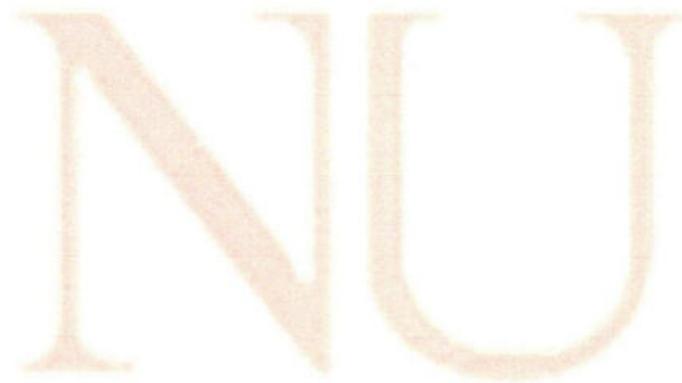




PROGRAM FILE



AREA-Computer Science and Engineering (CSE) (UG, PG & Ph.D)

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NIIT UNIVERSITY

VISION

NIIT University emerged from the visionary aspirations of esteemed intellectuals who sought to revolutionize the Indian education system, with a focus on cultivating original thinkers, innovative problem solvers, and inspiring leaders. Their goal was to foster a dynamic and intellectually stimulating learning environment that seamlessly blends academic theories with real-life experiences.

NU's BTech Computer Science and Engineering (CSE) program is designed to provide a comprehensive understanding of the foundational principles of computing and equip students with the necessary engineering skills for designing, implementing, and utilizing computer systems. This course offers a holistic perspective on the field of computing, encompassing the concepts, principles, and practical applications, allowing students to gain both theoretical knowledge and hands-on experience.

By enrolling in our CSE program, students will embark on a journey that not only acquaints them with the intricacies of computing but also nurtures their ability to apply and extend these concepts. Our curriculum is carefully crafted to ensure that students develop a well-rounded skill set, encompassing theoretical understanding, practical skills, and the capacity to apply these principles in real-world scenarios.

MISSION

The area of Computer Science and Engineering at NIIT University is dedicated to fulfilling the following mission:

M1: Providing the ideal environment for students to become industry-ready professionals, researchers, and entrepreneurs. We achieve this by offering courses on cutting-edge technology and advanced laboratory courses, ensuring that our students are well-equipped with the knowledge and skills demanded by the industry.

M2: Establishing Centres of Excellence that foster a conducive environment for our faculty to engage in progressive and convergent research themes. Through these centers, we aim to train our students in the latest advancements and emerging technologies, ensuring that they stay at the forefront of the field.

M3: Imparting high-quality experiential learning to our students, enabling them to gain expertise in modern software tools and cater to the real-time requirements of the industry. We focus on providing practical knowledge and hands-on experience to ensure our students are well-prepared for their professional careers.

M4: Instilling problem-solving and team-building skills among our students, emphasizing the importance of lifelong learning, and nurturing a sense of societal and ethical responsibilities. We believe in creating well-rounded professionals who are not only skilled in their domain but also possess the necessary attributes to make a positive impact on society.

M5: Offering continuing education programs in emerging areas of computer science, such as cybersecurity, data science, machine learning, and cloud computing. These programs are designed to provide ongoing learning opportunities for our stakeholders, including professionals already working in the industry, ensuring that they stay updated with the latest advancements.

At NIIT University, we are committed to providing a comprehensive and holistic learning experience to our students, empowering them to excel in their chosen fields and make significant contributions to the ever-evolving world of computer science and engineering.


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Computer Science and Engineering - Undergraduate and Postgraduate Programme Educational Objectives

The Computer Science and Engineering program at NIIT University is designed to empower graduates with the skills and knowledge necessary to achieve the following educational objectives:

1. **Thrive as proficient computer professionals:** Our graduates will be equipped to work productively as successful computer professionals in a diverse range of career paths. Whether in supportive or leadership roles within multidisciplinary teams, they will possess the competence to contribute effectively. Additionally, they will have the option to pursue higher studies to further enhance their expertise in the field.
2. **Demonstrate effective communication and ethical conduct:** We emphasize the development of excellent communication skills among our graduates, enabling them to effectively convey ideas and solutions. Furthermore, our program instills a strong awareness of societal needs and constraints, empowering graduates to incorporate these considerations into their professional endeavors. With a high regard for ethical responsibilities, they will contribute to the betterment of society through their practice.
3. **Embrace lifelong learning for personal and organizational growth:** Our program encourages graduates to engage in lifelong learning, ensuring they remain up-to-date in their profession. By nurturing a mindset of continuous growth, they will adapt to evolving technologies and industry trends, fostering personal development and contributing to the growth of the organizations they join. Through their commitment to ongoing learning, our graduates will stay at the forefront of the field.

At NIIT University, we are committed to providing a comprehensive education that equips our students with not only technical skills but also the qualities necessary for professional success. By focusing on these educational objectives, we aim to develop well-rounded graduates who are prepared to excel in their careers, make a positive impact on society, and actively contribute to the advancement of the computer science and engineering field.

PROGRAM SPECIFIC OUTCOME (PSOs)

PSOs for B.Tech. in Computer Science and Engineering

PSO 1: Ability to apply the knowledge of basic and advanced concepts of Computer Science in order to address compelling problems of society and provide an acceptable and practical solution.

PSO 2: Ability to understand the mathematical background to solve computational tasks and model solutions to real-life problems.

PSO 3: Ability to understand state-of-the-art research problems and identify the research gaps so as to provide innovative and effective methods to fill-up those gaps.

PSO 4: Use new technical advancements of Computer Science to produce appreciable contributions in the profession.

PSO 5: Ability to analyse a complex computing problem and to apply principles of computing and other relevant disciplines to identify solutions.

PSO 6: Ability to model data and design the system architecture of high performance and tolerant systems.

PSO 7: Ability to formulate learning solutions for process-centric systems.

PSO 8: Ability to achieve a successful career in Industry, in Research Institute, in Academics, and in Entrepreneurship.

PSO 9: Ability to publish technical papers in reputed journals and conferences under the guidance of dedicated faculty members.

PSO 10: Ability to get involved in innovative, industry relevant projects jointly with world class engineers in Collaborative Education mode which will provide an environment to convert their innovation into reality.

PSO 11: Develop expertise in specialized areas like Data Science, Artificial Intelligence, Cyber Security, Cloud Computing and Bigdata Engineering.

PSO 12: Ability to seamlessly become industry professional after six months' Industry Practice in Industry Environment in the final academic year.

PSOs for B.Tech. in Cyber Security Programme

PSO1: Evaluate the computer network and information security needs of an organization. Explain concepts and theories of networking and apply them to various situations, classifying networks, network security, analyzing performance, and implementing new technologies and cryptographic algorithms.

PSO2: Assess cyber-security risk management policies to adequately protect an organization's critical information and assets.

PSO3: Measure the performance of security systems within an enterprise-level information system. Troubleshoot, maintain, and update an enterprise-level information security system.

PSO4: Implement continuous network monitoring and provide real time security solutions.

PSO5: Formulate, update and communicate short- and long-term organizational cyber-security strategies and policies.

PSO6: Explain the concepts of confidentiality, availability, and integrity in Information Assurance, including physical, software, devices, policies and people. Analyze these factors in an existing system and design implementations.

PSO7: Analyse and evaluate the cyber security needs of an organization.

PSO8: Explain the new areas of security risks, like platform security, secured application development, cloud security, IoT security and blockchain security. Evaluate and compare systems software and emerging technologies.

PSO9: Effectively communicate technical information verbally, in writing, and in presentations.

PSO10: Implement cyber security solutions. Be able to use cybersecurity, information assurance, and cyber/computer forensics software/tools. Design operational and strategic cyber-security strategies and policies.

PSOs for B.Tech. in Data Science Programme

PSO1: Understand, analyze and develop essential proficiency in the areas related to data science and underlying statistical and computational principles, optimization techniques and apply the knowledge to solve practical problems.

PSO2: Ability to implement data science techniques along with artificial intelligence and such as inferential statistics, predictive modeling, neural networks, natural language processing, machine

learning, data visualization and bigdata analytics for solving a problem and designing novel algorithms for successful career and entrepreneurship.

PS03: Use modern tools, technologies, and programming languages in the area of Data Science.

PS04: Apply the concepts and practical knowledge in analysis, design and development of data driven decision making systems and applications to solve multi-disciplinary problems.

PS05: Ability to develop solutions for prediction and forecasting to industry and societal needs in a rapid changing technological environment and communicate with clients as an entrepreneur.

PS06: To provide a concrete foundation and enrich their abilities to qualify for Employment, Higher studies and Research in Data science and Artificial Intelligence with ethical values.

PS07: Pursue higher studies and continue to learn by participating in conferences, and seminars and by doing individual and group research in data science and related areas.

Program Specific Outcomes for Master of Technology (M.Tech) in Cyber Security:

1. Gain in-depth knowledge of cyber security principles, technologies, and methodologies.
2. Develop practical skills in identifying vulnerabilities and implementing effective security measures.
3. Apply advanced techniques for detecting, analyzing, and mitigating cyber threats.
4. Design and implement secure systems and architectures.
5. Understand legal and ethical considerations in cyber security practices.

PROGRAM OUTCOME (POs)

1. PG Engineering

NBA has defined the following three POs for a graduate of PG Engineering Program:

PO1: An ability to independently carry out research /investigation and development work to solve practical problems.

PO2: An ability to write and present a substantial technical report/document.

PO3: Students should be able to demonstrate a degree of mastery over the area as per the specialization of the program. The mastery should be at a level higher than the requirements in the appropriate bachelor program.

2. UG Engineering

Engineering Graduates will be able to:

PO1: Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO2: 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.

PO3: 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.

PO4: 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.

PO5: Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

PO6: 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.

PO7: 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.

PO8: Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of engineering practice.

PO9: Individual and teamwork: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO10: 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.

PO11: 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.

PO12: 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.

Course of Study

Undergraduate Programmes

- BTech Computer Science & Engineering
- BTech Cyber Security
- BTech Data Science

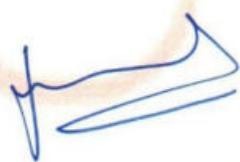
Postgraduate Programmes

- iMSc
- M.Tech-Cyber Security (with Infosys)

PhD in Comp. Sci and Engineering

Programme Architecture

Undergraduate Programme



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Programme Architecture with Course Description

B.Tech. Computer Science & Engineering

Date: February 17, 2023

Course Code	Course Title	L	T	P	C	Description
Semester I						
MAT 112	Calculus	3	1	0	4	This course includes the fundamentals and applications of differential calculus, integral calculus, vector calculus, and complex analysis. These concepts seem to have lots of applications in computer science engineering, electronics and communication engineering, among other branches of mathematics and engineering.
EL 111	Fundamentals of Electronics	3	1	0	4	This course is designed to help students gain an understanding of basics of DC and AC circuits. Students will learn to apply network analysis theorems & techniques to analyse and even design electrical and electronic circuits. Introduction of PN junction devices including diodes and transistors helps develop basic understanding of the working of analog & digital electronic circuits. Students will also get a chance to learn about digital logic families along with Boolean algebra and Number systems which will prepare them for the upcoming courses in their Engineering programme.
CHM 111	Science-I Chemistry	3	0	3	4	This course continues the study of the fundamental principles and laws of chemistry and biology. Topics include Reactions of Organic Compounds, separation, and purification- identification of organic compounds by spectroscopic techniques, oxidation and reduction reactions, photochemistry, supra molecular chemistry, nanoparticles and nano materials, green chemistry, and biomolecules. Upon completion, students should be able to demonstrate an understanding of chemical and biological concepts as needed to pursue further study in chemistry or biology related professional fields. Laboratory experiments and computer-based exercises augment and reinforce the basic principles discussed in lecture as well as provide practical examples.



TA 111	Fundamentals of Computer Programming	2	0	4	4	This is an introductory course on Programming Fundamentals. Its aim is to introduce basic concepts of Programming using high level language like Python. Students will solve problems by developing simple algorithms and then implement them using a Python programming language. The Lab component complements the theory by practicing the concept using Python. Through this course students will learn Object Oriented Programming concepts and how to use Object Oriented Python. Through this course students will become expert to use unique features of Python Language along with Python standard libraries and modules and packages.
TA 202	Engineering Graphics	2	0	2	3	Engineering graphics is the language of engineers. Engineers and scientists are constantly engaged in creative and productive work. Proficiency in Engineering Graphics will be of considerable aid in achieving these aids. It introduces students to theories of projection and the concepts of engineering drawing using the most widely used CAD application software Auto CAD. Basic AutoCAD commands will be introduced and emphasized throughout this course. The course will cover the Introduction to AutoCAD commands; Simple drawings; Orthographic and Isometric drawings, Projections of Points, Lines, Planes and Geometric Solids.
TA 102	Communication Skills	2	0	2	3	Communication plays a crucial role in the management of an organization. Without proper communication, no organization can function properly. No matter which medium one communicates in, speaking and listening both should take place. This course aims to hone the communication and professional skills of the young graduates making them ready for professional environment. The course has been designed to have an appropriate blend of theory and practical sessions so that the students gain a sound knowledge of communication theoretical skills and understand ways of applying these skills in future.

