JSPM's
RAJARSHI SHAHU COLLEGE OF ENGINEERING
TATHAWADE, PUNE-33
(An Autonomous Institute Affiliated to Savitribai Phule Pune University, Pune)

Department of Computer Engineering

Structure & Syllabi

S. Y. M. Tech (2019 Pattern)

w.e.f. Academic Year 2020-2021

Department of Computer Engineering

Vision

To create quality computer professional through excellent academic environment.

Mission of Department

1. To empower students with fundamental of Computer Engineering to be successful profession.
2. To impart quality education to enable the students for higher studies, research and entrepreneurship.
3. To cater for the service to society.

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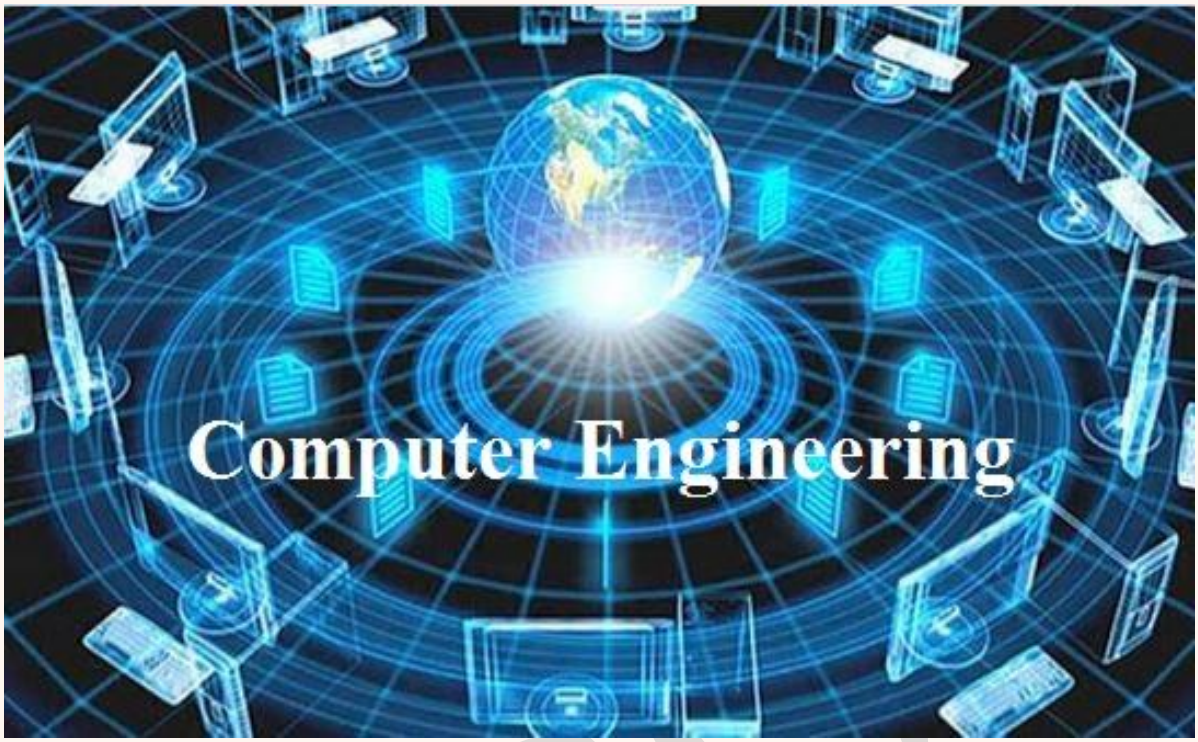

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Department of Computer Engineering

Program Outcomes (POs)

Engineering Graduates will be able to:

1.Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

2.Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

3.Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

4.Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

5.Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.

