Course Code	18CSE426J	Course Name	Quantum Machine Learning	Course Category	E	Professional Elective	L	T	P	C
							2	0	2	3

Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil
Course Offering Department	Computing Technologies	Data Book / Codes/Standards	Nil		

Course Objectives: The purpose of learning this course is to:

1 :	Gain knowledge about quantum computing, quantum mechanics and analyze the quantum circuits
2 :	Learn about the fundamentals of Machine Learning
3 :	Utilize Qiskit for supervised learning
4 :	Learn unsupervised learning with Qiskit
5 :	Utilize the quantum neural networks with Pennylane

Course Outcomes (CO): At the end of this course, learners will be able to:

		Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)	Engineering Knowledge	Problem Analysis	Design & Development	Analysis, Design, Research	Modern Tool Usage	Society & Culture	Environment & Sustainability	Ethics	Individual & Team Work	Communication	Project Mgt. & Finance	Life Long Learning	PSO - 1	PSO - 2	PSO – 3
		1	2	3	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CO-1 :	Identify the need of quantum computing and quantum gates	4	70	75	1	3	-		1						-	-	-	-	-
CO-2 :	Exploring the difference of Classical machine learning and. Quantum Machine Learning	4	70	75	2	3	1	-	-		-		-		-	-	-	-	-
CO-3 :	Develop the Quantum Machine Learning models	4	60	70	2	3	-	3	-		-		-		-	-	-	-	-
CO-4 :	Incorporate the Unsupervised learning with Qiskit	4	70	80	2	3	-	3	-		-		-		-	-	-	-	-
CO-5 :	Demonstrate the QNN, QCNN, QGAN using Qiskit and Pennylane	4	70	75	1	3	3	2	-		-		-		-	-	-	-	-

Duration (hour)		12	12	12	12	12
S-1	SLO-1	Introduction to Quantum Computing	Classical vs. Quantum Machine Learning	Introduction to Quantum Machine Learning	Introduction to Unsupervised learning	Introduction to Quantum Neural Networks
	SLO-2	Introduction to Superposition	Examples of Typical Machine Learning Problems	Four approaches to QML, Parameterized quantum circuits (PQC)	Principle Component Analysis	Quantum Convolutional Neural Networks(QCNN)
S-2	SLO-1	Classical superposition	The Three Ingredients of a Learning Problem	Quantum Information Encoding	Clustering	Hybrid QNN
	SLO-2	Quantum superposition				Problem solving session on a real dataset
S 3-4	SLO-1	**Lab 1:** Introduction to Qiskit	**Lab 4:** Python basics and Project preparation phase 1 (Analysis of problem statement related to quantum computing)	**Lab 7:** Implementation of Peter shor algorithm	**Lab 10 :** Implementation of Quantum K Nearest Neighbour	**Lab 13:** Implementation of Quantum Neural Networks
	SLO-2					
S-5	SLO-1	What is a Qubit?	Risk minimization in Supervised Learning	Training parameterized quantum circuits	Classifiers used in QML	Classical Generative Adversarial Networks (GAN)
	SLO-2	Mathematical Representation on Qubits	Training in Unsupervised Learning		Problem solving session	
S-6	SLO-1	Bloch Sphere	Methods in Machine Learning	Supervised learning	QML programming concepts in Qiskit	Quantum Generative Adversarial Networks (QGAN)
	SLO-2	Quantum Gates	Linear Models	Quantum variational classification	Analysis of Qiskit	
S 7-8	SLO-1	**Lab 2:** Develop circuit composer in Qiskit lab	**Lab 5:** Implement single and multiple qubit gates using python	**Lab 8:** Implementation of Grover's algorithm	**Lab 11:** Implementation of different QML models	**Lab 14:** Implementation of QCNN in healthcare applications
	SLO-2					
S-9	SLO-1	Entanglement	Neural Networks	Quantum kernel estimation / Quantum feature map and kernels	Analysis of exercises created by Qiskit	QGAN in Qiskit
	SLO-2					Problem Solving session

S-10	SLO-1	*Multi-Qubit states*	*Graphical and Kernel methods*	*Quantum Support Vector classification (QSVM)*	*Discussion about IBM Qiskit Summer School Challenge exercises 2022 and 2023*	*Pennylane and AWS Quantum Braket introduction*
	SLO-2	*CNOT gate*				*Use cases in QML*
S 11-12	SLO-1	**Lab 3:** *Demonstrate Quantum gates in Qiskit*	**Lab 6:** *Project preparation phase 2 (Design of the project based on problem statement using Qiskit or Pennylane)*	**Lab 9:** *Implementation of QSVM and Project preparation phase 3(Implementation of quantum problem statement in Qiskit or Pennylane)*	**Lab 12:** *project presentation phase 4 demo (use case developed) and thesis preparation*	**Lab 15:** *Project report submission (Thesis of use case developed)*
	SLO-2					