NU 111	Community Connect	0	0	2	1	Orientation to Field Visits: Each One Teach One; Importance of Education; Mentoring for Sensitivity & Curiosity; Understanding rural code of conduct; Sharing Technology education for access to learning Accelerated Learning: Observing & selecting the mentee; Remedial teaching; developing lessons & tests for recapitulation; Getting to know children's world; School evaluation systems; alternative systems of learning; Teaching for Community Empowerment. Measurement of Progress: in sensitivity; in degrees of curiosity; in aspirations; in learning styles; in mentoring styles; developing accelerated learning tests.
Semester II						
MAT 101	Algebra & Differential Equation	3	1	0	4	The objective of the course is to give the students a basic knowledge of linear algebra and differential equations and provide them with techniques available to solve differential equations. These concepts seem to have lots of applications in computer science engineering, electronics and communication engineering, among other branches of mathematics and engineering.
PHY 101	Science II Physics	3	0	2	4	This is a comprehensive course in Physics that deals with quantum mechanics, Semiconductor Physics, Magnetism, Dielectrics and LASER. In order to allow the students to get exposed to experimental methods, the course also has a laboratory component. This helps the students to integrate theoretical knowledge and concepts with practical experience. Students will also learn operation of scientific equipment, collection of data and their analysis.
ENV 301	Environmental Science	3	0	0	3	The Multidisciplinary Nature of Environmental Studies- Definition, scope and importance Need for public awareness.
CS 102	Data Structures	3	0	3	4	This course aims to provide the students with solid foundations in the basic concepts of programming: data structures and algorithms. This course offers the students a mixture of theoretical knowledge and practical experience. The study of data structures is carried out within an object-oriented framework with implementations in Python programming language.

TA 212	Workshop Practice	1	0	4	3	This course is designed to help students gain an understanding of where and how computers are used in modern manufacturing, particularly in manufacturing of electronics products. The Workshop Practice course supports to get hands on knowledge of several Workshop Practices like lathe, sheet metal work, machining etc. There are some additional experimental setups related to CNC machining, PCB Development which helps the students to enhance their knowledge. Students also get opportunity to implement their ideas through various application oriented micro projects. This outcome is to be achieved mostly by learning by-doing supplemented by one weekly lecture.
	HSSM-I*					
NU 112	Community Connect	0	0	2	1	Orientation to Field Visits: Each One Teach One; Importance of Education; Mentoring for Sensitivity & Curiosity; Understanding rural code of conduct; Sharing Technology education for access to learning Accelerated Learning: Observing & selecting the mentee; Remedial teaching; developing lessons & tests for recapitulation; Getting to know children's world; School evaluation systems; alternative systems of learning; Teaching for Community Empowerment. Measurement of Progress: in sensitivity; in degrees of curiosity; in aspirations; in learning styles; in mentoring styles; developing accelerated learning tests.
Semester III						
MAT 221	Probability & Random Process	3	1	0	4	The basic objective of this course is to give an elementary introduction to the theory of probability and random processes and their application for students in engineering
EL 101	Digital Logic and Circuit	3	0	3	4	Digital Logic & Circuits Course at Third semester UG level introduces the fundamentals of logic gates, Boolean Algebra, Karnaugh map etc. It also introduces Combinational & Sequential components like adder, multiplexer, encoders, decoders, flip-flop, latches, registers and their application in designing various combinational & sequential digital circuits. The course introduces the concept of Digital Circuits and focuses on analyzing, designing and utilizing combinational and sequential digital circuits.

CS 232	Discrete Maths		3	1	0	4	This course emphasizes on problem solving, understanding of mathematical definitions and proofs, grasping basic mathematical structures that are useful in Computer Science. Topics covered in this course are Logic and proofs, Graph Theory, Counting, Number Theory and introduction to Abstract Algebra. Propositional logic, first order logic, proof by contradiction, induction, invariant method etc. will be covered in Logic. In Graph Theory the topics to be covered include degree sequence, Eulerian graphs, isomorphism, trees, stable and bipartite matching, graph coloring, planar graphs etc. Sets, functions, number sequences, counting by mapping, pigeonhole principle, recursion and generating functions are some of the topics to be covered in Counting, while in Number Theory topics like Extended Euclidean Algorithm, Modular Arithmetic, Chinese Remainder Theorem and an introduction to Public Key Cryptography will be covered. In the introduction to Abstract Algebra, relations and their properties, n-ary relations, equivalence relations and partial orderings are covered. The prerequisites for this course is High School Algebra.
CS 251	Object Oriented Programming		2	0	4	4	Java is a large-scale object-oriented programming language. This course is designed to provide complete knowledge of Object-Oriented Programming through Java and to enhance the programming skills of the students by giving practical assignments to be done in labs.
CS 241	Introduction to Communications Systems		3	0	2	4	Introduction to Communication Systems at Third semester UG level introduces the fundamental of electrical communication systems, the elementary knowledge of electrical signals to multiple access transmission techniques. The in-depth knowledge of various modulation techniques in the analog and the digital domain is given. The mathematical representation of electrical communication systems and the wireless environment is also studied.
	HSSM-II*						

Semester IV



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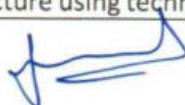
CS 201	Design & Analysis of Algorithms	3	0	3	4	<ul style="list-style-type: none"> • Techniques for the design and analysis of efficient algorithms, emphasizing methods useful in practice. Topics include sorting; search trees, heaps, and hashing; divide-and-conquer; dynamic programming; greedy algorithms; amortized analysis; graph algorithms; and shortest paths. • Advanced topics may include network flow, computational geometry, number-theoretic algorithms, polynomial and matrix calculations, caching, and parallel computing.
CS 302	Theory of Computation	3	1	0	4	<p>In this course, the following topics will be covered - Finite Automata (deterministic and nondeterministic), regular operations. Regular Expression, Equivalence of DFA, NFA and REs, closure properties. Non regular languages and pumping lemma, DFA Minimization. CFGs, Chomsky Normal Form. Non CFLs and pumping lemma for CFLs, PDAs, Equivalence of PDA and CFG. Properties of CFLs, DCFLs, Turing Machines and its variants. Configuration graph, closure properties of decidable and Turing-recognizable languages, decidability properties of regular languages and CFLs. Undecidability, reductions, Rice Theorem. Time and space measures, hierarchy theorems, complexity classes P, NP, L, NL, PSPACE, BPP and IP, complete problems, P versus NP conjecture.</p>
CS 122	Computer Architecture & Organization	3	0	2	4	<p>This course is about the design of computers. It covers both the overall design architecture and their internal detailed organization. Computer Architecture refers to those attributes of a system visible to programmer or that have direct impact on the logical execution of a program. Computer Organization refers to the operational units and their interconnection that realize the architectural specifications. At the end of this course, a student must not only be aware of various aspects of architecture but also must be in a position to evaluate the effects of the same on high level software.</p>



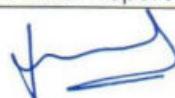
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CS 211	Operating Systems	3	0	2	4	This course provides an introduction to different fundamental aspects of Operating Systems. The course covers the operating system structure, their major components and organization as well as the underlying architectural support. The main prima face of the course is given on the concepts of multi-programming, multi-tasking, multiprocessing, time-sharing, processes, threads, their synchronization, scheduling and management, concurrency control and underlying issues of deadlock, memory management, virtual memory, page replacement algorithms and file management system. The entire course is supported through illustrated examples. Some introduction is also provided to the concepts of networking, distributed systems and different security issues.
CS 231	Database Management Systems	3	0	2	4	This is an introductory course on relational database systems. Its aim is to introduce basic concepts of databases and database management systems. At the end of this course it is expected that students will have a reasonably good theoretical as well as practical foundation on database systems. In particular, they will have a good understanding of relational data model, relational query languages, and database processing, SQL and PLSQL, physical database, storage and indexing structures, transaction management, database recovery.
HSSM-III*						
Semester V						
CS 261	Computer Networks	3	0	2	4	This course is to provide students with an overview of the concepts and fundamentals of data communication and computer networks. Topics to be covered include: data communication concepts and techniques in a layered network architecture, communications switching and routing, types of communication. Network congestion, network topologies, network configuration and management, network model components, layered network models (OSI reference model, TCP/IP networking architecture) and their protocols. Various types of networks (LAN, MAN, WAN and Wireless networks) and their protocols.

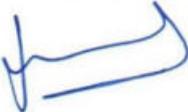
CS 301	Software Engineering	3	0	2	4	This course will provide an understanding of how to develop a software system by guiding them through the development lifecycle and different methodologies. This course will also provide knowledge and expertise of system design technique with object-oriented approach using UML. The course will help students to learn software requirements analysis process, object-oriented design technique, use case, test plan and test case preparation as part of problem-solving activities. This course will also provide students an overall understanding of Project Management with Software Project Estimation, Project Scheduling, Risk Management, Configuration Management, Software Quality Assurance and Software Maintenance.
	Open Elective - I*					
EL 302	Digital Image Processing	3	0	2	4	Digital Image Processing course at UG level introduces the fundamentals of Image Processing. The course will cover a wide range of Image Processing techniques in time and frequency domain. Apart from image processing, video handling will also get covered in the course.
CS 332	Compiler Design	3	0	2	4	This course aims to teach students the principals involved in compiler design. It will cover all the basic components of a compiler, but not the advanced material on optimizations and machine code generation. The course will have a project where students will have to develop a compiler for a subset of C language using tools like Lex and Yacc. The target environment will be SPIM simulator.
	HSSM-IV*	3	0	0	3	
Semester VI						
CS 3112	Multi-device Programming	1	0	6	4	This course introduces students to the tools & technologies used for front end designing and development for a software product. In particular, it focuses on technologies to design, develop, debug and test front-end part of a software application. Additionally, brief introduction to IoT applications using Raspberry Pi and Arduino is also a part of this course. After the end of the course the students are expected to learn the skills needed to design and develop robust, responsive and easy to test user interface (front-end) by following MVC based architecture using technologies like Angular



						and Bootstrap etc. Additionally, they get hands-on experience for the development of IoT applications.
CS 392	Capstone Project -- I	1	0	6	4	By empowering students with the skills necessary to access, understand and evaluate Information, Capstone Project will support students in the achievement of 21st century learning expectations. Students work in teams to develop or implement a real-world IT solution. <ul style="list-style-type: none"> • Address a typical business and organizational need such as data management, application development, system deployment, or security analysis. • Usage of HTML, CSS, JavaScript, JQuery and Bootstrap along with Web Application Framework. • Apply information technologies, applications, best practices, and standards in technical design, development, and implementation. • Practice soft skills in a real-world IT project, including project planning and management, research and learning, communication, writing, presentation, and teamwork.
	Professional Elective – I*	3	0	2	4	
	Professional Elective – II*	3	0	2	4	
NU 302	R & D Project	1	0	6	4	The Research and Development (R & D) projects is a core course for all undergraduate 6th semester students. The purpose of this course is to train the students to perform research and to be familiar with the activities and methodologies generally followed during the research work. All Faculty of NU share their research problems and students select a problem according to his/her research interest. The students perform literature survey and find the research gaps and challenges in their respective selected problem and then narrow down to specific gap/challenge on which they want to pursue the research. Subsequently the students design a complete solution and implement the same in consultation with their faculty mentor. Students present these during two mid semester evaluations and submit brief report to explain these



						points. They give the presentation and show the demonstration during the final evaluation and submit the final report with plagiarism report. The activities during the research process imparts valuable learning objectives, like understanding the research process, develop critical thinking and problem-solving skills in addition to soft skills like communication skills, team-work skills etc. Outcome of the R & D projects as publications, conference paper, prototype, patent encourage the undergraduate students and faculty supervisors. Moreover, it has a positive impact on NU as well as society at large. This will be the base for Advanced R&D project in VII semester.
	HSSM-V*	3	0	0	3	
Semester VII						
	Professional Elective – III*	3	0	2	4	
	Professional Elective – IV*	3	0	2	4	
	Professional Elective – V*	3	0	2	4	
	Open Elective – II*	3	0	2	4	
	Open Elective – III*	3	0	2	4	
CS 4191	Capstone Project -- II	1	0	6	4	By empowering students with the skills necessary to access, understand and evaluate Information, Capstone Project will support students in the achievement of 21st century learning expectations. Students work in teams to develop or implement a real world IT solution
Semester VIII						
NU 402	Industry Practice/Project	0	0	4	2	Industry Practice is a flagship course of 20 credits in the B Tech Programme of NIIT University. Every student of NIIT University has an opportunity to transfer learning from classroom to the workplace in industry in the final six-month semester of B Tech Programme. During Industry Practice, a student works on the real time project of an organization under direct mentoring by industry professional. This 6-month period makes the transition from student in a University to an employed professional in industry seamless or smooth for a student.