6. **The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

7.Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

8.Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

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9.Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
10.Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
11.Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
12.Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Department of Computer Engineering

Program Specific Outcomes (PSOs)

Upon successful completion of UG course in Computer Engineering Technology, the students will attain following Program Specific Outcomes:
PSO 1: The ability to understand, analyze and develop computer programs in the areas related to algorithms, system software, multimedia, web design, data science, and networking for efficient design of computer-based systems.
PSO 2: Problem-Solving Skills - The ability to apply standard practices and strategies in software project development using open-ended programming environments to deliver advanced computing systems.
PSO3: Professional Career and Entrepreneurship -The ability to employ modern computer languages, operating environments, and platforms in creating innovative career paths to be an entrepreneur.

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Highlights of the Syllabus

Curriculum of PG program for Computer Engineering is designed in association with

Academic Experts

Industry/Corporate Experts

Distinguished Alumni

Four Tracks in B.Tech.

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Unique features of the curriculum

1. **Four Tracks in M-Tech:**
   By offering various courses flexibility in choosing mentoring at work in specified field as:
   I. Parallel and Distributed Systems
   II. Artificial Intelligence
   III. Data Science
   IV. Networking

T1	Parallel and Distributed Systems	T2	Artificial Intelligence
1	Parallel Computing	1	Soft Computing
2	Multicore Architecture	2	Machine Learning
3	Fault Tolerant systems	3	Deep Structured Learning
4	Fog Computing	4	Deep Neural Network
T3	**Data Science**	**T4**	**Networking**
1	Data preparation and Analysis	1	Network Design and Analysis
2	Information Retrieval and Web Mining	2	Wireless Sensor Network
3	Optimization Techniques	3	Network Security
4	Big Data Analytics	4	Networked Multimedia System

2. **Internship Program**
   To support ever demanding industry requirements, the curriculum has included an industry internship with an objective to learn technologies pertaining to their discipline and enhance their technical knowledge with a support of the live platform of Industry.

3. **Motivation for Self-Learning:**
   The curriculum also offers a freedom to students to take the initiatives in their learning needs and set the goals with the help of online learning platforms like MOOCs, NPTEL, Swayam, etc.

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S. Y. M. Tech (Computer Engineering)
Academic Year – 2020-2021 Semester -III Structure

Course Code	Course	Teaching Scheme			Examination Schemes						Credits
		TH	Tut	Lab	Theory			Practical		Total	Total
					ISE (15)	MSE (25)	ESE (60)	TW	OR		
CS6101	Elective-V	3	--	--	15	25	60	--	--	100	3
CS6102	Internship/Value added course (VAC)	--	--	--	--	--	--	50	50	100	3
CS6103	Dissertation Phase-I	--	--	--	--	--	--	150	50	200	6
Total		**3**	--	--	**15**	**25**	**60**	**200**	**100**	**400**	**12**

Elective-V	
Code No.	**Title**
CS6101A	Cyber Crime and laws
CS6101B	Block chain Technology
CS6101C	Virtual Reality
CS6101D	Interdisciplinary elective Subject offered by other department

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S. Y. M. Tech (Computer Engineering)
Academic Year – 2020-2021 Semester –IV Structure

Course Code	Course	Teaching Scheme			Examination Schemes						Credits
		TH	Tut	Lab	Theory			Practical		Total	Total
					ISE (15)	MSE (25)	ESE (60)	TW	OR		
CS6104	Internship/Value added course (VAC)	--	--	--	--	--	--	50	50	100	3
CS6105	Dissertation Phase-II(Industry/Research)	--	--	--	--	--	--	250	150	400	17
Total		--	--	--	--	--	--	**300**	**200**	**500**	**20**

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Academic Year – 2020-2021

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SEMESTER III Syllabus

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S. Y. M. Tech (Computer Engineering)
Academic Year – 2020-2021 Semester -III
[CS6101A]: Cyber Crime and laws

Teaching Scheme:	Credit	Examination Scheme:
TH: - 3Hours/Week	TH: 03	In Sem. Evaluation : 15 Marks Mid Sem. Exam : 25 Marks End Sem. Exam : 60 Marks Total : 100 Marks

Course Prerequisites : Security ,IPR

Course Objective:

The objective of this course is to provide knowledge about the basic information on IT Act and Cyber law as well as the legislative and judicial development in the area.

