points of Failure Mitigation Methods Redundancies and fall-back methods

### **UNIT 4 MINING AND CRYPTO CURRENCIES - HOW TO USE AND INTERACT**

**9Hrs.**

Mining-Pools-Impact of CPU and GPU-Transaction in Bit coin Network- Block Mining-Block propagation and block relay

### **UNIT 5 USE CASES-APPLICATIONS IN DIFFERENT AREAS**

**9 Hrs.**

Industry applications of Blockchain-Blockchain in Government-Government use cases-Preventing Cybercrime through block chain-Block Chain in defense, tax payments

### **COURSE OUTCOMES :**

On completion of the course the student will be able to

**CO1:** Explain the structure of a block chain.

**CO2 :**Analyze the incentive structure in a block chain based system.

**CO3 :**Judge the scenario where “smart” contract is most appropriate.

**CO4 :**Identify Basic knowledge of Bitcoin, Ethereum.

**CO5 :**Apply Blockchain in future use cases for security.

**CO6 :**Understand the various Block Chain applications.

### **TEXT / REFERENCE BOOKS :**

1. Mastering Bitcoin: Unlocking Digital Cryptocurrencies, by Andreas Antonopoulos O'Reilly, First Edition, 2014.
2. Blockchain by Melanie Swa, O'Reilly Media 2015
3. Zero to Block chain - An IBM Redbooks course, by Bob Dill, David Smits -

### **END SEMESTER EXAM QUESTION PAPER PATTERN**

**Max. Marks: 100**

**Exam Duration:3 Hrs.**

Part A: 10 questions carrying 2 marks each – No choice

20 marks

Part B: 2 questions from each unit of internal choice, each carrying 16 marks

80 marks

SCSA1706	CYBER DIGITAL TWIN	L	T	P	Credits	Total Marks
		3	0	0	3	100

### COURSE OBJECTIVES

- To gain knowledge in cyber security and digital firmware.
- To identify types of digital twin and data IoT Technologies
- To make a twin modelling.
- To understand about Risk Management and Twin Constructions
- To make students aware of security concerns while implementing Cyber Digital Twin Technology

### UNIT I INTRODUCTION

9 Hrs

Introduction- Cyber Digital twin-definition-uses and benefits-need for digital twin-working principle Technology Digital thread-digital shadow-building blocks of digital twin-digital twin technology drivers and enablers.

### UNIT II DATA MODELLING ENVIRONMENT

9 Hrs

Types of digital twin-Based on Product and Process-Based on Functionality-Based on Maturity. Development considerations-Overview of Data-Modeling Environment. Modelling-model and data management-Managing data-implementing the model- Cloud and IOT technologies.

### UNIT-III DIGITAL TWIN OPTIMIZATION

9 Hrs

Cyber range vs digital twin-human behavior modeling in digital twin-optimization using digital twin-digital twin and cyber security- Techniques. Technologies-Industrial IOT and Digital Twin-simulation and digital twin-Machine learning and digital twin-virtual reality and digital twin-cloud technology and digital twin.

### UNIT IV RISK MANAGEMENT

9 Hrs

Digital twin and Risk Assessment-Digital twin reference model-Implementation-Development of risk assessment plan-Development of communication and control system-Development of digital twin tools-Integration-platform validation-Difficulties-Practical implications.

### UNIT –V APPLICATIONS

9 Hrs

Applications: Digital Twin in Manufacturing-Digital Twin in Automotive-Digital Twin in Healthcare-Digital Twin in Utilities-Digital Twin in Construction.

### COURSE OUTCOMES:

On completion of the course the student will be able to

**CO1:** Implement fundamental Cyber System and Digital Twin Technology

**CO2:** Understand types and data modelling of Digital twin

**CO3:** Understand the optimization, simulation and validation

**CO4:** Know about the risk and Control development

**CO5:** Understand the application in different fields

**CO6:** Develop applications using Cyber digital Twin Technologies

### TEXT/REFERENCE BOOK:

1. Cyber-physical System and Digital Twins - Michael E. AuerKalyan Ram B.Digital - Part of the Lecture Notes in Networks and Systems book series.
2. Development and Deployment on the Cloud – Nassim Khaed, Bibin Pattel and Affan Siddiqui – Elsevier 2020.
3. Hacking Exposed Industrial Control Systems: ICS and SCADA Security Secrets & Solutions (1st Edition), by Clint Bodungen, Bryan Singer, Aaron Shbeeb, Kyle Wilhoit, and Stephen Hilt, ISBN: 978-1259589713.
4. Applied Cyber Security and the Smart Grid: Implementing Security Controls into the Modern Power Infrastructure (1st Edition), by Eric D. Knapp and Raj Samani
5. The Art of Invisibility - Kevin Mitnick,2017.

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Part B: 2 questions from each unit of internal choice, each carrying 16 marks

**Exam Duration:3 Hrs.**

20 marks

80 marks