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Programme Architecture with Course Description

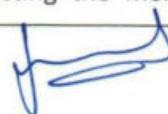
B.Tech. Cyber Security

Date: February 20, 2023

Course Code	Course Title	L	T	P	C	Description
Semester I						
MAT 112	Calculus	3	1	0	4	This course includes the fundamentals and applications of differential calculus, integral calculus, vector calculus, and complex analysis. These concepts seem to have lots of applications in computer science engineering, electronics and communication engineering, among other branches of mathematics and engineering.
CHM 111	Science - I Chemistry	3	0	2	4	This course continues the study of the fundamental principles and laws of chemistry and biology. Topics include Reactions of Organic Compounds, separation, and purification-identification of organic compounds by spectroscopic techniques, oxidation and reduction reactions, photochemistry, supra molecular chemistry, nanoparticles and nano materials, green chemistry, and biomolecules. Upon completion, students should be able to demonstrate an understanding of chemical and biological concepts as needed to pursue further study in chemistry or biology related professional fields. Laboratory experiments and computer-based exercises augment and reinforce the basic principles discussed in lecture as well as provide practical examples.
EL 111	Fundamentals of Electronics	3	1	0	4	This course is designed to help students gain an understanding of basics of DC and AC circuits. Students will learn to apply network analysis theorems & techniques to analyse and even design the electrical and electronic circuits. Introduction of PN junction devices including diodes and transistors helps develop basic understanding of the working of analog & digital electronic circuits. Students will also get a chance to learn about digital logic families along with Boolean algebra and Number systems which will prepare them for the upcoming courses in their Engineering programme.
TA 111	Fundamentals of Computer Programming	2	0	4	4	This is an introductory course on Programming Fundamentals. Its aim is to introduce basic concepts of Programming using high level language like Python. Students will solve problems by developing simple algorithms and then implement them using a Python programming language. The Lab component complements the theory by practicing the concept using Python. Through this course

						students will learn Object Oriented Programming concepts and how to use Object Oriented Python. Through this course students will become expert to use unique features of Python Language along with Python standard libraries and modules and packages.
TA 212	Workshop Practice	1	0	4	3	This course is designed to help students gain an understanding of where and how computers are used in modern manufacturing, particularly in manufacturing of electronics products. The Workshop Practice course supports to get hands on knowledge of several Workshop Practices like lathe, sheet metal work, machining etc. There are some additional experimental setups related to CNC machining, PCB Development which helps the students to enhance their knowledge. Students also get opportunity to implement their ideas through various application oriented micro projects. This outcome is to be achieved mostly by learning by-doing supplemented by one weekly lecture.
TA 102	Communication Skills	2	0	2	3	Communication plays a crucial role in the management of an organization. Without proper communication, no organization can function properly. No matter which medium one communicates in, speaking and listening both should take place. This course aims to hone the communication and professional skills of the young graduates making them ready for professional environment. The course has been designed to have an appropriate blend of theory and practical sessions so that the students gain a sound knowledge of communication theoretical skills and understand ways of applying these skills in future.
NU 111	Community Connect	0	0	2	1	Orientation to Field Visits: Each One Teach One; Importance of Education; Mentoring for Sensitivity & Curiosity; Understanding rural code of conduct; Sharing Technology education for access to learning Accelerated Learning: Observing & selecting the mentee; Remedial teaching; developing lessons & tests for recapitulation; Getting to know children's world; School evaluation systems; alternative systems of learning; Teaching for Community Empowerment. Measurement of Progress: in sensitivity; in degrees of curiosity; in aspirations; in learning styles; in mentoring styles; developing accelerated learning tests.
Semester II						

MAT 101	Algebra and Differential Equations	3	1	0	4	The objective of the course is to give the students a basic knowledge of linear algebra and differential equations and provide them with techniques available to solve differential equations. These concepts seem to have lots of applications in computer science engineering, electronics and communication engineering, among other branches of mathematics and engineering.
PHY 101	Science - II Physics	3	0	2	4	This is a comprehensive course in Physics that deals with quantum mechanics, Semiconductor Physics, Magnetism, Dielectrics and LASER. In order to allow the students to get exposed to experimental methods, the course also has a laboratory component. This helps the students to integrate theoretical knowledge and concepts with practical experience. Students will also learn operation of scientific equipment, collection of data and their analysis.
ENV 301	Environmental Science	3	0	0	0	The Multidisciplinary Nature of Environmental Studies- Definition, scope and importance Need for public awareness.
CS 102	Data Structures	3	0	2	4	This course aims to provide the students with solid foundations in the basic concepts of programming: data structures and algorithms. This course offers the students a mixture of theoretical knowledge and practical experience. The study of data structures is carried out within an object-oriented framework with implementations in Python programming language.
TA 202	Engineering Graphics	2	0	2	3	Engineering graphics is the language of engineers. Engineers and scientists are constantly engaged in creative and productive work. Proficiency in Engineering Graphics will be of considerable aid in achieving these aids. It introduces students to theories of projection and the concepts of engineering drawing using the most widely used CAD application software AutoCAD. Basic AutoCAD commands will be introduced and emphasized throughout this course. The course will cover the Introduction to AutoCAD commands; Simple drawings; Orthographic and Isometric drawings, Projections of Points, Lines, Planes and Geometric Solids.
	HSSM-I*	3	0	0	3	
NU 111	Community Connect	0	0	2	1	Orientation to Field Visits: Each One Teach One; Importance of Education; Mentoring for Sensitivity & Curiosity; Understanding rural code of conduct; Sharing Technology education for access to learning Accelerated Learning: Observing & selecting the mentee; Remedial



						teaching; developing lessons & tests for recapitulation; Getting to know children's world; School evaluation systems; alternative systems of learning; Teaching for Community Empowerment. Measurement of Progress: in sensitivity; in degrees of curiosity; in aspirations; in learning styles; in mentoring styles; developing accelerated learning tests.
Semester III						
MAT 241	Mathematical Foundation of Cyber Security	3	1	0	4	The course covers the mathematical foundations that are most relevant for Cyber Security studies. It highlights the basics of number theory like, GCD, Divisibility, Prime number etc. This course includes algebraic structure for Groups, Discrete logarithms, and Classification. Probability theory is important to understand the concept of probability and conditional probability. Statistics and regression are useful for analyzing large cyber data. All mathematical concepts are highly important for the mathematical foundation and calculation of Cyber Security.
CS 251	Object Oriented Programming (with Java)	2	0	4	4	Java is a large-scale object-oriented programming language. This course is designed to provide complete knowledge of Object-Oriented Programming through Java and to enhance the programming skills of the students by giving practical assignments to be done in labs.
CS 261	Computer Networks	3	0	2	4	This course is to provide students with an overview of the concepts and fundamentals of data communication and computer networks. Topics to be covered include: data communication concepts and techniques in a layered network architecture, communications switching and routing, types of communication. Network congestion, network topologies, network configuration and management, network model components, layered network models (OSI reference model, TCP/IP networking architecture) and their protocols. Various types of networks (LAN, MAN, WAN and Wireless networks) and their protocols.
CS 291	Introduction to Cyber Security	3	1	0	4	Introduction to Cyber Security provide the essential knowledge of Cyber Security and It will help students to understand the security issue related to Cyber Space. Knowledge of Cyber threats, Risk, Vulnerability and attacks. Student can also understand the Cyber Security measures and security techniques to protect their valuable assets.

CS 241	Introduction to Communications Systems	3	0	2	4	Introduction to Communication Systems at Third semester UG level introduces the fundamental of electrical communication systems, the elementary knowledge of electrical signals to multiple access transmission techniques. The in-depth knowledge of various modulation techniques in the analog and the digital domain is given .The mathematical representation of electrical communication systems and the wireless environment is also studied.
	HSSM-II*	3	0	0	3	
Semester IV						
CS 201	Design & Analysis of Algorithms	3	0	3	4	<ul style="list-style-type: none"> • Techniques for the design and analysis of efficient algorithms, emphasizing methods useful in practice. Topics include sorting; search trees, heaps, and hashing; divide-and-conquer; dynamic programming; greedy algorithms; amortized analysis; graph algorithms; and shortest paths. • Advanced topics may include network flow, computational geometry, number-theoretic algorithms, polynomial and matrix calculations, caching, and parallel computing.
CS 122	Computer Organization and Architecture	3	0	2	4	This course is about the design of computers. It covers both the overall design architecture and their internal detailed organization. Computer Architecture refers to those attributes of a system visible to programmer or that have direct impact on the logical execution of a program. Computer Organization refers to the operational units and their interconnection that realize the architectural specifications. At the end of this course, a student must not only be aware of various aspects of architecture but also must be in a position to evaluate the effects of the same on high level software.
CS 252	Cryptography	3	0	2	4	This course provides Knowledge of modern cryptography and communication security. It focuses on how cryptographic algorithms and protocols work and how to use them. The course covers the concepts of block ciphers and message authentication codes, public key encryption, digital signatures, and key establishment, and the Digital Signature Algorithm. Basic cryptanalytic techniques and examples of practical security solutions are explored to understand how to design and evaluate modern security solutions.


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CS 262	Network Security	3	0	2	4	In this course, students are introduced to the core concepts of Network Security. The course focuses on the fundamental knowledge of Network Security. It includes a wide range of OSI Layered related attacks and corresponding defense mechanisms to build deep understanding of Network Security among the readers. The course also contains current network security technologies such as Firewalls, IPSEC, IDS. The attacks and defensive mechanisms are divided into various layers with practical tools and techniques. After completion of this course the students are expected to be capable in performing Network Security, apply defensive strategies to protect networks in an organization. Students are also expected to carry forward research in the domains of interest after thorough understanding of the security concepts in this course.
CS 211	Operating Systems	3	0	2	4	This course provides an introduction to different fundamental aspects of Operating Systems. The course covers the operating system structure, their major components and organization as well as the underlying architectural support. The main prima face of the course is given on the concepts of multi-programming, multi-tasking, multiprocessing, time-sharing, processes, threads, their synchronization, scheduling and management, concurrency control and underlying issues of deadlock, memory management, virtual memory, page replacement algorithms and file management system. The entire course is supported through illustrated examples. Some introduction is also provided to the concepts of networking, distributed systems and different security issues.
	HSSM-III*	3	0	0	3	
Semester V						
CS 301	Software Engineering	3	0	2	4	This course will provide an understanding of how to develop a software system by guiding them through the development lifecycle and different methodologies. This course will also provide knowledge and expertise of system design technique with object-oriented approach using UML. The course will help students to learn software requirements analysis process, object-oriented design technique, use case, test plan and test case preparation as part of problem-solving activities. This course will also provide students an overall understanding of Project Management with Software Project Estimation,

						Project Scheduling, Risk Management, Configuration Management, Software Quality Assurance and Software Maintenance.
CS 4151	Cyber Security	3	0	2	4	The course starts with discussion of Cyber security threat landscape on the Internet and covers most of the areas of web, application and network security which a student working in this domain should know. The subject covers some protocols including HTTP, TLS, DNS, SMTP, FTP etc. and talks about specific cyber security attacks including Phishing, Spoofing, Denial of Service and many more. Students will also learn some security frameworks and modeling techniques to understand threat in a system and develop their countermeasures. Cyber security laws will help them with the necessary information that will be required when they will work in Cyber policing in future. Overall this course will help them understand Cyber security in detail.
CS 4241	Cyber Forensics	3	0	2	4	The course covers the procedures for identification, preservation, and extraction of electronic evidence, auditing and investigation of network and host system intrusions, analysis and documentation of information gathered, and preparation of expert testimonial evidence. The course will also provide hands on experience on various forensic tools and resources for system administrators and information system security officers.
CS 371	Secure Programming and Application Security	2	0	4	4	Secure Programming explores the implementation of security controls within web applications, mobile applications, utility applications, and traditional applications. Students will explore secure coding and testing techniques as well as application security configuration techniques. Specific review of secure coding techniques will include: Data Validation, Session Management, Exception Handling, and Data Encryption. Specific review of application security configuration techniques will include the secure configuration management of the application web server. Students will also review policy specific requirements necessary to implement a secure development program within enterprise organizations. Specifically, students will use source code analysis tools, HTTP Proxies, automated scanners, command-line tools, to

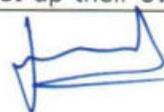
						appraise software security.
	Open Elective - I*	3	0	2	4	
	HSSM-IV*	3	0	0	3	
Semester VI						
CS 3162	Cloud Security	2	0	4	4	The course provides fundamentals of cloud computing, cloud architectures based on current standards, protocols, and best practices intended for delivering Cloud based enterprise IT services and applications. Identify the known threats, risks, vulnerabilities, and privacy issues associated with Cloud based IT services. The concepts and guiding principles for designing and implementing appropriate safeguards and countermeasures for Cloud based IT services approaches. The course includes the knowledge to design security architectures that assure secure isolation of physical and logical infrastructures. The course provides basic understand the industry security standards, regulatory mandates, audit policies, compliance requirements for Cloud based infrastructures.
	Professional Elective – I*	3	0	2	4	
	Professional Elective – II*	3	0	2	4	
CS 392	Capstone Project -- I	1	0	6	4	By empowering students with the skills necessary to access, understand and evaluate Information, Capstone Project will support students in the achievement of 21st century learning expectations. Students work in teams to develop or implement a real-world IT solution. <ul style="list-style-type: none"> • Address a typical business and organizational need such as data management, application development, system deployment, or security analysis. • Usage of HTML, CSS, JavaScript, JQuery and Bootstrap along with Web Application Framework. • Apply information technologies, applications, best practices, and standards in technical design, development, and implementation. • Practice soft skills in a real-world IT project, including project planning and management, research and learning, communication, writing, presentation, and teamwork.

NU 302	R & D Project	1	0	6	4	The Research and Development (R & D) projects is a core course for all undergraduate 6th semester students. The purpose of this course is to train the students to perform research and to be familiar with the activities and methodologies generally followed during the research work. All Faculty of NU share their research problems and students select a problem according to his/her research interest. The students perform literature survey and find the research gaps and challenges in their respective selected problem and then narrow down to specific gap/challenge on which they want to pursue the research. Subsequently the students design a complete solution and implement the same in consultation with their faculty mentor. Students present these during two mid semester evaluations and submit brief report to explain these points. They give the presentation and show the demonstration during the final evaluation and submit the final report with plagiarism report. The activities during the research process imparts valuable learning objectives, like understanding the research process, develop critical thinking and problem-solving skills in addition to soft skills like communication skills, team-work skills etc. Outcome of the R & D projects as publications, conference paper, prototype, patent encourage the undergraduate students and faculty supervisors. Moreover, it has a positive impact on NU as well as society at large. This will be the base for Advanced R&D project in VII semester.
	HSSM-V*	3	0	0	3	
Semester VII						
	Professional Elective – III*	3	0	2	4	
	Professional Elective – IV*	3	0	2	4	
	Professional Elective – V*	3	0	2	4	
	Open Elective – II*	3	0	2	4	
	Open Elective – III*	3	0	2	4	
CS 4191	Capstone Project -- II	1	0	6	4	By empowering students with the skills necessary to access, understand and evaluate Information, Capstone Project will support students in the achievement of 21st century learning expectations. Students work in teams to develop or implement a real world IT solution
Semester VIII						

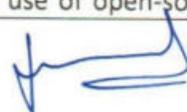
NU 402	Industry Practice / Project	0	0	4 0	2 0	Industry Practice is a flagship course of 20 credits in the B Tech Programme of NIIT University. Every student of NIIT University has an opportunity to transfer learning from classroom to the workplace in industry in the final six-month semester of B Tech Programme. During Industry Practice, a student works on the real time project of an organization under direct mentoring by industry professional. This 6-month period makes the transition from student in a University to an employed professional in industry seamless or smooth for a student.
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Other available Professional/Open Electives