Course Outcome:

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

CO1: Understand the concept of cyber space

CO2: Introduction to cyber crime and Law

CO3: Various types of cyber crime issues

CO4: Understand IT Act

CO5: Understand IT Act & its Amendments

CO6: IPR

Course Contents

UNIT-I	Cyber Space	07Hours
Concept of Cyberspace, Issues of Jurisdiction in Cyberspace: Jurisdiction Principles under International law, Jurisdiction in different states, Position in India. Conflict of Laws in Cyberspace, International Efforts for harmonization Privacy in Cyberspace.		
UNIT-II	**Cyber Crime**	**07 Hours**
Introduction to cyber crime and cyber law, cyber space and information technology, Nature and scope of cyber crime, Jurisdiction of cyber crime.		
UNIT-III	**Cyber Crime issues**	**07 Hours**
Important definitions under IT Act 2000, Cyber crime issues: unauthorized access, White collar crimes, viruses, malwares, worms, Trojans, logic bomb, Cyber stalking, voyeurism, obscenity in internet, Software piracy.		

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UNIT-IV	IT Act	07 Hours
IT Act 2000, offences under IT Act and IT (amendment) Act, 2008. CRPC overview, Case studies, Role of intermediaries, Electronic evidence, Cyber terrorism, espionage, warfare and protected system		
UNIT-V	**IT Act & its Amendments**	**08 Hours**
Overview of amended laws by the IT Act, 2000: The Indian Penal Code, 1860, The Indian Evidence Act, 1872, The Banker's Book Evidence Act, 1891, The Reserve Bank of India Act, 1934, Cyber Theft and the Indian Telegraph Act, 1885. Relevant Case laws. Digital Signatures and certificate -legal issues		
UNIT-VI	**IPR**	**06 Hours**
Intellectual Property rights: Introduction to IP, Copyright, Related Rights, Trademarks, Geographical Indications, Industrial Design, Patents, Licensing and transfer of technology, WIPO Treaties, Copyrights Act, Patents Act, Trademarks Act		

References:

R1: Cyber Security, Cyber Crime and Cyber Forensics: Applications and Perspectives, Raghu Santanam, M. Sethumadhavan, Information Science Reference

R2: Pfleeger, Charles P. and Shari L. Pfleeger. Security in Computing, 4th Edition. Upper Saddle River, NJ: Prentice Hall, 2008

R3: Cybercrime: Security and Surveillance in the Information Age, Douglas Thomas; Brian Loader

R4: Computer Crime: A Crime-Fighters Handbook by David Icove

R5: Crime in the Digital Age: Controlling Telecommunications and Cyberspace Illegalities, Peter N. Grabosky

R6: Cyberlaw – The Indian Perspective By Pavan Duggal, Saakshar Law Publications.

R7: Jonathan Rosenoer,"Cyber Law: The law of the Internet", Springer-Verlag, 1997

R8: Mark F Grady, FransescoParisi, "The Law and Economics of Cyber Security", Cambridge University Press, 2006

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S. Y. M. Tech (Computer Engineering)
Academic Year – 2020-2021 Semester -III
[CS6101B]: Blockchain Technology

Teaching Scheme:	Credit	Examination Scheme:
TH: - 3 Hours/Week	TH: 03	In Sem. Evaluation : 15 Marks Mid Sem. Exam : 25 Marks End Sem. Exam : 60 Marks Total : 100 Marks

Prerequisites Courses: Distributed Systems

Course Objective:
The objective of this course is to provide knowledge about the basic information on blockchain

Course Outcome:
After successful completion of the course, students will able to:
CO1: To understand the consensus problem, blockchain models
CO2: To understand hashing
CO3: Mathematical analysis of properties of Bitcoin.
CO4: To understand Ethereum
CO5: To understand the proofs and protocols in Blockchain

Course Contents

UNIT-I	Abstract Models for Blockchain	09Hours

The consensus problem - Asynchronous Byzantine Agreement - AAP protocol and its analysis - Nakamoto Consensus on permission-less, nameless, peer-to-peer network - Abstract Models for BLOCKCHAIN - GARAY model - RLA Model - Proof of Work (PoW) as random oracle - formal treatment of consistency, liveness and fairness - Proof of Stake (PoS) based Chains - Hybrid models (PoW + PoS).