Learning Resources	
1.Quantum Computation and Quantum Information. M. A. Nielsen and I. L. Chuang, Cambridge University Press *2. Ciaran Hughes, Joshua Isaacson, Anastatsia Perry, Ranbel F. Sun, Jessica Turner, "Quantum Computing for the Quantum Curious", Springer, 2021* *3. Maria Schuld and Francesco Petruccione, "Machine Learning with Quantum Computers", Second Edition, Springer, 2021* *4. Maria Schuld and Francesco Petruccione, "Supervised Learning with Quantum Computers", Springer, 2018* *5. Peter Wittek, "Quantum Machine Learning – What Quantum Computing Means to Data Mining", Elsevier.* *7. Michael A. Nielsen and Issac L. Chuang," Quantum Computation and Information, Cambridge, 2002* *8. Mikio Nakahara and Tetsuo Ohmi,"Quantum Computing", CRC Press, 2008* *9. N. David Mermin, "Quantum Computer Science", Cambridge, 2007* *10. https://qiskit.org/*	*11.An Introduction to Quantum Computing. P. Kaye, R. Laflamme, and M. Mosca, Oxford University Press, New York* *12. Quantum Computer Science. N. David Mermin:, Cambridge University Press* *13. Quantum Algorithm Zoo. https://quantumalgorithmzoo.org/* *14. Quantum Algorithm Zoo. https://quantumalgorithmzoo.org/* *15. https://qiskit.org/documentation/machine-learning/* *16. https://qiskit.org/textbook/ch-algorithms/index.html* *17. Course	8.370.1x	MIT Open Learning Library* *18. https://github.ibm.com/dmadan07/Grover-ex* *19. https://qiskit.org/documentation/finance/* *20. https://qiskit.org/textbook/ch-algorithms/index.html* *21. https://cds.cern.ch/record/1522001/files/978-1-4614-6336-8_BookBackMatter.pdf* *22. The Story of Shor's Algorithm, Straight From the Source	Peter Shor - YouTube* *23. Janani A (Resource Website) (google.com)* *24. https://www.youtube.com/watch?v=3-e4xJa7Flk (IBM Qiskit Summer School – 2023 tutorials)*

Learning Assessment

	Bloom's Level of Thinking	Continuous Learning Assessment (50% weightage)								Final Examination (50% weightage)	
		CLA – 1 (10%)		CLA – 2 (15%)		CLA – 3 (15%)		CLA – 4 (10%)			
		Theory (5%)	Practice (5%)	Theory (7.5%)	Practice (7.5%)	Theory (7.5%)	Practice (7.5%)	Theory (5%)	Practice (5%)	Theory (25%)	Practice (25%)
Level 1	Remember	20%		15%		15%				15%	
Level 2	Understand	20%		25%		25%		25%		20%	
Level 3	Apply	45%	30%	40%	35%	40%	40%	20%	20%	45%	30%
Level 4	Analyze	15%	40%	20%	35%	20%	30%	20%	50%	20%	35%
Level 5	Evaluate		30%		30%		30%	25%	30%		35%
Level 6	Create										
	Total	100 %	100 %	100 %	100 %	100 %	100 %	100%	100%	100%	100%

CLA – 4 can be from any combination of these: Assignments, Seminars, Tech Talks, Mini-Projects, Case-Studies, Self-Study, MOOCs, Certifications, Conf. Paper etc.,

Course Designers

Experts from Industry	Experts from Higher Technical Institutions	Internal Experts
Karthick Ganesh and Janani Ananthanarayanan, BOSONQ Psi,Bengaluru	*Dr.Jayakumar Vaithiyashankar, IBM Quantum Educator, IBM Qiskit Advocate.,Presidency university ,Bengaluru.*	*1.Dr. Gayathri.M* *Assistant Professor,* *CTech* *2. Dr. S. Nalini,* *Assistant Professor,* *CTech*

Course Code	18CSE420T	Course Name	Oracle Cloud Infrastructure Foundations	Course Category	E	Professional Elective	L	T	P	C
							3	0	0	3

Pre-requisite Courses	Nil		Co-requisite Courses	Nil		Progressive Courses	Nil			
Course Offering Department		Computing Technologies		Data Book / Codes/Standards		Nil				

Course Learning Rationale (CLR): *The purpose of learning this course is to:*

		Learning			Program Learning Outcomes (PLO)															
		1	2	3	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CLR-1 :	Describe the key features and components of OCI																		
CLR-2 :	Identify the core OCI service offerings																		
CLR-3 :	Understand OCI security model																		
CLR-4 :	Get to know the OCI compliance structure																		
CLR-5 :	Understand OCI pricing, support model and operations																		

PLO column headers: Level of Thinking (Bloom), Expected Proficiency (%), Expected Attainment (%); Engineering Knowledge, Problem Analysis, Design & Development, Analysis, Design, Research, Modern Tool Usage, Society & Culture, Environment & Sustainability, Ethics, Individual &Team Work, Communication, Project Mgt. & Finance, Life Long Learning, PSO – 1, PSO – 2, PSO – 3

Course Learning Outcomes (CLO): *At the end of this course, learners will be able to:*

		Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CO-1 :	Demonstrate the key features of OCI	2	80	85	3	-	-	-	-	-	-	-	-	-	-	-	3	-	-
CO-2 :	Implement the core OCI service offerings	2	75	80	3	-	-	-	-	-	-	-	-	-	-	-	3	-	-
CO-3 :	Incorporate the OCI security model	2	85	80	3	-	-	2	-	-	-	-	-	-	-	-	2	-	-
CO-4 :	Evaluate the OCI compliance structure	2	80	75	3	-	2	-	2	-	-	-	-	-	-	-	-	3	-
CO-5 :	Analyze OCI Pricing, support model and operations	2	75	85	2	-	2	-	-	-	-	-	-	-	-	-	-	3	-