COURSE CODE	COURSE NAME	L	T	P	C	DESCRIPTION
CS 3152	Ethical Hacking	3	0	2	4	In this course, students are introduced to the concept of ethical hacking, gain the knowledge of the Ethical Hacking terminology, difference between ethical hackers and unethical hackers, Steps of ethical hacking. This course also focusing on networking concept and virtualization, virtualization features and practical implementation of virtualization. In this course students can also learn about the information gathering technique, scanning concept, their uses for ethical hacking, how the unethical hackers hack the system password, hiding files and covering their footprints. Students also learn about the trojan, viruses, worms, ransomware etc., understanding the different types of attacks like- SQL Injection, XSS, DOS & DDOS, Wi-fi hacking and many more. Students can understand the concept of cryptography, its types and all about the vulnerability assessment and penetration testing framework for the organizations. In the Last students can learn all about the mitigation techniques of attacks. After completion of this course the students are expected to be capable in performing ethical hacking techniques, perform vulnerability assessment to protect systems and networks in an organization.
CS 5142	Vulnerability Assessment & Penetration Testing	3	0	2	4	This VAPT course encourages the students to identify the Vulnerabilities and how to Penetrate those Vulnerabilities which existing in the real world. It helps the students in carrying out the assessments required to effectively find out and mitigate the risks associated with security infrastructure of an organization. Students will set up their own lab to simulate



						the real-world challenges and methodology to perform penetration testing in the lab. End of the this course students shall have hands on experience on various tools & techniques of vulnerability assessment & penetration testing.
CS 541	Information Security Risk Assessment and Assurance	3	1	0	4	This course gives a clarification about various aspects associated with information security; risk assessment and assurance. The concept of organizational security, different industry standards, functional requirements for security solutions, security management and implementations will be explained in this course.
CS 3102	Dimensional and NoSQL Databases	2	0	4	4	This course starts with exploring the difference between centralized and distributed databases and the need for distributed databases. This further leads to the origins, characteristics of NoSQL databases. The four classes of NoSQL Databases are considered here namely, key-value store, column store, document store and graph based stores. The second part of the course looks at decision making in an enterprise and the shift in approach that is required from traditional OLTP systems to OLAP systems. In this regard, Data Warehouse conceptual modeling will be taught. Finally the data engineering pipeline ETL required will be a hands-on task which will be delivered on relational and NoSQL databases done in the first part of the course. The course gives a hands-on approach to the four types of NoSQL databases namely, key-value store, column based, document store and graph based databases. The students will be able to demonstrate competency in these four types of databases. In the second part of the course, students will model star and snow flake schema using a decision based approach. Finally, The students will be able to demonstrate competency in ETL.
CS 3132	Cloud Computing Concepts	3	0	2	4	Cloud Computing will cover the concepts, historical development, service models, deployment models, and reference architecture. It includes various technological foundation such as virtualization, service-oriented architecture, and other core components. This course will also cover the various attacks on cloud environment along with security aspects of cloud computing. Applied areas are covered to explain the usability of cloud computing. The course will be supported by use of open-source software for



						virtualization and cloud computing lab.
CS 3152	Ethical Hacking	3	0	2	4	In this course, students are introduced to the concept of ethical hacking, gain the knowledge of the Ethical Hacking terminology, difference between ethical hackers and unethical hackers, Steps of ethical hacking. This course also focusing on networking concept and virtualization, virtualization features and practical implementation of virtualization. In this course students can also learn about the information gathering technique, scanning concept, their uses for ethical hacking, how the unethical hackers hack the system password, hiding files and covering their footprints. Students also learn about the trojan, viruses, worms, ransomware etc., understanding the different types of attacks like- SQL Injection, XSS, DOS & DDOS, Wi-fi hacking and many more. Students can understand the concept of cryptography, its types and all about the vulnerability assessment and penetration testing framework for the organizations. In the Last students can learn all about the mitigation techniques of attacks. After completion of this course the students are expected to be capable in performing ethical hacking techniques, perform vulnerability assessment to protect systems and networks in an organization.
CS 322	Artificial Intelligence	3	0	2	4	This course is offered to students of sixth semester of B. Tech. (CSE) specializing in Artificial Intelligence. The course starts by introducing the concept of agents. It goes on to cover fundamental knowledge of Artificial Intelligence including the basic search algorithms for problem solving including uninformed and informed search. It then discusses various approaches for knowledge representation including rule based systems, semantic nets and frames. These knowledge representations are then used for inferencing and reasoning using forward chaining, backward chaining, AND/OR graphs and graph traversal for semantic nets. These ideas are then extended to develop fuzzy sets and fuzzy logic. Fuzzy inferencing system is discussed using the Mamdani technique. The course concludes with a detailed description of genetic algorithms including different representation of solutions, different forms of selection, different operators.

						Lastly, Holland's theorem for proof of converges for classical GA is also discussed.
CS 342	Artificial Neural Network	3	0	2	4	<ul style="list-style-type: none"> This course is an introduction to Artificial Neural Networks. It will focus on the computational fundamentals of artificial neural networks and their applications.
CS 4101	Introduction to Linear and Non Linear Optimization	3	0	2	4	This course is an introduction to linear and nonlinear optimization using mathematical techniques. Many problems from data science, machine learning, engineering, and economics can be formulated as an optimization problem. The objective of this course is to introduce various types of optimization problem, build the theoretical foundation, and build practical; solution methods. The course will also provide opportunity to use freely available software for solving optimization problems.
CS 4111	Computer Vision	3	0	2	4	This course introduces the basic concepts of Computer Vision to the students of undergraduate level.
CS 4121	Web Intelligence & Algorithms	3	0	2	4	The aim of the course is to introduce algorithmic techniques used in various web applications to extract intelligence. The course has special focus on search engines, recommender systems and on linked data and the semantic web. The student will also learn practical implementations of the algorithms and design and development of intelligent systems
CS 4131	Machine Learning	3	0	2	4	This course is for students of seventh semester of B. Tech. (CSE) specializing in Artificial Intelligence and an open elective to other students. The course introduces the concept of supervised (classification and regression), unsupervised and semi-supervised learning. Concepts like features, feature vectors and feature spaces are introduced. The course then develops supervised learning algorithms like nearest neighbor, decision trees, Bayesian learning, linear regression, polynomial and other non-linear regression, logistic regression, support vector machines, perceptron and multi-layer perceptron. Modern approaches of deep learning using CNN and autoencoders are also discussed. Techniques for dimension reduction using PCA and different feature selection methods are also discussed. Various unsupervised learning methods are discussed like K-means, DBSCAN, hierarchical clustering, expectation maximization. The course concludes with a discussion on reinforcement learning with a significant discussion on the exploration versus exploitation dilemma.

CS 4151	Cyber Security	3	0	2	4	The course starts with discussion of Cyber security threat landscape on the Internet and covers most of the areas of web, application and network security which a student working in this domain should know. The subject covers some protocols including HTTP, TLS, DNS, SMTP, FTP etc. and talks about specific cyber security attacks including Phishing, Spoofing, Denial of Service and many more. Students will also learn some security frameworks and modeling techniques to understand threat in a system and develop their countermeasures. Cyber security laws will help them with the necessary information that will be required when they will work in Cyber policing in future. Overall this course will help them understand Cyber security in detail.
CS 4201	Blockchain Technology and Application	3	0	2	4	Blockchain is an emerging technology which supports decentralization. This course will focus on core concepts of Blockchain such as distributed consensus mechanisms, cryptographic primitives as well as available blockchain platforms such as Bitcoin, Hyperledger, Ethereum and Algorand. This course will also focus on writing smart contracts in some of these platforms. The prerequisite for attending this course is knowledge of information security and strong background in mathematics.
CS 4231	Fog and Edge Networks	3	0	2	4	In this course, we will study significant tools and applications that comprise today's cloud computing, fog and edge platform, with a special focus on using the cloud for networks and mankind applications. The course content will come directly from research papers, articles, and documentation of cloud, fog and edge, data center, architectures, technologies and applications. We will work together to develop a deep understanding of this content through class presentations and discussions of this material.
CS 4241	Cyber Forensics	3	0	2	4	The course covers the procedures for identification, preservation, and extraction of electronic evidence, auditing and investigation of network and host system intrusions, analysis and documentation of information gathered, and preparation of expert testimonial evidence. The course will also provide hands on experience on various forensic tools and resources for system administrators and information system security officers.

CS 4251	AI in Cyber Security	3	0	2	4	This course gives an overview of AI and ML concepts and how to apply them to solve problems in the area of Cybersecurity. This course also gives an overview of Cyber Threat Intelligence and future trends of AI and ML in the field of Cybersecurity.
CS 4261	Natural Language Processing & Text analytics	3	0	2	4	The course is an introduction to Natural Language Processing (NLP). The main objective of the course is to learn the fundamental concepts used in processing natural language. NLP requires learning material from several fields: linguistics, machine learning and statistical analysis, and core natural language techniques. The course includes algorithms and data structures required to develop practical computer systems capable of performing intelligent tasks on natural language: analyse, understand and generate written text. The course also includes techniques to do the text analytics and develop various applications like sentiment analysis/recommendation system, question answering, conversational interfaces, Machine translation, spell checker, text summarization and coreference resolution. Implementation of NLP applications using the Natural Language Toolkit or NLTK and Python is covered.
CS 4271	Neural Networks and Deep Learning	3	0	2	4	This course introduces the concepts of Neural Networks and Deep Learning to the students of undergraduate level.
CS 451	Data Mining	3	0	2	4	This course provides an introduction to fundamental aspects of data mining which is extraction of valid, novel, potentially useful, understandable patterns from data sources such as, databases, texts, web, images, etc. This course covers the importance of data preprocessing, major tasks in data preprocessing, association rule mining, different types of clustering techniques, decision tree construction, and evaluation of classifier performance and outlier detection techniques. The theoretical aspects are supported by a lab component.
CS 461	Introduction to Information Security	3	0	2	4	This course will introduce the concepts of the Cryptography and Information Security. It consists of topics on various cryptographic models available, Mail Protocols Standards, IP Security Architecture; Firewall Design Principles. Students will also learn implementation of some of the mechanisms through practical's. • To provide introduction to the concept of Network Security Model and Cryptography systems. • To give the knowledge of Digital Signature and other

						Security Measures available. • To familiarize with the various techniques like PGP and S/MIME. • To showcase IP Security Architecture & Transport Layer Security to identify the vulnerability of the Internet systems and recognize the mechanisms of the attacks. • To explain the firewall design principles and various intrusion detection system
CS 481	Information Retrieval	3	1	0	4	The course is an advanced course on the theory and practice of modern Information Retrieval Systems It aims to cover both basic and advanced algorithms and techniques for text retrieval systems as well as web retrieval systems. The course also delivers on advanced retrieval systems that are multilingual, multimedia and XML in nature.
CS 491	Natural Language Processing	3	0	2	4	The course is an introduction to Natural Language Processing (NLP). The main objective of the course is to learn the fundamental concepts used in processing natural language. NLP requires learning material from several fields: linguistics, machine learning and statistical analysis, and core natural language techniques. The course includes algorithms and data structures required to develop practical computer systems capable of performing intelligent tasks on natural language: analyze, understand and generate written text. The course also includes techniques to use the information extracted from natural language in various applications like sentiment analysis, question answering, conversational interfaces. Implementation of NLP applications using the Natural Language Toolkit or NLTK and Python is covered.
CS 511	Systems and Network Security	3	0	2	4	In this course, students are introduced to the core concepts of system and network security. The course focuses on the fundamental knowledge of systems and networks. It includes a wide range of network attacks and corresponding defense mechanisms to build deep understanding of network security among the readers. The course also contains current network security technologies such as firewalls, IPSEC, intrusion detection and prevention systems, network security models, multilevel security, and security management and monitoring. The attacks and defensive mechanisms are divided into various layers while explanation and deep focus has been given in understanding of the practical tools and techniques to make the reader capable to play an active job role as a system security or

						network security professional. System security concepts such as operating system hardening, trusted computing, and access control are added for better understanding of operating system security issues. After completion of this course the students are expected to be capable in performing network scans, enumerations install and apply defensive strategies to protect systems and networks in an organization. Students are also expected to carry forward research in the domains of interest after thorough understanding of the security concepts in this course.
DS 402	Big Data Concepts	2	0	4	4	The course covers techniques to build and maintain reliable and scalable systems capable of handling large amounts of data using Apache Hadoop, its extensions, libraries and related technologies
DS 412	Inferential Statistics for Data Science	2	0	4	4	Basic principles for statistical inference with practical applications of data. Includes point estimation, confidence intervals, hypothesis testing, ANOVA and simple linear regression. Includes use of statistical R software.
DS 432	Predictive Modeling for data Science	2	0	4	4	This course will focus on predictive modeling methods most relevant to data science. Students will implement these methods using statistical software.
EL 372	Architecture, Protocols and Design Principles of IOT	3	0	2	4	The course enables student to understand the basics of Internet of things Architecture and protocols. It introduces some of the application areas where Internet of Things can be applied. The course also helps to understand the IoT Reference Architecture and Real World Design Constraints. The course also give the insights of the various embedded and cloud security concepts.
ET 401	Learning Technologies Project Course	0	0	1	4	It is within above framework and in pursuit of knowledge, skill and motivation for effective Teaching-Learning that the course is then designed to engage students in Learning Technologies Projects as drawn from individual students' specialization subject domains from engineering & technology, sciences, management, social sciences, humanities and green environment. Primarily, the learning technologies project categories will cover Projects in Designing System Development Life Cycle (SDLC) and Project-Based Learning.