UNIT-II	Cryptocurrency	09 Hours

Cryptographic basics for cryptocurrency - a short overview of Hashing, signature schemes, encryption schemes and elliptic curve cryptography.

UNIT-III	Bitcoin	08 Hours

Bitcoin - Wallet - Blocks - Merkley Tree - hardness of mining - transaction verifiability - anonymity - forks - double spending - mathematical analysis of properties of Bitcoin.

UNIT-IV	Ethereum	08 Hours

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Ethereum Virtual Machine (EVM) - Wallets for Ethereum - Solidity - Smart Contracts - some attacks on smart contracts		
UNIT-V	**Protocols in Blockchain**	**08 Hours**
Zero Knowledge proofs and protocols in Blockchain - Succinct non interactive argument for Knowledge (SNARK) - pairing on Elliptic curves - Zcash.		

References:

R1 Arvind Narayanan, Joseph Bonneau, Edward Felten, Andrew Miller, and Steven Goldfeder. Bitcoin and cryptocurrency technologies: a comprehensive introduction. Princeton University Press, 2016. (Free download available)

R2 Joseph Bonneau et al, SoK: Research perspectives and challenges for Bitcoin and cryptocurrency, IEEE Symposium on security and Privacy, 2015 (article available for free download) { curtain raiser kind of generic article, written by seasoned experts and pioneers}.

R3 J.A.Garay et al, The bitcoin backbone protocol - analysis and applications EUROCRYPT 2015 LNCS VOl 9057, (VOLII), pp 281-310. (Also available at eprint.iacr.org/2016/1048) . (serious beginning of discussions related to formal models for bitcoin protocols).

R4 R.Pass et al, Analysis of Blockchain protocol in Asynchronous networks , EUROCRYPT 2017, (eprint.iacr.org/2016/454) . A significant progress and consolidation of several principles).

R5 R.Pass et al, Fruitchain, a fair blockchain, PODC 2017 (eprint.iacr.org/2016/916).

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S. Y. M. Tech (Computer Engineering)
Academic Year – 2020-2021 Semester -III
[CS6101C]: Virtual reality

Teaching Scheme:	Credit	Examination Scheme:
TH: - 3 Hours/Week	TH: 03	In Sem. Evaluation : 15 Marks Mid Sem. Exam : 25 Marks End Sem. Exam : 60 Marks Total : 100 Marks

Prerequisites Courses: Computer Graphics

Course Objective:

The objective of this course is to provide knowledge about the basic information on Virtual reality

Course Outcome:

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

CO1: To understand Virtual Reality And Virtual Environments
CO 2: To choose Hardware Technologies For 3D User Interfaces
CO 3: 3D User Interface Input Hardware
CO 4: Software Technologies
CO 5: 3D Interaction Techniques
CO 6: Designing And Developing 3d User Interfaces

Course Contents

UNIT-I	Virtual Reality and Virtual Environments	07Hours
The historical development of VR:Scientific landmarks Computer Graphics, Real-time computer graphics, Flight simulation, Virtual environments, Requirements for VR, benefits of Virtual reality.		
UNIT-II	**Hardware Technologies For 3D User Interfaces**	**07 Hours**
Visual Displays Auditory Displays, Haptic Displays, Choosing Output Devices for 3D User Interfaces.		
UNIT-III	**3D User Interface Input Hardware**	**07 Hours**
Input device characteristics, Desktop input devices, Tracking Devices, 3D Mice, Special Purpose Input Devices, Direct Human Input, Home-Brewed Input Devices, Choosing Input Devices for 3D		