Duration (hour)		9	9	9	9	9
S-1	SLO-1	*OCI Introduction*	Networking	Database Introduction	Observability and Management Introduction.	Security Introduction
	SLO-2	*OCI Introduction - Illustration*	Compute and Storage	*Database Overview - Illustration*	Monitoring	Cloud Guard
S-2	SLO-1	OCI Overview	VCN Introduction	App Dev	*Monitoring - Illustration*	Security Zones
	SLO-2	OCI Overview - Illustration	VCN Routing	Database Introduction	Logging	Security Advisor
S-3	SLO-1	OCI Architecture	VCN Security	Autonomous DB	*Logging - Illustration*	Security Zones and Security Advisor - Illustration
	SLO-2	*OCI Architecture - Illustration*	VCN Basics	DB Systems	Events	Vulnerability Scanning
S-4	SLO-1	Identity and Access Management	Local Peering (Using DRG)	MySQL	*Events and Notification - Illustration*	*Vault*
	SLO-2	IAM Introduction	Load Balancer	NoSQL	Analytics and AI Introduction	Web Application Firewall
S-5	SLO-1	Compartments	*Load Balancer - Illustration*	Developer Services Overview	Data Integration	Web Application Firewall - Illustration
	SLO-2	Demo: Compartments and Identity Domains	Compute Introduction	Oracle Container Engine for Kubernetes (OKE)	Data Flow	Bastion
S-6	SLO-1	AuthN	Instance Basics	Oracle Container Engine for Kubernetes (OKE) - Illustration	Data Catalog	Hybrid Introduction
	SLO-2	Demo: AuthN	Scaling	Oracle Container Registry (OCIR)	Data Science	Dedicated Regions
S-7	SLO-1	AuthZ	OS Management Service	OCI DevOps Service		Oracle Cloud VMware Solution
	SLO-2	Demo: AuthZ	Storage Introduction	API Gateway		Pricing
S-8	SLO-1		Object Storage	Functions		Cost Management
	SLO-2		Block Volume	*Functions - Illustration*		*Cloud Advisor - Illustration*
S-9	SLO-1		File Storage	Resource Manager		*Cost Management - Illustration*
	SLO-2		Migration Services	OCI Developer Services Case Study		Tagging

Learning Resources	Text Book: Nouman Ahmed Khan, "Oracle Cloud Infrastructure (OCI) Foundations Associate : Study Guide With Practice Questions & Labs", Second Edition, 2022. Reference Books: 1. Aparna Nagaraj and joseph Garcia, "Oracle Cloud Infrastructure Fundamentals", First Edition, 2017. 2. Y. V. Ravi Kumar and K. M. Krishna Kumar,"Oracle Cloud Infrastructure Foundations Associate Study Guide: Exam 1Z0-1085", Wiley Publisher, 2023.	

Learning Assessment											
	Bloom's Level of Thinking	Continuous Learning Assessment (50% weightage)								Final Examination (50% weightage)	
		CLA – 1 (10%)		CLA – 2 (15%)		CLA – 3 (15%)		CLA – 4 (10%)#			
		Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice
Level 1	Remember Understand	40 %	-	30 %	-	30 %	-	30 %	-	30%	-
Level 2	Apply Analyze	40 %	-	40 %	-	40 %	-	40 %	-	40%	-
Level 3	Evaluate Create	20 %	-	30 %	-	30 %	-	30 %	-	30%	-
	Total	100 %		100 %		100 %		100 %		100 %	

CLA – 4 can be from any combination of these: Assignments, Seminars, Tech Talks, Mini-Projects, Case-Studies, Self-Study, MOOCs, Certifications, Conf. Paper etc.,

Course Designers		
Experts from Industry	Experts from Higher Technical Institutions	Internal Experts
1. Mr.Prakash Phule, Senior Consultant at Oracle India Pvt Ltd, Mumbai, Maharashtra, India	1.	1. Dr.A.Pandian, SRMIST
2. Mr. N.Krishnamoorthy – Business Manager- South,Greens, #5 Muthiah MudaliSreet, Cathedral Road. Chennai -86	2.	2. Dr.V.V.Ramalingam , SRMIST

Course Code	18CSE304J	Course Name	BUILDING APPLICATIONS USING OPEN SOURCE AUGMENTED REALITY AND VIRTUAL REALITY SDKS	Course Category	E	Professional Elective	L	T	P	C
							2	0	2	3

Pre-requisite Courses	Nil		Co-requisite Courses	Nil		Progressive Courses	Nil	
Course Offering Department		School of Computing			Data Book / Codes/Standards		Nil	

Duration (hour)		9	9	9	9	9
S-1	SLO-1	VR, AR, MR, xR: similarities and differences	*AR components and techniques*	*AR Advanced SDKs*	*Specific Aspects of Unreal Engine*	*Introduction to Oculus Quest*
	SLO-2	Current trends, and state of the art in immersive technologies				
S-2	SLO-1	The future of human experience - Human Perception and Cognition	*AR Frameworks*	*ARCore& Kit*	*Blueprint for VR*	*Oculus Quest set up and environment*
	SLO-2					
S-3-4	SLO-1	Developing platforms and consumer devices	*Practical understanding of real world AR application development*	*Hands on Unity Software*	*VR interactions*	*Object Interaction in Oculus Quest*
	SLO-2					
S-5	SLO-1	Human Visual System, Human Auditory System, Human Vestibular System	*VR components and techniques*	*Perform preliminary data quality check and formatting*	*setting Unreal Engine levels*	*User Interface Development*
	SLO-2					
S-6	SLO-1	Physiology, Psychology and the	*VR Frameworks*	*AR Spark Studio*	*Small application demos*	*Setup and Locomotion concepts*
	SLO-2	Human Experience, Adaptation and Artefacts, Ergonomics, Ethics				
S-7-8	SLO-1	Guidelines for Proper VR Usage	*Practical understanding of real world VR application development*	*Use case applications using Unity software*	*Unreal Engine optimization on the demos*	*VR application*
	SLO-2	User-Centered Design, User Experience				
S-9	SLO-1	Scientific Concerns, VR	*AR methodologies and project types*	*Wikitude*	*Unreal Engine Physics*	*Application Interaction*
	SLO-2	Health and Safety Issues, Effects of VR Simulations on Users, Cyber sickness, before and now, Ethical Code of Conduct.	*VR methodologies and project types*	*Usage of 8th Wall tool*	*Advanced Unreal Engine use cases*	