GIS 401	Geospatial Intelligence	3	0	2	4	Geospatial intelligence is a discipline and an emerging profession that involves use of geospatial technology, critical information, and analytical rigor for a decision advantage in domains of natural resource management, disaster management and strategic defence or security. This course is designed for B.Tech. Compute Science & Engineering (CSE) students to provide exposure on geospatial technology and intelligence for various applications in both theoretical and practical aspects. The course also offers more in-depth knowledge on the use of computer vision and artificial intelligence in geospatial intelligence applications. This course is best fit for B.Tech. CSE students with AI knowledge.
GIS 411	Remote Sensing Fundamentals and Analysis	3	0	2	4	This course designed to introduce remote sensing to students from B.Tech. CSE with geomatics specialization. It provides basic concepts and fundamentals of physical principles of remote sensing along with the digital image processing concepts for remote sensing analysis. The course provides a firm basis for understanding and effective utilization of remote sensing datasets and techniques in any field of application.
GIS 421	Fundamentals of Geographic Information Systems (GIS)	2	0	4	4	This course designed to introduce Geographic Information Systems (GIS) to students from B.Tech. CSE with geomatics specialization. It provides basic principles and techniques of GIS analysis. The course provides a firm basis for understanding and effective utilization of GIS techniques and software for various applications. The lab practical of this course will be emphasized to provide hands-on experience on ArcGIS software.
NU 401	Advanced R & D Project	1	0	6	4	Advanced R&D project is offered as an open elective in seventh semester to the fast learners and carry same credits as the other open electives. It will be based on the R&D project that students have done in 6th semester. The students who have shown promise during the R&D project during the sixth semester will get an opportunity to extend the work in the advanced R&D project. They will be working under the same faculty who had mentored him / her during the R&D project in VI semester. Some of the possible extensions may be, applying the same technique to different problems, fine tuning/improving the techniques to get the higher precision/accuracy, get to do more recent literature survey, devising instruments to collect data, data gathering & analysis etc. as per discussions with faculty

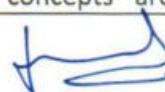


										mentor. Finally, students will write a comprehensive report/research article as guided by faculty mentor. Evaluation will be based on mid semester evaluation, end semester evaluation, mentor's evaluation and comprehensive report/research article. They give the presentation and show the demonstration during the final evaluation and submit the final report with plagiarism report.

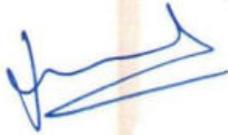
***HSSM Courses**

COURSE CODE	COURSE NAME	L	T	P	C	DESCRIPTION
ECON 102	Economics	3	0	0	3	Nature and scope of economic science, its relationship with other social sciences; quantification of economic variables, theories of consumer behavior and of the firm: linear economic models; market structures; social accounting and basic elements of economic planning.
ENG 102	English Literature	3	0	0	3	Literature is the study of societal behaviour which would help the students to gain insight about the individual's personality, attitude, motivation, learning and perception to become ethical. To learn and appreciate literature of any given language it is necessary to study literature written by the native speakers of that language. When a student studies literature of a period he/she can understand economic social and political situation of that time. Literature in English helps the students to develop a universal insight and make them appreciate values of various countries. The complexities and diversities of human society are well portrayed in this course. This course covers traditional and modern prospects of various ideologies and recollects them in an interesting manner.
HSS 201	Professional Ethics & Values	3	0	0	3	This course on Professional Ethics & Values facilitate students in exploring the meaning & concepts of Ethics, Professional Ethics and in understanding the nuances of Self Discipline, Teamwork and Time Management from practical point of view and enables student to think from different vantage points applying ethical framework while undertaking any decision and actions. The course intends to enable students for doing critical analysis with

						reference to paradigm of Professional Responsibility and Ethical Leadership.
HSS 301	Selected Readings	0	3	0	3	With time and advent of new technologies human kind is losing touch with the wisdom that comes from reading books. The new torch bearers of the world, the younger generation is often seen completely oblivious to the benefits of reading a good book in their leisure time. This course aims at encouraging the healthy habit of reading books in the young generation. The books can be from any genre but will surely give them some food for thought at the end of the day.
MGT 201	Basics of Management	3	0	0	3	Topics to be covered include Introduction to Management: Meaning, Definition, its nature, purpose, importance & Functions; Management as Art, Science. Is management a Profession; Difference between management and administration. Evolution of Management Thought: Contributions of F.W.Taylor, Henri Fayol, Elton Mayo, Chester Barhard, Peter Drucker, Michael Porter to management thought. Various approaches to management. Evolution of Management in India. Functions of Management: Planning - Meaning - Need & Importance, types, levels – advantages & limitations. Forecasting - Need & Techniques. Decision making - Types - Process of rational decision making & techniques of decision making. Organizing - Elements of organizing & processes: Types of organizations, Delegation of authority - Need, difficulties in delegation - Decentralization. Staffing - Meaning & Importance. Direction - Nature - Principles. Communication - Types & Importance. Motivation - Importance - theories.
MGT 401	Entrepreneurship	3	0	0	3	The Business Environment in India has undergone a paradigm shift since the adoption of LPG. Indian Inc. catapulted itself to the role of 'Change Agent'. It is catalyst of a Knowledge-driven Market-centric economy. Competition breeds Innovation. Our economic policies encourage First generation Entrepreneurs – be it Micro, Small, Medium besides traditional Large Enterprises. The traditional form of business models like Family-run businesses are also success flag-post ventures in highly competitive global market ecosystem. Yet, there is a Knowledge-Divide. Our traditional theory based concepts are not effectively



							<p>motivating young students to commercially exploit their Knowledge resource. This course will fill the void by sensitizing the students of the churning of business environment. The course will imbibe the attitudes of Entrepreneurship in budding students and hone their skill sets to Establish, Expand or Diversify and also explore merging concepts of growth of their own business.</p>
ECON 401	Fundamentals of Engineering Economics	3	0	0	3		<p>Engineers seek solutions to problems, and the economic viability of each potential solution is normally considered along with the technical aspects. The goal of this course is to introduce students to the process of integrating engineering proposals with economic analysis, to select among several viable alternative projects; and to understand and appreciate the models and measures used in decision making in engineering economics. This course introduces the fundamental concepts of economics and to explain how these will affect the functioning of an organization and contribute to decision making in engineering operations. The topics covered in this course include time value of money, cost-benefit analysis, depreciation, inflation, income taxes and risk analysis.</p>


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Programme Architecture with Course Description

B.Tech. Data Science

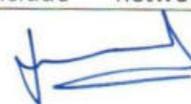
Course Code	Course Title	L	T	P	C	Description
Semester I						
MAT 112	Calculus	3	1	0	4	This course includes the fundamentals and applications of differential calculus, integral calculus, vector calculus, and complex analysis. These concepts seem to have lots of applications in computer science engineering, electronics and communication engineering, among other branches of mathematics and engineering.
CHM 111	Science - I Chemistry	3	0	2	4	This course continues the study of the fundamental principles and laws of chemistry and biology. Topics include Reactions of Organic Compounds, separation, and purification- identification of organic compounds by spectroscopic techniques, oxidation and reduction reactions, photochemistry, supra molecular chemistry, nanoparticles and nano materials, green chemistry, and biomolecules. Upon completion, students should be able to demonstrate an understanding of chemical and biological concepts as needed to pursue further study in chemistry or biology related professional fields. Laboratory experiments and computer-based exercises augment and reinforce the basic principles discussed in lecture as well as provide practical examples.
EL 111	Fundamentals of Electronics	3	1	0	4	This course is designed to help students gain an understanding of basics of DC and AC circuits. Students will learn to apply network analysis theorems & techniques to analyse and even design the electrical and electronic circuits. Introduction of PN junction devices including diodes and transistors helps develop basic understanding of the working of analog & digital electronic circuits. Students will also get a chance to learn about digital logic families along with Boolean algebra and Number systems which will prepare them for the upcoming courses in their Engineering programme.
TA 111	Fundamentals of Computer Programming (with Python)	2	0	4	4	This is an introductory course on Programming Fundamentals. Its aim is to introduce basic concepts of Programming using high level language like Python. Students will solve problems by developing simple algorithms and then implement them using a Python programming language. The Lab component complements the theory by practicing the



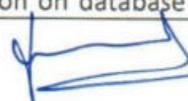
						concept using Python. Through this course students will learn Object Oriented Programming concepts and how to use Object Oriented Python. Through this course students will become expert to use unique features of Python Language along with Python standard libraries and modules and packages.
TA 212	Workshop Practice	1	0	4	3	This course is designed to help students gain an understanding of where and how computers are used in modern manufacturing, particularly in manufacturing of electronics products. The Workshop Practice course supports to get hands on knowledge of several Workshop Practices like lathe, sheet metal work, machining etc. There are some additional experimental setups related to CNC machining, PCB Development which helps the students to enhance their knowledge. Students also get opportunity to implement their ideas through various application oriented micro projects. This outcome is to be achieved mostly by learning by-doing supplemented by one weekly lecture.
TA 102	Communication Skills	2	0	2	3	Communication plays a crucial role in the management of an organization. Without proper communication, no organization can function properly. No matter which medium one communicates in, speaking and listening both should take place. This course aims to hone the communication and professional skills of the young graduates making them ready for professional environment. The course has been designed to have an appropriate blend of theory and practical sessions so that the students gain a sound knowledge of communication theoretical skills and understand ways of applying these skills in future.
NU 111	Community Connect	0	0	2	1	Orientation to Field Visits: Each One Teach One; Importance of Education; Mentoring for Sensitivity & Curiosity; Understanding rural code of conduct; Sharing Technology education for access to learning Accelerated Learning: Observing & selecting the mentee; Remedial teaching; developing lessons & tests for recapitulation; Getting to know children's world; School evaluation systems; alternative systems of learning; Teaching for Community Empowerment. Measurement of Progress: in sensitivity; in degrees of curiosity; in aspirations; in learning styles; in mentoring styles; developing accelerated learning tests.
Semester II						

MAT 101	Algebra and Differential Equations	3	1	0	4	The objective of the course is to give the students a basic knowledge of linear algebra and differential equations and provide them with techniques available to solve differential equations. These concepts seem to have lots of applications in computer science engineering, electronics and communication engineering, among other branches of mathematics and engineering.
PHY 101	Science - II Physics	3	0	2	4	This is a comprehensive course in Physics that deals with quantum mechanics, Semiconductor Physics, Magnetism, Dielectrics and LASER. In order to allow the students to get exposed to experimental methods, the course also has a laboratory component. This helps the students to integrate theoretical knowledge and concepts with practical experience. Students will also learn operation of scientific equipment, collection of data and their analysis.
ENV 301	Environmental Science	3	0	0	3	The Multidisciplinary Nature of Environmental Studies- Definition, scope and importance Need for public awareness.
CS 102	Data Structures (with Python)	3	0	2	4	This course aims to provide the students with solid foundations in the basic concepts of programming: data structures and algorithms. This course offers the students a mixture of theoretical knowledge and practical experience. The study of data structures is carried out within an object-oriented framework with implementations in Python programming language.
TA 202	Engineering Graphics	2	0	2	3	Engineering graphics is the language of engineers. Engineers and scientists are constantly engaged in creative and productive work. Proficiency in Engineering Graphics will be of considerable aid in achieving these aids. It introduces students to theories of projection and the concepts of engineering drawing using the most widely used CAD application software AutoCAD. Basic AutoCAD commands will be introduced and emphasized throughout this course. The course will cover the Introduction to AutoCAD commands; Simple drawings; Orthographic and Isometric drawings, Projections of Points, Lines, Planes and Geometric Solids.
	HSSM-I*	3	0	0	3	
Semester III						
MAT 221	Probability & Random Process	3	1	0	4	The basic objective of this course is to give an elementary introduction to the theory of probability and random processes and their application for students in engineering.

DS 201	Foundations of Data Science	3	0	2	4	The course covers the mathematical foundations that are most relevant for data science. This course will cover the concepts of various supervised and unsupervised learning techniques. This course will also help students to understand the various applications and current data science technologies and tools.
CS 232	Discrete Mathematics	3	1	0	4	This course emphasises on problem solving, understanding of mathematical definitions and proofs, grasping basic mathematical structures that are useful in Computer Science. Topics covered in this course are Logic and proofs, Graph Theory, Counting and Number Theory. Propositional logic, first order logic, proof by contradiction, induction, invariant method etc. will be covered in Logic. In Graph Theory the topics to be covered include degree sequence, Eulerian graphs, isomorphism, trees, stable and bipartite matching, graph coloring, planar graphs etc. Sets, functions, number sequences, counting by mapping, pigeonhole principle, recursion and generating functions are some of the topics to be covered in Counting, while in Number Theory topics like Extended Euclidean Algorithm, Modular Arithmetic, Chinese Remainder Theorem and an introduction to Public Key Cryptography will be covered. Relations, sub-algebras, semigroups, monoids, groups, rings, integral domains, fields to be covered in Abstract Algebra. The prerequisites for this course is High School Algebra.
CS 251	Object Oriented Programming (with Java)	2	0	4	4	This course introduces computer programming using the JAVA programming language with object-oriented programming (OOPs) principles. Emphasis is placed on event-driven programming methods, including creating and manipulating objects, classes, and Java Database Connectivity (JDBC)
DS 211	Data Visualization	2	0	4	4	This course covers the techniques and algorithms for creating effective visualizations with special emphasis given to interactive data visualization.
	HSSM-II*	3	0	0	3	
Semester IV						
CS 201	Design & Analysis of Algorithms	3	0	3	4	<ul style="list-style-type: none"> • Techniques for the design and analysis of efficient algorithms, emphasizing methods useful in practice. Topics include sorting; search trees, heaps, and hashing; divide-and-conquer; dynamic programming; greedy algorithms; amortized analysis; graph algorithms; and shortest paths. • Advanced topics may include network flow,