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Interfaces.		
UNIT-IV	**Software Technologies**	**07 Hours**
Database -World Space, World Coordinate, World Environment, Objects -Geometry, Position/Orientation, Hierarchy, Bounding Volume, Scripts and other attributes, VR Environment -VR Database, Tessellated Data, LODs, Cullers and Occluders, Lights and Cameras, Scripts, Interaction - Simple, Feedback, Graphical User Interface, Control Panel, 2DControls, Hardware Controls, Room/Stage/Area Descriptions, W orld Authoring and Playback, VR toolkits, Available software in the market.		
UNIT-V	**3D Interaction Techniques**	**08 Hours**
3D Manipulation tasks, Manipulation Techniques and Input Devices, Interaction Techniques for 3D Manipulation, Deign Guidelines -3D Travel Tasks, Travel Techniques, Design Guidelines -Theoretical Foundations of W ayfinding, User Centered W ayfinding Support, Environment Centered W ayfinding Support,Evaluating W ayfinding Aids, Design Guidelines -System Control,Classification, Graphical Menus, Voice Commands, Gestrual Commands, Tools, Mutimodal System Control Techniques, Design Guidelines, Case Study: Mixing System Control Methods, Symbolic Input Tasks, symbolic Input Techniques,Design Guidelines, Beyond Text and Number entry.		
UNIT-VI	**Designing and Developing 3D User Interfaces**	**06 Hours**
Strategies for Designing andDeveloping Guidelines and Evaluation.(2)ADVANCES IN 3D USER INTERFACES: 3DUser Interfaces for the Real W orld, AR Interfaces as 3D Data Browsers, 3D Augmented Reality Interfaces, Augmented Surfaces and Tangible Interfaces, Agents in AR, Transitional AR-VR Interfaces -The future of 3D User Interfaces, Questions of 3D UI Technology, 3D Interaction Techniques, 3D UI Design and Development, 3D UI Evaluation and Other Issues.		

References:

R1.Alan B Craig, W illiam R Sherman and Jeffrey D W ill, “Developing Virtual Reality Applications: Foundations of Effective Design”, Morgan Kaufmann, 2009.

R2.Gerard Jounghyun Kim, “Designing VirtualSystems: The Structured Approach”, 2005.

R3.Doug A Bowman, Ernest Kuijff, Joseph J LaViola, Jr and Ivan Poupyrev, “3D User Interfaces, Theory and Practice”, Addison W esley, USA, 2005.

R4.Oliver Bimber and Ramesh Raskar, “Spatial Augmented Reality: Meging Real and Virtual Worlds”,2005.

R5.Burdea, Grigore CandPhilippe Coiffet, “Virtual Reality Technology”, Wiley Interscience, India,2003.

R6.John Vince, “Virtual Reality Systems”, Addison Wesley, 1995.

R7.Howard Rheingold, “Virtual Reality: The Revolutionary Technology and how it Promises to Transform Society”, Simon and Schuster, 1991.

R8.William R Sherman and Alan B Craig, “Understanding Virtual Reality: Interface, Application and Design (The Morgan Kaufmann Series in Computer Graphics)”.Morgan KaufmannPublishers, San Francisco, CA, 2002

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Academic Year – 2020-2021 Semester -III
[CS6102]: Internship / Value Added course

Teaching Scheme: PR: Hours/Week	Credit 03	Examination Scheme: TW : 50 Marks OR : 50 Marks Total : 100Marks

Internship

Students will get an opportunity to work in actual industrial environment if they opt for internship. In case of internship, they will solve a live problem using software/analytical/computational tools. Students will learn to write technical reports. Students will develop skills to present and defend their work in front of technically qualified audience. Students can take up small problems in the field of engineering as mini project. It can be related to solution to an engineering problem, verification and analysis of experimental data available, conducting experiments on various engineering subjects, material characterization, studying a software tool for the solution of an engineering problem etc.