Learning Resources	1. *David Rose,"Super sight: What Augmented Reality Means for our lives, our work, and the way we imagine our future", Nov 2021*	2. *Jonathan Linowes, "Augmented Reality with Unity AR Foundation- a practical guide to cross platform AR development with Unity and later versions, 2021*
	3. *Lily Sayter, Brain Solis, The augmented Workforce, 2020*	4. *Kenneth J.Varnum, Beyond Reality- Augmented Virtual and Mixed Reality in the library, 2020*
	5. *Hevin W Allen, Meta Verse- A beginners guide to the new digital revolution*	

Learning Assessment

	Bloom's Level of Thinking	Continuous Learning Assessment (50% weightage)								Final Examination (50% weightage)	
		CLA – 1 (10%)		CLA – 2 (15%)		CLA – 3 (15%)		CLA – 4 (10%)			
		Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice
Level 1	Remember	25%	25%	25%	25%	25%	25%	25%	25%	25%	25%
Level 2	Understand	25%	25%	25%	25%	25%	25%	25%	25%	25%	25%
Level 3	Apply	25%	25%	25%	25%	25%	25%	25%	25%	25%	25%
Level 4	Analyze	25%	25%	25%	25%	25%	25%	25%	25%	25%	25%
Level 5	Evaluate	-	-	-	-	-	-	-	-	-	-
Level 6	Create	-	-	-	-	-	-	-	-	-	-
	Total	100 %		100 %		100 %		100 %		100 %	

CLA – 4 can be from any combination of these: Application Assignments, Seminars, Tech Talks, Mini-worklets

Course Code	18CSE412J	Course Name	Offensive Security		Course Category	E	Professional Elective		L	T	P	C
									2	0	2	3

Pre-requisite Courses	Nil		Co-requisite Courses	Nil		Progressive Courses	
Course Offering Department		Computing Technologies		Data Book / Codes/Standards		Nil	

Course Objective:	The purpose of learning this course is to:
CLR-1	Apply penetration testing tools for kali Linux systems
CLR-2	Practice on offensive tools and Metasploit framework
CLR-3	Analyze the types of cyber attacks
CLR-4	Demonstrate offensive JavaScript tools and explore antivirus software
CLR-5	Discover Windows hacking tools

Learning 1-6

	Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)

Program Learning Outcomes (PLO)

Course Outcomes (CO):	At the end of this course, learners will be able to:	Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)	1 Engineering Knowledge	2 Problem Analysis	3 Design & Development	4 Analysis, Design, Research	5 Modern Tool Usage	6 Society & Culture	7 Environment & Sustainability	8 Ethics	9 Individual & Team Work	10 Communication	11 Project Mgt. & Finance	12 Life Long Learning	13 PSO - 1	14 PSO - 2	15 PSO - 3
CO-1 :	Find and fix the vulnerabilities in web applications	3	60	70	3	-	-	-	2	-	-	1	-	-	-	3	-	-	-
CO-2 :	Create and test exploit code for executing attacks, and evade detection.	3	60	70	3	-	-	-	2	-	-	1	-	-	-	3	-	-	-
CO-3 :	Identify and handle smuggling, phishing and injection attacks	4	60	70	3	-	-	-	2	-	-	1	-	-	-	3	-	-	-
CO-4 :	Detect windows credential attacks using tools	4	60	70	3	-	-	-	2	-	-	1	-	-	-	3	-	-	-
CO-5 :	Operate on Applocker bypass for windows	3	60	70	3	-	-	-	2	-	-	1	-	-	-	3	-	-	-