						computational geometry, number-theoretic algorithms, polynomial and matrix calculations, caching, and parallel computing.
DS 212	Statistical Methods for Data Science	3	0	2	4	This course covers fundamental aspects of inferential statistics for data science students. The course will involve theoretical topics and some programming assignments. Topics covered include Probability Theory, Random Variables, Statistical Inference, Hypothesis Testing, Bayesian Inferences and Computational Methods. The course is an in-depth coverage on various Statistical Techniques to make the students conversant with the methods of Statistics used for data science. For Analysis R software is used. The students will continuously practice their newly acquired skills through R Studio. The class is expected to be interactive, and students are encouraged to participate in class discussions.
DS 222	Optimization for Data Science	3	0	2	4	This course covers optimization techniques that are required for data science. The objective of this course is to introduce various types of optimization problem, build the theoretical foundation, and build practical solutions.
CS 211	Operating Systems	3	0	2	4	This course provides an introduction to different fundamental aspects of Operating Systems. The course covers the operating system structure, their major components and organization as well as the underlying architectural support. The main prima face of the course is given on the concepts of multi-programming, multi-tasking, multiprocessing, time-sharing, processes, threads, their synchronization, scheduling and management, concurrency control and underlying issues of deadlock, memory management, virtual memory, page replacement algorithms and file management system. The entire course is supported through illustrated examples. Some introduction is also provided to the concepts of networking, distributed systems and different security issues.
CS 231	Database Management Systems	3	0	2	4	This is an introductory course on relational database systems. Its aim is to introduce basic concepts of databases and database management systems. At the end of this course it is expected that students will have a reasonably good theoretical as well as practical foundation on database systems. In



						particular, they will have a good understanding of relational data model, relational query languages, and database processing, SQL and PLSQL, physical database, storage and indexing structures, transaction management, database recovery.
	HSSM-III*	3	0	0	3	
Semester V						
CS 381	Foundations of Machine Learning	3	0	2	4	This course covers techniques and algorithm for machine learning
CS 491	Natural Language Processing & Text Analytics	3	0	2	4	The course is an introduction to Natural Language Processing (NLP). The main objective of the course is to learn the fundamental concepts used in processing natural language. NLP requires learning material from several fields: linguistics, machine learning and statistical analysis, and core natural language techniques. The course includes algorithms and data structures required to develop practical computer systems capable of performing intelligent tasks on natural language: analyze, understand and generate written text. The course also includes techniques to use the information extracted from natural language in various applications like sentiment analysis, question answering, conversational interfaces. Implementation of NLP applications using the Natural Language Toolkit or NLTK and Python is covered.
EL 302	Digital Image Processing	3	0	2	4	Digital Image Processing course at UG level introduces the fundamentals of Image Processing. The course will cover a wide range of Image Processing techniques in time and frequency domain. Apart from image processing, video handling will also get covered in the course.
DS 412	Inferential Statistics for Data Science	2	0	4	4	Basic principles for statistical inference with practical applications of data. Includes point estimation, confidence intervals, hypothesis testing, ANOVA and simple linear regression. Includes use of statistical R software.
	Open Elective – I*	3	0	2	4	
	HSSM-IV*	3	0	0	3	
Semester VI						
DS 312	Introduction to Artificial Intelligence & Deep Learning	3	0	2	4	This course introduces artificial intelligence and deep learning. It covers the core topics of knowledge representation, reasoning, learning, and applications including Natural Language Processing, Perception, and other related technologies.
	Professional Elective – I*	3	0	2	4	

	Professional Elective - II*	3	0	2	4	
CS 392	Capstone Project -- I	1	0	6	4	By empowering students with the skills necessary to access, understand and evaluate Information, Capstone Project will support students in the achievement of 21st century learning expectations. Students work in teams to develop or implement a real-world IT solution. <ul style="list-style-type: none"> • Address a typical business and organizational need such as data management, application development, system deployment, or security analysis. • Usage of HTML, CSS, JavaScript, JQuery and BootStrap along with Web Application Framework. • Apply information technologies, applications, best practices, and standards in technical design, development, and implementation. • Practice soft skills in a real-world IT project, including project planning and management, research and learning, communication, writing, presentation, and teamwork.
NU 302	R & D Project	1	0	6	4	The Research and Development (R & D) projects is a core course for all undergraduate 6th semester students. The purpose of this course is to train the students to perform research and to be familiar with the activities and methodologies generally followed during the research work. All Faculty of NU share their research problems and students select a problem according to his/her research interest. The students perform literature survey and find the research gaps and challenges in their respective selected problem and then narrow down to specific gap/challenge on which they want to pursue the research. Subsequently the students design a complete solution and implement the same in consultation with their faculty mentor. Students present these during two mid semester evaluations and submit brief report to explain these points. They give the presentation and show the demonstration during the final evaluation and submit the final report with plagiarism report. The activities during the research process imparts valuable learning objectives, like understanding the research process, develop critical thinking and problem-solving skills in addition to soft skills like communication skills, team-work skills etc. Outcome of the R & D projects as publications, conference paper, prototype, patent encourage the undergraduate students and faculty supervisors. Moreover, it has a positive

						impact on NU as well as society at large. This will be the base for Advanced R&D project in VII semester.
	HSSM-V*	3	0	0	3	
Semester VII						
	Professional Elective – III*	3	0	2	4	
	Professional Elective – IV*	3	0	2	4	
	Professional Elective – V*	3	0	2	4	
	Open Elective – II*	3	0	2	4	
	Open Elective – III*	3	0	2	4	
CS 4191	Capstone Project -- II	1	0	6	4	By empowering students with the skills necessary to access, understand and evaluate Information, Capstone Project will support students in the achievement of 21st century learning expectations. Students work in teams to develop or implement a real world IT solution
Semester VIII						
NU 402	Industry Practice / Project	0	0	40	20	Industry Practice is a flagship course of 20 credits in the B Tech Programme of NIIT University. Every student of NIIT University has an opportunity to transfer learning from classroom to the workplace in industry in the final six-month semester of B Tech Programme. During Industry Practice, a student works on the real time project of an organization under direct mentoring by industry professional. This 6-month period makes the transition from student in a University to an employed professional in industry seamless or smooth for a student.
Other available Professional/Open Electives						
COURSE CODE	COURSE NAME	L	T	P	C	DESCRIPTION
CS 3102	Dimensional and NoSQL Databases	2	0	4	4	This course starts with exploring the difference between centralized and distributed databases and the need for distributed databases. This further leads to the origins, characteristics of NoSQL databases. The four classes of NoSQL Databases are considered here namely, key-value store, column store, document store and graph based stores. The second part of the course looks at decision making in an enterprise and the shift in approach that is required from traditional OLTP systems to OLAP systems. In this regard,

						<p>Data Warehouse conceptual modeling will be taught. Finally, the data engineering pipeline ETL required will be a hands-on task which will be delivered on relational and NoSQL databases done in the first part of the course. The course gives a hands-on approach to the four types of NoSQL databases namely, key-value store, column based, document store and graph-based databases. The students will be able to demonstrate competency in these four types of databases. In the second part of the course, students will model star and snowflake schema using a decision-based approach. Finally, the students will be able to demonstrate competency in ETL.</p>
CS 3152	Ethical Hacking	3	0	2	4	<p>In this course, students are introduced to the concept of ethical hacking, gain knowledge of the Ethical Hacking terminology, difference between ethical hackers and unethical hackers, Steps of ethical hacking. This course also focusing on networking concept and virtualization, virtualization features and practical implementation of virtualization. In this course students can also learn about the information gathering technique, scanning concept, their uses for ethical hacking, how the unethical hackers hack the system password, hiding files and covering their footprints. Students also learn about the trojan, viruses, worms, ransomware etc., understanding the different types of attacks like- SQL Injection, XSS, DOS & DDOS, Wi-fi hacking and many more. Students can understand the concept of cryptography, its types and all about the vulnerability assessment and penetration testing framework for the organizations. In the Last students can learn all about the mitigation techniques of attacks. After completion of this course the students are expected to be capable in performing ethical hacking techniques, perform vulnerability assessment to protect systems and networks in an organization.</p>
CS 4231	Fog and Edge Networks	3	0	2	4	<p>In this course, we will study significant tools and applications that comprise today's cloud computing, fog and edge platform, with a special focus on using the cloud for networks and mankind applications. The course content will come directly from research papers, articles, and documentation of cloud, fog and edge, data center, architectures, technologies and applications. We will work together to develop a deep understanding of</p>

						<p>this content through class presentations and discussions of this material.</p>
DS 401	Numerical Methods for Data Science	3	1	0	4	<p>The key concepts of numerical analysis required for understanding data science will be covered in the course. The course starts with basic concepts of Linear Algebra, some related concepts in statistics and optimization and explores the various tools in the light of Data Science.</p>
DS 402	Big Data Concepts	2	0	4	4	<p>The course covers techniques to build and maintain reliable and scalable systems capable of handling large amounts of data using Apache Hadoop, its extensions, libraries and related technologies</p>
CS 3102	Dimensional and NoSQL Databases	2	0	4	4	<p>This course starts with exploring the difference between centralized and distributed databases and the need for distributed databases. This further leads to the origins, characteristics of NoSQL databases. The four classes of NoSQL Databases are considered here namely, key-value store, column store, document store and graph based stores. The second part of the course looks at decision making in an enterprise and the shift in approach that is required from traditional OLTP systems to OLAP systems. In this regard, Data Warehouse conceptual modeling will be taught. Finally the data engineering pipeline ETL required will be a hands-on task which will be delivered on relational and NoSQL databases done in the first part of the course. The course gives a hands-on approach to the four types of NoSQL databases namely, key-value store, column based, document store and graph based databases. The students will be able to demonstrate competency in these four types of databases. In the second part of the course, students will model star and snow flake schema using a decision based approach. Finally, The students will be able to demonstrate competency in ETL.</p>
CS 3132	Cloud Computing Concepts	3	0	2	4	<p>Cloud Computing will cover the concepts, historical development, service models, deployment models, and reference architecture. It includes various technological foundation such as virtualization, service-oriented architecture, and other core components. This course will also cover the various attacks on cloud environment along</p>

						with security aspects of cloud computing. Applied areas are covered to explain the usability of cloud computing. The course will be supported by use of open-source software for virtualization and cloud computing lab.
CS 3152	Ethical Hacking	3	0	2	4	In this course, students are introduced to the concept of ethical hacking, gain the knowledge of the Ethical Hacking terminology, difference between ethical hackers and unethical hackers, Steps of ethical hacking. This course also focusing on networking concept and virtualization, virtualization features and practical implementation of virtualization. In this course students can also learn about the information gathering technique, scanning concept, their uses for ethical hacking, how the unethical hackers hack the system password, hiding files and covering their footprints. Students also learn about the trojan, viruses, worms, ransomware etc., understanding the different types of attacks like- SQL Injection, XSS, DOS & DDOS, Wi-fi hacking and many more. Students can understand the concept of cryptography, its types and all about the vulnerability assessment and penetration testing framework for the organizations. In the Last students can learn all about the mitigation techniques of attacks. After completion of this course the students are expected to be capable in performing ethical hacking techniques, perform vulnerability assessment to protect systems and networks in an organization.
CS 322	Artificial Intelligence	3	0	2	4	This course is offered to students of sixth semester of B. Tech. (CSE) specializing in Artificial Intelligence. The course starts by introducing the concept of agents. It goes on to cover fundamental knowledge of Artificial Intelligence including the basic search algorithms for problem solving including uninformed and informed search. It then discusses various approaches for knowledge representation including rule based systems, semantic nets and frames. These knowledge representations are then used for inferencing and reasoning using forward chaining, backward chaining, AND/OR graphs and graph traversal for semantic nets. These ideas are then extended to develop fuzzy sets and fuzzy logic. Fuzzy inferencing system is discussed using the Mamdani technique. The course

						concludes with a detailed description of genetic algorithms including different representation of solutions, different forms of selection, different operators. Lastly, Holland's theorem for proof of converges for classical GA is also discussed.
CS 342	Artificial Neural Network	3	0	2	4	<ul style="list-style-type: none"> This course is an introduction to Artificial Neural Networks. It will focus on the computational fundamentals of artificial neural networks and their applications.
CS 4101	Introduction to Linear and Non Linear Optimization	3	0	2	4	This course is an introduction to linear and nonlinear optimization using mathematical techniques. Many problems from data science, machine learning, engineering, and economics can be formulated as an optimization problem. The objective of this course is to introduce various types of optimization problem, build the theoretical foundation, and build practical; solution methods. The course will also provide opportunity to use freely available software for solving optimization problems.
CS 4111	Computer Vision	3	0	2	4	This course introduces the basic concepts of Computer Vision to the students of undergraduate level.
CS 4121	Web Intelligence & Algorithms	3	0	2	4	The aim of the course is to introduce algorithmic techniques used in various web applications to extract intelligence. The course has special focus on search engines, recommender systems and on linked data and the semantic web. The student will also learn practical implementations of the algorithms and design and development of intelligent systems
CS 4131	Machine Learning	3	0	2	4	This course is for students of seventh semester of B. Tech. (CSE) specializing in Artificial Intelligence and an open elective to other students. The course introduces the concept of supervised (classification and regression), unsupervised and semi-supervised learning. Concepts like features, feature vectors and feature spaces are introduced. The course then develops supervised learning algorithms like nearest neighbor, decision trees, Bayesian learning, linear regression, polynomial and other non-linear regression, logistic regression, support vector machines, perceptron and multi-layer perceptron. Modern approaches of deep learning using CNN and autoencoders are also discussed. Techniques for dimension reduction using PCA and different feature selection methods are also discussed. Various unsupervised learning methods are discussed like K-means, DBSCAN,

						hierarchical clustering, expectation maximization. The course concludes with a discussion on reinforcement learning with a significant discussion on the exploration versus exploitation dilemma.
CS 4151	Cyber Security	3	0	2	4	The course starts with discussion of Cyber security threat landscape on the Internet and covers most of the areas of web, application and network security which a student working in this domain should know. The subject covers some protocols including HTTP, TLS, DNS, SMTP, FTP etc. and talks about specific cyber security attacks including Phishing, Spoofing, Denial of Service and many more. Students will also learn some security frameworks and modeling techniques to understand threat in a system and develop their countermeasures. Cyber security laws will help them with the necessary information that will be required when they will work in Cyber policing in future. Overall this course will help them understand Cyber security in detail.
CS 4201	Blockchain Technology and Application	3	0	2	4	Blockchain is an emerging technology which supports decentralization. This course will focus on core concepts of Blockchain such as distributed consensus mechanisms, cryptographic primitives as well as available blockchain platforms such as Bitcoin, Hyperledger, Ethereum and Algorand. This course will also focus on writing smart contracts in some of these platforms. The prerequisite for attending this course is knowledge of information security and strong background in mathematics.
CS 4231	Fog and Edge Networks	3	0	2	4	In this course, we will study significant tools and applications that comprise today's cloud computing, fog and edge platform, with a special focus on using the cloud for networks and mankind applications. The course content will come directly from research papers, articles, and documentation of cloud, fog and edge, data center, architectures, technologies and applications. We will work together to develop a deep understanding of this content through class presentations and discussions of this material.
CS 4241	Cyber Forensics	3	0	2	4	The course covers the procedures for identification, preservation, and extraction of electronic evidence, auditing and investigation of network and host system intrusions, analysis and documentation of information gathered, and preparation of expert testimonial evidence. The course will also