Value Added course

NPTEL course of at least 12 weeks

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Academic Year – 2020-2021 Semester -III
[CS6103]: Dissertation Phase-I

Teaching Scheme: PR: Hours/Week	Credit 06	Examination Scheme: TW : 150 Marks OR : 50 Marks Total : 200 Marks

Course Outcome:
After successful completion of the course, students will able to:

- Students will get an opportunity to work in actual industrial environment if they opt for internship.
- In case of project, they will solve a live problem using software/analytical/computational tools.
- Students will learn to write technical reports.
- Students will develop skills to present and defend their work in front of technically qualified audience.

Motivation, Problem statement, survey of journal papers related to the problem statement, problem modeling and design using set theory, NP-Hard analysis, SRS, UML, Classes, Signals, Test scenarios and other necessary, problem specific UML, software engineering documents. Student should publish one International Journal Paper (having ISSN Number and preferably with Citation Index II); or paper can be published in reputed International Journal recommended by the guide of the Dissertation and in addition to above the term work shall include the paper published, reviewers comments and certificate of presenting the paper in the conference To maintain the quality of the dissertation work it is mandatory on the dissertation guides to maintain a progressive record of the dissertation contact Hrs which shall include the dissertation discussion agenda, weekly outcomes achieved during practical sessions, corrective actions and comments on the progress report as per the plan submitted by the students including dates and timing, along with the signature of the student as per the class and teacher time table; such record of progressive work shall be referred by the dissertation examiners during evaluation. The presentation should cover motivation, mathematical modeling, data-table discussion and conclusion. The reports shall be prepared using LATEX derivative. Partial implementation is expected.

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SEMESTER IV

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S. Y. M. Tech (Computer Engineering)
Academic Year – 2020-2021 Semester -IV
[CS6102]: Internship / Value Added course

Teaching Scheme: PR: Hours/Week	Credit 03	Examination Scheme: TW : 50 Marks OR : 50 Marks Total : 100Marks

Internship

Students will get an opportunity to work in actual industrial environment if they opt for internship. In case of internship, they will solve a live problem using software/analytical/computational tools. Students will learn to write technical reports. Students will develop skills to present and defend their work in front of technically qualified audience. Students can take up small problems in the field of engineering as mini project. It can be related to solution to an engineering problem, verification and analysis of experimental data available, conducting experiments on various engineering subjects, material characterization, studying a software tool for the solution of an engineering problem etc.

Value Added course

NPTEL course of at least 12 weeks

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Academic Year – 2020-2021 Semester -IV
[CS6105]: Dissertation Phase-II

Teaching Scheme: PR: Hours/Week	Credit 17	Examination Scheme: TW : 250 Marks OR : 150 Marks Total : 400 Marks

Course Outcome:

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

- Students will be able to use different experimental techniques.
- Students will be able to use different software/ computational/analytical tools.
- Students will be able to design and develop an experimental set up/ equipment/test rig.
- Students will be able to conduct tests on existing set ups/equipments and draw logical conclusions from the results after analyzing them.
- Students will be able to either work in a research environment or in an industrial environment.
- Students will be conversant with technical report writing.
- Students will be able to present and convince their topic of study to the engineering community.

Selection of Technology, Installations, UML implementations, testing, Results, and performance discussions using data tables per parameter considered for the improvement with existing known algorithms and comparative graphs to support the conclusions drawn. Student should publish one International Journal Paper (having ISSN Number and preferably with Citation Index II); or paper can be published in reputed International Journal recommended by the guide of the Dissertation and in addition to above the term work shall include the paper published, reviewers comments and certificate of presenting the paper in the conference. To maintain the quality of the dissertation work it is mandatory on the dissertation guides to maintain a progressive record of the dissertation which shall include the dissertation discussion agenda, weekly outcomes achieved during practical sessions, corrective actions and comments on the progress report as per the plan submitted by the students including dates and timing, along with the signature of the student as per the class and teacher time table; such record of progressive work shall be referred by the dissertation examiners during evaluation.

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