Duration (hour)		15	15	15	15	15
S-1	SLO-1	Linux Fundamentals	Windows Startup – Persistence - demo	Downloaders – HTML Smuggling attack on chrome and edge	Jscript Payload creation and execution with offensive tool -demo	Windows Credential Attacks with Accessibility Features
	SLO-2	Types of Penetration Testing	Windows Components- Windows Process	Creating Phishing attacks with custom malware	Porting C# code to JavaScript	Bypassing Windows 7 administrator account with Accessibility Features
S-2	SLO-1	Red team and Blue team Introduction- attack chain	Understanding on Malware- demo	VBA Macros with demo	Jscript offensive tool creation with C# -1	Applocker Bypass Theory- Bypass using misconfiguration
	SLO-2	Basic Bash Scripting with demo	Introduction to Offensive Tools	PowerShell Download Cradle	Jscript offensive tool creation with C# -2	Bypass using DLL execution and external tools
S-3-4	SLO-1	Lab 1: Ping Sweep the network	Lab 4: Offensive File Analysis	Lab 7: HTML Smuggling attack via all browsers	Lab 10: C# Shellcode Runner Creation with Windows API (WIN32 API) and port io to JScript	Lab 13: Applocker bypass using the above techniques and document
	SLO-2					
S-5	SLO-1	Reconnaissance Phase tools with demo	Introduction to Nmap and Demo	Demo on creating a legitimate look-alike phishing document with payload	How Antivirus software works Antivirus database update - 1	Living off the land Binaries (Lolbin) – demo
	SLO-2	Enumeration Phase	Introduction to Nikto and Demo	VBA Shellcode Runner- PowerShell Shellcode Runner	How Antivirus software works Antivirus database update - 2	Analysis on a realtime malware that are using lolbin
S-6	SLO-1	Tools for Enumeration	Metasploit Framework and Demo	Pinvoke Usage for PowerShell Shellcode Runner - 1	Find the antivirus Signature from the detected file	Applocker Bypass with Windows Binaries abd XSL transformation
	SLO-2	Demo on Enumeration	Study of Payload creation with Metasploit	PowerShell Shellcode Runner with UserAgents	Antivirus evasion with Metasploit – 1 and 2	PowerShell Empire – All- tool
S-7-8	SLO-1	Lab 2: Reconnaissance network artifacts of the target and enumerate the target	Lab 5: Do Pingsweep, enumeration via Nmap, Reconnaissance with Nikto on the target	Lab 8: Create a PowerShell Shellcode runner and import it to Microsoft Winword and get a reverse connection	Lab 11: Using Metasploit try to reduce the detection of an offensive file	Lab 14: Applocker bypass using the above techniques and document, Create a simple lolbin offensive file that connects back to you
	SLO-2					

S-9	SLO-1	*Windows Operating Systems Concepts*	*Demo on creating an offensive tool*	*Process Injection – Introduction and attack with C#*	*Encoders- Encrypters*	*Overview of Hardware hacking tools*
	SLO-2	*Demo on Windows Operating systems boot process*	*Staged Metasploit payload*	*Malicious Process Injection Analysis with Tools- DLL Injection attack with C#*	*Antivirus Evasion with C# Shellcode C# shellcode encrypters*	*Wifi and USB Hacking tools*
S -10	SLO-1	*User mode and Kernel mode process Windows APIs*	*Non-Staged Metasploit payload Building our First Payload Listeners*	*Malicious DLL Injection Analysis with Tools*	*Windows Credential Attacks*	*Opensource Intelligence Framework (OSINT)*
	SLO-2	*Demo on Windows APIs and their functionality, Windows Registry*	*Meterpreter Payload- Enumeration with Meterpreter Sessions-demo*	*Process Hollowing Injection - Introduction*	*Mimikatz and memory dumping*	*Demo on OSINT -1*
S-11-12	SLO-1	*Lab 3: Profiling a running process and report*	*Lab 6: Create an Offensive tool which connects back to your Listener*	*Lab 9: Create a simple process injection with a windows calculator*	*Lab 12: Tools used for Windows credential Attack*	*Lab 15: Profile the target and identify possible backdoors in the system to gain access to SYSTEM-level privilege and create a report on the findings.*
	SLO-2					
	SLO-2					

Learning Resources	1. *Raphaël Hertzog, Jim O'Gorman, Mati Aharoni, "Kali Linux Revealed - Mastering the Penetration Testing Distribution", OFFSEC Press, 1st Editon, 2017* 2. *Patrick Engebretson," The Basics of Hacking and Penetration Testing: Ethical Hacking and Penetration Testing Made Easy", Syngress; 2 edition, 2013*

Learning Assessment

	Bloom's Level of Thinking	Continuous Learning Assessment (50% weightage)								Final Examination (50% weightage)	
		CLA – 1 (10%)		CLA – 2 (15%)		CLA – 3 (15%)		CLA – 4 (10%)			
		Theory (5%)	Practice (5%)	Theory (7.5%)	Practice (7.5%)	Theory (7.5%)	Practice (7.5%)	Theory (5%)	Practice (5%)	Theory (25%)	Practice (25%)
Level 1	Remember	20%		15%		15%				15%	
Level 2	Understand	20%		25%		25%				20%	
Level 3	Apply	45%	30%	40%	35%	40%	40%	15%	20%	45%	30%
Level 4	Analyze	15%	40%	20%	35%	20%	30%	20%	50%	20%	35%
Level 5	Evaluate		30%		30%		30%	15%	30%		35%
Level 6	Create	20%		15%		15%				15%	
	Total	100 %	100 %	100 %	100 %	100 %	100 %			20%	

CLA – 4 can be from any combination of these: Assignments, Seminars, Tech Talks, Mini-Projects, Case-Studies, Self-Study, MOOCs, Certifications, Conf. Paper etc.,

Course Designers

Experts from Industry	Experts from Higher Technical Institutions	Internal Experts
1. Mr. Reegun Richard Jayapaul, Senior Threat Architect at Trustwave, reegunj@outlook.com		*1. Mrs. B. Sowmiya, SRMIST*
		2. Mrs. B. Ida Seraphim, SRMIST

Course Code	18CSE310J	Course Name	Quantum Computation	Course Category	E	Professional Elective	L	T	P	C
							2	0	2	3

Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil
Course Offering Department	Computing Technlogies	**Data Book / Codes/Standards**		Nil	