						provide hands on experience on various forensic tools and resources for system administrators and information system security officers.
CS 4251	AI in Cyber Security	3	0	2	4	This course gives an overview of AI and ML concepts and how to apply them to solve problems in the area of Cybersecurity. This course also gives an overview of Cyber Threat Intelligence and future trends of AI and ML in the field of Cybersecurity.
CS 4261	Natural Language Processing & Text analytics	3	0	2	4	The course is an introduction to Natural Language Processing (NLP). The main objective of the course is to learn the fundamental concepts used in processing natural language. NLP requires learning material from several fields: linguistics, machine learning and statistical analysis, and core natural language techniques. The course includes algorithms and data structures required to develop practical computer systems capable of performing intelligent tasks on natural language: analyse, understand and generate written text. The course also includes techniques to do the text analytics and develop various applications like sentiment analysis/recommendation system, question answering, conversational interfaces, Machine translation, spell checker, text summarization and coreference resolution. Implementation of NLP applications using the Natural Language Toolkit or NLTK and Python is covered.
CS 4271	Neural Networks and Deep Learning	3	0	2	4	This course introduces the concepts of Neural Networks and Deep Learning to the students of undergraduate level.
CS 451	Data Mining	3	0	2	4	This course provides an introduction to fundamental aspects of data mining which is extraction of valid, novel, potentially useful, understandable patterns from data sources such as, databases, texts, web, images, etc. This course covers the importance of data preprocessing, major tasks in data preprocessing, association rule mining, different types of clustering techniques, decision tree construction, and evaluation of classifier performance and outlier detection techniques. The theoretical aspects are supported by a lab component.



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CS 461	Introduction to Information Security	3	0	2	4	This course will introduce the concepts of the Cryptography and Information Security. It consists of topics on various cryptographic models available, Mail Protocols Standards, IP Security Architecture; Firewall Design Principles. Students will also learn implementation of some of the mechanisms through practical's. <ul style="list-style-type: none"> • To provide introduction to the concept of Network Security Model and Cryptography systems. • To give the knowledge of Digital Signature and other Security Measures available. • To familiarize with the various techniques like PGP and S/MIME. • To showcase IP Security Architecture & Transport Layer Security to identify the vulnerability of the Internet systems and recognize the mechanisms of the attacks. • To explain the firewall design principles and various intrusion detection system
CS 481	Information Retrieval	3	1	0	4	The course is an advanced course on the theory and practice of modern Information Retrieval Systems It aims to cover both basic and advanced algorithms and techniques for text retrieval systems as well as web retrieval systems. The course also delivers on advanced retrieval systems that are multilingual, multimedia and XML in nature.
CS 491	Natural Language Processing	3	0	2	4	The course is an introduction to Natural Language Processing (NLP). The main objective of the course is to learn the fundamental concepts used in processing natural language. NLP requires learning material from several fields: linguistics, machine learning and statistical analysis, and core natural language techniques. The course includes algorithms and data structures required to develop practical computer systems capable of performing intelligent tasks on natural language: analyze, understand and generate written text. The course also includes techniques to use the information extracted from natural language in various applications like sentiment analysis, question answering, conversational interfaces. Implementation of NLP applications using the Natural Language Toolkit or NLTK and Python is covered.
CS 511	Systems and Network Security	3	0	2	4	In this course, students are introduced to the core concepts of system and network security. The course focuses on the fundamental knowledge of systems and networks. It includes a wide range of network attacks and corresponding defense mechanisms to build

						<p>deep understanding of network security among the readers. The course also contains current network security technologies such as firewalls, IPSEC, intrusion detection and prevention systems, network security models, multilevel security, and security management and monitoring. The attacks and defensive mechanisms are divided into various layers while explanation and deep focus has been given in understanding of the practical tools and techniques to make the reader capable to play an active job role as a system security or network security professional. System security concepts such as operating system hardening, trusted computing, and access control are added for better understanding of operating system security issues. After completion of this course the students are expected to be capable in performing network scans, enumerations install and apply defensive strategies to protect systems and networks in an organization. Students are also expected to carry forward research in the domains of interest after thorough understanding of the security concepts in this course.</p>
DS 402	Big Data Concepts	2	0	4	4	The course covers techniques to build and maintain reliable and scalable systems capable of handling large amounts of data using Apache Hadoop, its extensions, libraries and related technologies
DS 412	Inferential Statistics for Data Science	2	0	4	4	Basic principles for statistical inference with practical applications of data. Includes point estimation, confidence intervals, hypothesis testing, ANOVA and simple linear regression. Includes use of statistical R software.
DS 432	Predictive Modeling for data Science	2	0	4	4	This course will focus on predictive modeling methods most relevant to data science. Students will implement these methods using statistical software.
EL 372	Architecture, Protocols and Design Principles of IOT	3	0	2	4	The course enables student to understand the basics of Internet of things Architecture and protocols. It introduces some of the application areas where Internet of Things can be applied. The course also helps to understand the IoT Reference Architecture and Real World Design Constraints. The course also give the insights of the various embedded and cloud security concepts.
ET 401	Learning Technologies Project Course	0	0	1	4	It is within above framework and in pursuit of knowledge, skill and motivation for effective Teaching-Learning that the course is then designed to engage students in Learning Technologies Projects as drawn from individual students' specialization subject

						domains from engineering & technology, sciences, management, social sciences, humanities and green environment. Primarily, the learning technologies project categories will cover Projects in Designing System Development Life Cycle (SDLC) and Project-Based Learning.
GIS 401	Geospatial Intelligence	3	0	2	4	Geospatial intelligence is a discipline and an emerging profession that involves use of geospatial technology, critical information, and analytical rigor for a decision advantage in domains of natural resource management, disaster management and strategic defence or security. This course is designed for B.Tech. Compute Science & Engineering (CSE) students to provide exposure on geospatial technology and intelligence for various applications in both theoretical and practical aspects. The course also offers more in-depth knowledge on the use of computer vision and artificial intelligence in geospatial intelligence applications. This course is best fit for B.Tech. CSE students with AI knowledge.
GIS 411	Remote Sensing Fundamentals and Analysis	3	0	2	4	This course designed to introduce remote sensing to students from B.Tech. CSE with geomatics specialization. It provides basic concepts and fundamentals of physical principles of remote sensing along with the digital image processing concepts for remote sensing analysis. The course provides a firm basis for understanding and effective utilization of remote sensing datasets and techniques in any field of application.
GIS 421	Fundamentals of Geographic Information Systems (GIS)	2	0	4	4	This course designed to introduce Geographic Information Systems (GIS) to students from B.Tech. CSE with geomatics specialization. It provides basic principles and techniques of GIS analysis. The course provides a firm basis for understanding and effective utilization of GIS techniques and software for various applications. The lab practical of this course will be emphasized to provide hands-on experience on ArcGIS software.
NU 401	Advanced R & D Project	1	0	6	4	Advanced R&D project is offered as an open elective in seventh semester to the fast learners and carry same credits as the other open electives. It will be based on the R&D project that students have done in 6th semester. The students who have shown promise during the R&D project during the sixth semester will get an opportunity to extend the work in the advanced R&D project. They will be working under the same faculty who had mentored him / her during the R&D

						project in VI semester. Some of the possible extensions may be, applying the same technique to different problems, fine tuning/improving the techniques to get the higher precision/accuracy, get to do more recent literature survey, devising instruments to collect data, data gathering & analysis etc. as per discussions with faculty mentor. Finally, students will write a comprehensive report/research article as guided by faculty mentor. Evaluation will be based on mid semester evaluation, end semester evaluation, mentor's evaluation and comprehensive report/research article. They give the presentation and show the demonstration during the final evaluation and submit the final report with plagiarism report.

***HSSM Courses**

COURSE CODE	COURSE NAME	L	T	P	C	DESCRIPTION
ECON 102	Economics	3	0	0	3	Nature and scope of economic science, its relationship with other social sciences; quantification of economic variables, theories of consumer behavior and of the firm; linear economic models; market structures; social accounting and basic elements of economic planning.
ENG 102	English Literature	3	0	0	3	Literature is the study of societal behaviour which would help the students to gain insight about the individual's personality, attitude, motivation, learning and perception to become ethical. To learn and appreciate literature of any given language it is necessary to study literature written by the native speakers of that language. When a student studies literature of a period he/she can understand economic social and political situation of that time. Literature in English helps the students to develop a universal insight and make them appreciate values of various countries. The complexities and diversities of human society are well portrayed in this course. This course covers traditional and modern prospects of various ideologies and recollects them in an interesting manner.

HSS 201	Professional Ethics & Values	3	0	0	3	This course on Professional Ethics & Values facilitate students in exploring the meaning & concepts of Ethics, Professional Ethics and in understanding the nuances of Self Discipline, Teamwork and Time Management from practical point of view and enables student to think from different vantage points applying ethical framework while undertaking any decision and actions. The course intends to enable students for doing critical analysis with reference to paradigm of Professional Responsibility and Ethical Leadership.
HSS 301	Selected Readings	0	3	0	3	With time and advent of new technologies human kind is losing touch with the wisdom that comes from reading books. The new torch bearers of the world, the younger generation is often seen completely oblivious to the benefits of reading a good book in their leisure time. This course aims at encouraging the healthy habit of reading books in the young generation. The books can be from any genre but will surely give them some food for thought at the end of the day.
MGT 201	Basics of Management	3	0	0	3	Topics to be covered include Introduction to Management: Meaning, Definition, its nature, purpose, importance & Functions; Management as Art, Science. Is management a Profession; Difference between management and administration. Evolution of Management Thought: Contributions of F.W.Taylor, Henri Fayol, Elton Mayo, Chester Barhard, Peter Drucker, Michael Porter to management thought. Various approaches to management. Evolution of Management in India. Functions of Management: Planning - Meaning - Need & Importance, types, levels – advantages & limitations. Forecasting - Need & Techniques. Decision making - Types - Process of rational decision making & techniques of decision making. Organizing - Elements of organizing & processes: Types of organizations, Delegation of authority - Need, difficulties in delegation - Decentralization. Staffing - Meaning & Importance. Direction - Nature - Principles. Communication - Types & Importance. Motivation - Importance - theories.

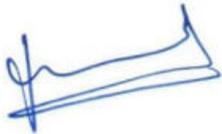


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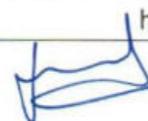
MGT 401	Entrepreneurship	3	0	0	3	The Business Environment in India has undergone a paradigm shift since the adoption of LPG. Indian Inc. catapulted itself to the role of 'Change Agent'. It is catalyst of a Knowledge-driven Market-centric economy. Competition breeds Innovation. Our economic policies encourage First generation Entrepreneurs – be it Micro, Small, Medium besides traditional Large Enterprises. The traditional form of business models like Family-run businesses are also success flag-post ventures in highly competitive global market ecosystem. Yet, there is a Knowledge-Divide. Our traditional theory based concepts are not effectively motivating young students to commercially exploit their Knowledge resource. This course will fill the void by sensitizing the students of the churning of business environment. The course will imbibe the attitudes of Entrepreneurship in budding students and hone their skill sets to Establish, Expand or Diversify and also explore merging concepts of growth of their own business.
ECON 401	Fundamentals of Engineering Economics	3	0	0	3	Engineers seek solutions to problems, and the economic viability of each potential solution is normally considered along with the technical aspects. The goal of this course is to introduce students to the process of integrating engineering proposals with economic analysis, to select among several viable alternative projects; and to understand and appreciate the models and measures used in decision making in engineering economics. This course introduces the fundamental concepts of economics and to explain how these will affect the functioning of an organization and contribute to decision making in engineering operations. The topics covered in this course include time value of money, cost-benefit analysis, depreciation, inflation, income taxes and risk analysis.