Course Objectives:	The purpose of learning this course is to:
1 :	Gain knowledge about quantum computing and quantum mechanics
2 :	Analyze the Quantum Circuits
3 :	Utilize Open source Qiskit for quantum programing
4 :	Learn about Grover and deustch Jozsa quantum algorithms
5 :	Utilize the quantum concept and explore its applications

Learning — 1 2 3 (Level of Thinking (Bloom), Expected Proficiency (%), Expected Attainment (%))

Program Learning Outcomes (PLO) — 1 Engineering Knowledge, 2 Problem Analysis, 3 Design & Development, 4 Analysis, Design, Research, 5 Modern Tool Usage, 6 Society & Culture, 7 Environment & Sustainability, 8 Ethics, 9 Individual & Team Work, 10 Communication, 11 Project Mgt. & Finance, 12 Life Long Learning, 13 PSO - 1, 14 PSO - 2, 15 PSO – 3

Course Outcomes (CO):	At the end of this course, learners will be able to:	L	P	A	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CO-1 :	Identify the need of quantum computing and quantum mechanics	4	70	75	1	3	-	-	-	-	-	-	-	-	-	-	-	-	-
CO-2 :	Explore the Quantum gates and Quantum Circuits	4	70	75	2	3	1	-	-	-	-	-	-	-	-	-	-	-	-
CO-3 :	Develop the quantum programs for circuit optimization.	4	60	70	2	3	-	3	-	-	-	-	-	-	-	-	-	-	-
CO-4 :	Incorporate the Quantum algorithms Deustch Jozsa and Grover	4	70	80	2	3	-	3	-	-	-	-	-	-	-	-	-	-	-
CO-5 :	Demonstrate the different Quantum simulators and real time applications	4	70	75	1	3	-	3	-	-	-	-	-	-	-	-	-	-	-

Duration (hour)		12	12	12	12	12
S-1	SLO-1	Need for Quantum Computing and fundamental concepts	Fubini Study metric	Quantitative measures of circuit	Introduction to Grover algorithm	Introduction to quantum applications
	SLO-2	Vector spaces, Probability	Geometry of quantum states	Analysis of quality of Circuits	Detailed walk through on Grovers algorithm	Research challenges of quantum
S-2	SLO-1	Complex numbers and mathematical preliminaries	Tutorial style problem solving session	Circuit optimization	Quantum Amplitude Estimation	Introduction to QC Models
	SLO-2	Postulates of quantum mechanics				Physical Realization of Models
S 3-4	SLO-1	**Lab 1:** Python basics	**Lab 4:** Quantum hardware and Simulators	**Lab 7:** Quantum circuits	**Lab 10 :** Quantum teleportation in Qiskit	**Lab 13:** project presentation and demo (use case developed)
	SLO-2					
S-5	SLO-1	Bra-ket notations	Complexity classes	Tutorial style problem solving sessions	Tutorial-problems analysis	Tech landscape
	SLO-2	Measurements	Turing machine		Problem solving session	VQE
S-6	SLO-1	Composite systems	Turing machine concepts	Introduction to quantum algorithms	Programming concepts in Qiskit	Tutorial-problems
	SLO-2	Bells theorem	Quantum gates	Deustch Jozsa algorithm	Analysis of Qiskit	Problem solving session
S 7-8	SLO-1	**Lab 2:** Navigation on Circuit composer and Qiskit in Quantum Lab	**Lab 5:** implement single and multiple qubit gates	**Lab 8:** Visualization tools (State vector and Q-Sphere)	**Lab 11:** Implementation of Grovers algorithm	**Lab 14:** Project thesis preparation
	SLO-2					
S-9	SLO-1	Entanglement	Quantum circuits	Oracles and Phase kick back	Exploring Qiskit	Discussion of different use cases
	SLO-2				Programming in quantum	Use case in logistics
S-10	SLO-1	Pure and Mixed states	Quantum circuits design	Deustch Jozsa Algorithm-details	Analysis of exercises created by NPTEL	Use case in ML and image processing

	SLO-2	*Block sphere*			*Usage of IBM composer*	*Use case in finance and quantum cryptography*
S 11-12	SLO-1	**Lab 3:** *Project preparation phase 1 (Analysis of problem statement related to quantum computing)*	**Lab 6:** *Project preparation phase 2 (Design of the project based on problem statement)*	**Lab 9:** *Project preparation phase 3 (Implementation of quantum problem statement in cloud environment)*	**Lab 12:** *Project preparation phase 4 (Testing of the software implemented)*	**Lab 15:** *Project report submission (Thesis of use case developed)*
	SLO-2					

Learning Resources	*1. Quantum Computation and Quantum Information. M. A. Nielsen and I. L. Chuang, Cambridge University Press* *2. Presskil Lecture notes: Available online: http://www.theory.caltech.edu/~preskill/ph229/* *3 Michael A. Nielsen and Issac L. Chuang," Quantum Computation and Information, Cambridge, 2002* *4. Mikio Nakahara and Tetsuo Ohmi,"Quantum Computing", CRC Press, 2008* *5. N. David Mermin,"Quantum Computer Science", Cambridge, 2007* *6. https://qiskit.org/*	*7. An Introduction to Quantum Computing. P. Kaye, R. Laflamme, and M. Mosca, Oxford University Press, New York* *8. Quantum Computer Science. N. David Mermin:, Cambridge University Press* *9. Quantum Cryptography. D. Unruh:, Available online:* *https://courses.cs.ut.ee/all/MTAT.07.024/2017_fall/uploads/* 10. *NIST Post Quantum Cryptography, Available online: https://csrc.nist.gov/projects/post-quantum-cryptography/round-2-submissions* 11. *Quantum Algorithms for Cryptographically Significant Boolean Functions - An IBMQ Experience. SAPV Tharrmashastha, D. Bera, A. Maitra and S. Maitra, Springer 2020.* 12. *Quantum Algorithm Zoo. https://quantumalgorithmzoo.org/* 13. *Handbook of Applied Cryptography. A. J. Menezes, P. C. van Oorschot, and S. A. Vanstone. CRC Press* 14. Chap 2,3,4 of Quantum Computing Explained by David McMahon (if available) 15. https://qiskit.org/learn/intro-qc-qh *16. https://github.ibm.com/dmadan07/Grover-ex* *17. https://qiskit.org/documentation/machine-learning/* *18. https://qiskit.org/documentation/finance/* *19. https://qiskit.org/textbook/ch-algorithms/index.html* *20. https://cds.cern.ch/record/1522001/files/978-1-4614-6336-8_BookBackMatter.pdf*

Learning Assessment

	Bloom's Level of Thinking	Continuous Learning Assessment (50% weightage)								Final Examination (50% weightage)	
		CLA – 1 (10%)		CLA – 2 (15%)		CLA – 3 (15%)		CLA – 4 (10%)			
		Theory (5%)	Practice (5%)	Theory (7.5%)	Practice (7.5%)	Theory (7.5%)	Practice (7.5%)	Theory (5%)	Practice (5%)	Theory (25%)	Practice (25%)
Level 1	Remember	20%		15%		15%				15%	
Level 2	Understand	20%		25%		25%		25%		20%	
Level 3	Apply	45%	30%	40%	35%	40%	40%	20%	20%	45%	30%
Level 4	Analyze	15%	40%	20%	35%	20%	30%	20%	50%	20%	35%
Level 5	Evaluate		30%		30%		30%	25%	30%		35%
Level 6	Create										
	Total	100 %	100 %	100 %	100 %	100 %	100 %	100%	100%	100%	100%

CLA – 4 can be from any combination of these: Assignments, Seminars, Tech Talks, Mini-Projects, Case-Studies, Self-Study, MOOCs, Certifications, Conf. Paper etc.,

Course Designers

Experts from Industry	Experts from Higher Technical Institutions	Internal Experts
Prabha Narayan , *QKRISHI*		*Gayathri.M* *Assistant Professor,* *Ctech.*

18CSE418T Sparse Intensive GPU Computing
SParse Intensive GPU Computing –SPIG

Voluminous and high dimensional data persist in all domains. This course deals with applications of sparse computation in various domains to solve complex optimization problems such as Large Sparse Eigen value Problems, Scalable recommendation systems, development of Cyber Spar-City with the inclusion of sparsity due to the time of ever-growing model size and complexity, sparse computation offers a compelling solution. In addition, to reduce critical time spent deploying technologies towards data centers, so as to provide GPU platforms for researchers, students, and data science enthusiasts with the performance and tools they need to get up and running quickly.

Course Objectives

- To design an Indian Sparsity framework by creating supercomputing framework.
- To understand the design and implementation strategies of various applications of complex optimization problems
- To harness the sparse computing facilities with new AI applications using incremental customization
- To enable sparsity and to apply manipulations over the massively parallel hardware.
- To execute applications using sparse computation independently and parallel.

18CSE419T GPU Programming
COURSE OBJECTIVES

- To understand the basics of GPU architectures
- To write programs for massively parallel processors
- To understand the issues in mapping algorithms for GPUs
- To introduce different GPU programming models

COURSE DESCRIPTION

The use of Graphics Processing Units for rendering is well known, but their power for general parallel computation has only recently been explored. Parallel algorithms running on GPUs can often achieve up to 100x speedup over similar CPU algorithms, with many existing applications for physics simulations, signal processing, financial modeling, neural networks, and countless other fields.This course covers programming techniques for the GPU. The course will introduce NVIDIA's parallel computing language, CUDA. Beyond covering the CUDA programming model and syntax, the course will also discuss GPU architecture, high performance computing on GPUs, parallel algorithms, CUDA libraries, and applications of GPU computing.

Course Code	18GNE417T	Course Name	Application Development Fundamentals		Course Category	E	*Professional Elective*	L	T	P	C
								2	1	0	3

Pre-requisite Courses	*Nil*	Co-requisite Courses	*Nil*	Progressive Courses	*Nil*
Course Offering Department	*Computing Technologies*	Data Book / Codes/Standards	*Nil*		

Course Objective: The purpose of learning this course is to:

1	*Understand the enterprise cloud based platform and Customize an instance using scripting*
2	*Design user interface for applications and devise business rules*
3	*Analyze and design the application and modules*
4	*Automate work process and test it*
5	*Develop and configure mobile applications*

Course Outcomes (CO): At the end of this course, learners will be able to:

		Level of Thinking	Expected Proficiency (%)	Expected Attainment (%)	1 Engineering Knowledge	2 Problem Analysis	3 Design & Development	4 Analysis, Design, Research	5 Modern Tool Usage	6 Society & Culture	7 Environment & Sustainability	8 Ethics	9 Individual & Team Work	10 Communication	11 Project Mgt. & Finance	12 Life Long Learning	13 PSO-1	14 PSO-2	15 PSO-3
CO-1 :	*Experience a cloud based workflow automation platform and personalize instance*	3	80	70	2	-	3	-	-	-	-	-	-	-	-	-	-	-	-
CO-2 :	*Learn how scripting adds and extends functionality in applications*	3	85	75	-	-	3	-	2	-	-	-	-	-	-	-	-	-	-
CO-3 :	*Write, test and debug UI policies and Business rules*	4	75	70	2	-	3	-	-	-	-	-	-	-	-	-	-	-	-
CO-4 :	*Build a flow, trigger and add script to a flow*	4	85	80	-	-	3	2	-	-	-	-	-	-	-	-	-	-	-
CO-5 :	*Use flow designer to automate process and Create mobile application with low/ no code platform*	3	85	75	-	-	-	2	3	-	-	-	-	-	-	-	-	-	-

Learning 1-6

Program Learning Outcomes (PLO)

Duration (hour)		9	9	9	9	9
S-1	SLO-1	A cloudbased Platform Overview, Navigation, and Access Module	Client script overview,	Glide system API and methods	Application Forms	Introduction to App Engine Studio for Developers
	SLO-2	Lists and Filters Module Forms Module	Client side API's	Glide Record API and query	Fields and Views	UI Builder Fundamentals
S-2	SLO-1	Tasks Module, Reporting and Knowledge Management Module	client side debugging	Script includes overview	Controlling access, Configure application security	Creation of web user interface
	SLO-2	Service Catalog Module Virtual Agent Module	Reference objects, script versions	Define and extend class with application scope	Automate Work, Import and Integrate External Data	Application of style and themes
S-3	SLO-1	Enrollment in Now platform and create personal developer instances	Two simple client scripts, g_form and g_user, Debugging client scripts	Write ,test and debug business rules using glide system methods and Glide record queries	Use flow designer to automate process	App developer UI interface Micro certification
	SLO-2					
S-4	SLO-1	Personalize Your Instance, Favorite a Filtered List	UI policy and execution	Flow Designer scripting	Test with ATF	Mobile Development Essentials: Introduction
	SLO-2	Create and Comment on a Record	Write test and debug UI policies	Flow Designer objects	Software testing lifecycle, Explore testing options	Creation of new mobile application
S-5	SLO-1	Create a Visual Task Board from a List, Order an Item from Service Catalog	Catalog client scripts	Script triggered subflow	Service Catalog	Create and Apply List Screens, use functions in mobile

	SLO					
	SLO-2	Create a Dashboard and a Report, Flag and Comment on a Knowledge Articles	Catalog UI Policies, Variable sets	Action designer script step	Web services	Configure offline access in mobile agent
S-6	SLO-1	Micro-Certification - Welcome to ServiceNow	Practice scripting using catalog scripts and UI policies	Build a flow, trigger and add script to a flow	Create and run test using ATF	Practice mobile app development
	SLO-2					
S-7	SLO-1	Introduction to scripting, Javascript	Business rules overview	ServiceNow studio overview	Flow Designer Essentials	Review sessions – mainline exam
	SLO-2	The syntax editor, Locate scripts	When business rules run and what execute them	Application Development concepts	Flow Designer Introduction	Review certified application developer blueprint
S-8	SLO-1	Application scope	Server side global variables	Application analysis and design	Flow Designer :Create a flow	Practice using PDI
	SLO-2	Javascript	Debugging business rules	Create application and modules	Flow Designer: Create Sub flows and Actions	CAD preparatory module
S-9	SLO-1	Using the syntax editor, syntax checking, explore scripting resources.	Create, display and debug business rules	Practice on guided application creator	Flow Designer-Micro certification	Attempt of CAD examination
	SLO-2					

Learning Resources	1. ServiceNow, ServiceNow Administration Fundamentals - Tokyo. Available from: eVantage, ServiceNow, [2022]. 2. ServiceNow, . IT Service Management (ITSM) Fundamentals - Tokyo. Available from: eVantage, ServiceNow, [2022].	3. ServiceNow, . Scripting in ServiceNow Fundamentals - Tokyo. Available from: eVantage, ServiceNow, [2022]. 4. ServiceNow, . Application Development Fundamentals - Tokyo. Available from: eVantage, ServiceNow, [2022].

Learning Assessment

	Bloom's Level of Thinking	Continuous Learning Assessment (100% weightage)								Final Examination (% weightage)	
		CLA – 1 (10%)		CLA – 2 (20%)		CLA – 3 (30%)		CLA – 4 (40%)			
		Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice
Level 1	Remember	10%	10%	10%	10%	10%	10%	-	20%	-	-
Level 2	Understand										
Level 3	Apply	20%	20%	20%	20%	20%	20%	-	40%	-	-
Level 4	Analyze										
Level 5	Evaluate	20%	20%	20%	20%	20%	20%	-	40%	-	-
Level 6	Create										
	Total	100 %		100 %		100 %		100%		-	

CLA – 4 can be from any combination of these: Assignments, Seminars, Tech Talks, Mini-Projects, Case-Studies, Self-Study, MOOCs, Certifications, Conf. Paper etc.,

Course Designers

Experts from Industry	Experts from Higher Technical Institutions	Internal Experts
Experts from ServiceNow:		*Dr.K.R.Jansi,Assistant Professor/CTECH*
1. Alexa Petersen, Academic Partnership Director		
2. Trey Hemmingsen, Program Manager		