Programme Architecture

Postgraduate Programme


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Programme Architecture iMSc in Computer Science						
Course Code	Course Title	L	T	P	C	Description
Semester I						
MAT 011	Remedial Math-I	2	2	0	4	This pre-calculus course covers elements of Polynomial, Rational, Exponential, Logarithmic, Trigonometric functions, and their applications.
PHY 101	Science-I (Physics/Chemistry)	3	0	3	4	This is a comprehensive course in Physics that deals with quantum mechanics, Semiconductor Physics, Magnetism, Dielectrics and LASER. In order to allow the students to get exposed to experimental methods, the course also has a laboratory component. This helps the students to integrate theoretical knowledge and concepts with practical experience. Students will also learn operation of scientific equipment, collection of data and their analysis.
TA 111	Fundamentals of Computer Programming	2	0	4	4	This is an introductory course on Programming Fundamentals. Its aim is to introduce basic concepts of Programming using high level language like Python. Students will solve problems by developing simple algorithms and then implement them using a Python programming language. The Lab component complements the theory by practicing the concept using Python. Through this course students will learn Object Oriented Programming concepts and how to use Object Oriented Python. Through this course students will become expert to use unique features of Python Language along with Python standard libraries and modules and packages.
TA 102	Communication Skills	2	0	2	3	Communication plays a crucial role in the management of an organization. Without proper communication, no organization can function properly. No matter which medium one communicates in, speaking and listening both should take place. This course aims to hone the



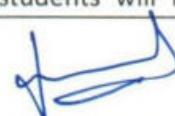
						communication and professional skills of the young graduates making them ready for professional environment. The course has been designed to have an appropriate blend of theory and practical sessions so that the students gain a sound knowledge of communication theoretical skills and understand ways of applying these skills in future.	
	HSSM - I		3	0	0	3	
NU 111	Community Connect (Audit)		0	0	2	1	Orientation to Field Visits: Each One Teach One; Importance of Education; Mentoring for Sensitivity & Curiosity; Understanding rural code of conduct; Sharing Technology education for access to learning Accelerated Learning: Observing & selecting the mentee; Remedial teaching; developing lessons & tests for recapitulation; Getting to know children's world; School evaluation systems; alternative systems of learning; Teaching for Community Empowerment. Measurement of Progress: in sensitivity; in degrees of curiosity; in aspirations; in learning styles; in mentoring styles; developing accelerated learning tests.
	Total Semester L-T-P-C		12	2	9+2	18+1	
Semester II							
MAT 012	Remedial Math-II		2	2	0	4	This pre-calculus course covers elements of Coordinate Geometry, Vectors, Matrix Algebra, Sequences, Probability, Statistics, and their applications.
MAT 022	Remedial Math III		2	2	0	4	This univariate calculus course introduces the concept of Limits, Continuity, Differentiation, Integration, and their applications.
CHM 111	Science (Physics/Chemistry)	II	3	0	3	4	This course continues the study of the fundamental principles and laws of chemistry and biology. Topics include Reactions of Organic Compounds, separation, and purification-identification of organic compounds by spectroscopic techniques, oxidation and reduction reactions, photochemistry, supra molecular chemistry, nanoparticles and nano materials, green chemistry, and biomolecules. Upon

						completion, students should be able to demonstrate an understanding of chemical and biological concepts as needed to pursue further study in chemistry or biology related professional fields. Laboratory experiments and computer-based exercises augment and reinforce the basic principles discussed in lecture as well as provide practical examples.	
CS 102	Data Structures		3	0	3	4	This course aims to provide the students with solid foundations in the basic concepts of programming: data structures and algorithms. This course offers the students a mixture of theoretical knowledge and practical experience. The study of data structures is carried out within an object-oriented framework with implementations in Python programming language.
EL 111	Fundamentals of Electronics		3	1	0	4	This course is designed to help students gain an understanding of basics of DC and AC circuits. Students will learn to apply network analysis theorems & techniques to analyse and even design the electrical and electronic circuits. Introduction of PN junction devices including diodes and transistors helps develop basic understanding of the working of analog & digital electronic circuits. Students will also get a chance to learn about digital logic families along with Boolean algebra and Number systems which will prepare them for the upcoming courses in their Engineering programme.
ENV 301	Environmental Science (Audit)		3	0	0	3	The Multidisciplinary Nature of Environmental Studies- Definition, scope and importance Need for public awareness.
NU 112	Community Connect (Audit)		0	0	2	1	Orientation to Field Visits: Each One Teach One; Importance of Education; Mentoring for Sensitivity & Curiosity; Understanding rural code of conduct; Sharing Technology education for access to learning Accelerated Learning: Observing & selecting the mentee; Remedial teaching; developing lessons &

						tests for recapitulation; Getting to know children’s world; School evaluation systems; alternative systems of learning; Teaching for Community Empowerment. Measurement of Progress: in sensitivity; in degrees of curiosity; in aspirations; in learning styles; in mentoring styles; developing accelerated learning tests.
	Total Semester L-T-P-C	16	4	6+2	22+1	
Semester III						
	HSSM - II	3	0	0	3	
MAT 112	Calculus	3	1	0	4	This course includes the fundamentals and applications of differential calculus, integral calculus, vector calculus, and complex analysis. These concepts seem to have lots of applications in computer science engineering, electronics and communication engineering, among other branches of mathematics and engineering.
EL 101	Digital Logic and Circuit	3	0	3	4	Digital Logic & Circuits Course at Third semester UG level introduces the fundamentals of logic gates, Boolean Algebra, Karnaugh map etc. It also introduces Combinational & Sequential components like adder, multiplexer, encoders, decoders, flip-flop, latches, registers and their application in designing various combinational & sequential digital circuits. The course introduces the concept of Digital Circuits and focuses on analyzing, designing and utilizing combinational and sequential digital circuits.
CS 232	Discrete Maths	3	1	0	4	This course emphasizes on problem solving, understanding of mathematical definitions and proofs, grasping basic mathematical structures that are useful in Computer Science. Topics covered in this course are Logic and proofs, Graph Theory, Counting, Number Theory and introduction to Abstract Algebra. Propositional logic, first order logic, proof by contradiction, induction, invariant method etc. will be covered in Logic. In Graph Theory the topics to be covered include degree sequence, Eulerian graphs, isomorphism, trees,

							stable and bipartite matching, graph coloring, planar graphs etc. Sets, functions, number sequences, counting by mapping, pigeonhole principle, recursion and generating functions are some of the topics to be covered in Counting, while in Number Theory topics like Extended Euclidean Algorithm, Modular Arithmetic, Chinese Remainder Theorem and an introduction to Public Key Cryptography will be covered. In the introduction to Abstract Algebra, relations and their properties, n-ary relations, equivalence relations and partial orderings are covered. The prerequisites for this course is High School Algebra.
CS 251	Object Oriented Programming	2	0	4	4		Java is a large-scale object-oriented programming language. This course is designed to provide complete knowledge of Object-Oriented Programming through Java and to enhance the programming skills of the students by giving practical assignments to be done in labs.
CS 241	Introduction to Communications Systems	3	0	2	4		Introduction to Communication Systems at Third semester UG level introduces the fundamental of electrical communication systems, the elementary knowledge of electrical signals to multiple access transmission techniques. The in-depth knowledge of various modulation techniques in the analog and the digital domain is given .The mathematical representation of electrical communication systems and the wireless environment is also studied.
Total Semester L-T-P-C		17	3	9+2	24+1		
Semester IV							
CS 201	Design & Analysis of Algorithms	3	0	3	4		
MAT 101	Algebra & Differential Equation	3	1	0	4		The objective of the course is to give the students a basic knowledge of linear algebra and differential equations and provide them with techniques available to solve differential equations. These concepts seem to have lots of applications in computer science

						engineering, electronics and communication engineering, among other branches of mathematics and engineering.
CS 122	Computer Arch. & Organization	3	0	2	4	This course is about the design of computers. It covers both the overall design architecture and their internal detailed organization. Computer Architecture refers to those attributes of a system visible to programmer or that have direct impact on the logical execution of a program. Computer Organization refers to the operational units and their interconnection that realize the architectural specifications. At the end of this course, a student must not only be aware of various aspects of architecture but also must be in a position to evaluate the effects of the same on high level software.
CS 211	Operating System	3	0	2	4	This course provides an introduction to different fundamental aspects of Operating Systems. The course covers the operating system structure, their major components and organization as well as the underlying architectural support. The main prima face of the course is given on the concepts of multi-programming, multi-tasking, multiprocessing, time-sharing, processes, threads, their synchronization, scheduling and management, concurrency control and underlying issues of deadlock, memory management, virtual memory, page replacement algorithms and file management system. The entire course is supported through illustrated examples. Some introduction is also provided to the concepts of networking, distributed systems and different security issues.
CS 231	Database Management Systems	3	0	2	4	This is an introductory course on relational database systems. Its aim is to introduce basic concepts of databases and database management systems. At the end of this course it is expected that students will have a reasonably good



						<p>theoretical as well as practical foundation on database systems. In particular, they will have a good understanding of relational data model, relational query languages, and database processing, SQL and PLSQL, physical database, storage and indexing structures, transaction management, database recovery.</p>
	HSSM - III	3	0	0	3	
	Total Semester L-T-P-C	18	0	9+2	23+1	
Semester V						
CS 261	Computer Networks	3	0	2	4	<p>This course is to provide students with an overview of the concepts and fundamentals of data communication and computer networks. Topics to be covered include: data communication concepts and techniques in a layered network architecture, communications switching and routing, types of communication. Network congestion, network topologies, network configuration and management, network model components, layered network models (OSI reference model, TCP/IP networking architecture) and their protocols. Various types of networks (LAN, MAN, WAN and Wireless networks) and their protocols.</p>
CS 301	Software Engineering	3	0	2	4	<p>This course will provide an understanding of how to develop a software system by guiding them through the development lifecycle and different methodologies. This course will also provide knowledge and expertise of system design technique with object-oriented approach using UML. The course will help students to learn software requirements analysis process, object-oriented design technique, use case, test plan and test case preparation as part of problem-solving activities. This course will also provide students an overall understanding of Project Management with Software Project Estimation, Project Scheduling, Risk Management, Configuration Management, Software Quality</p>

						Assurance and Software Maintenance.
CS 302	Theory of Computation	3	1	0	4	In this course, the following topics will be covered - Finite Automata (deterministic and nondeterministic), regular operations. Regular Expression, Equivalence of DFA, NFA and REs, closure properties. Non regular languages and pumping lemma, DFA Minimization. CFGs, Chomsky Normal Form. Non CFLs and pumping lemma for CFLs, PDAs, Equivalence of PDA and CFG. Properties of CFLs, DCFLs, Turing Machines and its variants. Configuration graph, closure properties of decidable and Turing-recognizable languages, decidability properties of regular languages and CFLs. Undecidability, reductions, Rice Theorem. Time and space measures, hierarchy theorems, complexity classes P, NP, L, NL, PSPACE, BPP and IP, complete problems, P versus NP conjecture.
CS 332	Compiler Design	3	0	2	4	This course aims to teach students the principals involved in compiler design. It will cover all the basic components of a compiler, but not the advanced material on optimizations and machine code generation. The course will have a project where students will have to develop a compiler for a subset of C language using tools like Lex and Yacc. The target environment will be SPIM simulator.
EL 302	Digital Image Processing	3	0	2	4	Digital Image Processing course at UG level introduces the fundamentals of Image Processing. The course will cover a wide range of Image Processing techniques in time and frequency domain. Apart from image processing, video handling will also get covered in the course.
	HSSM-IV	3	0	0	3	
	Total Semester L-T-P-C	18	1	8+2	23+1	
Semester VI						



CS 392	Capstone Project I	1	0	6	4	By empowering students with the skills necessary to access, understand and evaluate Information, Capstone Project will support students in the achievement of 21st century learning expectations. Students work in teams to develop or implement a real-world IT solution. <ul style="list-style-type: none"> • Address a typical business and organizational need such as data management, application development, system deployment, or security analysis. • Usage of HTML, CSS, JavaScript, JQuery and Bootstrap along with Web Application Framework. • Apply information technologies, applications, best practices, and standards in technical design, development, and implementation. • Practice soft skills in a real-world IT project, including project planning and management, research and learning, communication, writing, presentation, and teamwork.
CS 3112	Multi-device Programming	1	0	6	4	This course introduces students to the tools & technologies used for front end designing and development for a software product. In particular, it focuses on technologies to design, develop, debug and test front-end part of a software application. Additionally, brief introduction to IoT applications using Raspberry Pi and Arduino is also a part of this course. After the end of the course the students are expected to learn the skills needed to design and develop robust, responsive and easy to test user interface (front-end) by following MVC based architecture using technologies like Angular and Bootstrap etc. Additionally, they get hands-on experience for the development of IoT applications.
	Professional Elective – I	3	0	2	4	
	Professional Elective – II	3	0	2	4	
NU 302	R & D Project	1	0	6	4	The Research and Development (R & D) projects is a core course for all undergraduate 6th semester students. The purpose of this course is to train the students to perform research and to be

familiar with the activities and methodologies generally followed during the research work. All Faculty of NU share their research problems and students select a problem according to his/her research interest. The students perform literature survey and find the research gaps and challenges in their respective selected problem and then narrow down to specific gap/challenge on which they want to pursue the research. Subsequently the students design a complete solution and implement the same in consultation with their faculty mentor. Students present these during two mid semester evaluations and submit brief report to explain these points. They give the presentation and show the demonstration during the final evaluation and submit the final report with plagiarism report. The activities during the research process imparts valuable learning objectives, like understanding the research process, develop critical thinking and problem-solving skills in addition to soft skills like communication skills, team-work skills etc. Outcome of the R & D projects as publications, conference paper, prototype, patent encourage the undergraduate students and faculty supervisors. Moreover, it has a positive impact on NU as well as society at large. This will be the base for Advanced R&D project in VII semester.

HSSM-V	3	0	0	3	
Total Semester L-T-P-C	14	0	18+2	23+1	

Semester VII

Professional Elective – III	3	0	2	4	
Professional Elective – IV	3	0	2	4	
Professional Elective – V	3	0	2	4	
Open Elective – I	3	0	2	4	
Open Elective – II	3	0	2	4	
Capstone Project -- II	1	0	6	4	
Total Semester L-T-P-C	16	0	16+2	24+1	

Semester VIII

NU 402	Industry Practice/Project	0	0	40	20	Industry Practice is a flagship course of 20 credits in the B Tech Programme of NIIT University. Every student of NIIT University has an opportunity to transfer learning from classroom to the workplace in industry in the final six-month semester of B Tech Programme. During Industry Practice, a student works on the real time project of an organization under direct mentoring by industry professional. This 6-month period makes the transition from student in a University to an employed professional in industry seamless or smooth for a student.
					180	
Specialization Area Courses						
Data Science						
COURSE CODE	COURSE NAME	L	T	P	C	DESCRIPTION
CS 3102	Dimensional and NoSQL Databases	2	0	4	4	This course starts with exploring the difference between centralized and distributed databases and the need for distributed databases. This further leads to the origins, characteristics of NoSQL databases. The four classes of NoSQL Databases are considered here namely, key-value store, column store, document store and graph based stores. The second part of the course looks at decision making in an enterprise and the shift in approach that is required from traditional OLTP systems to OLAP systems. In this regard, Data Warehouse conceptual modeling will be taught. Finally the data engineering pipeline ETL required will be a hands-on task which will be delivered on relational and NoSQL databases done in the first part of the course. The course gives a hands-on approach to the four types of NoSQL databases namely, key-value store, column based,

						document store and graph based databases. The students will be able to demonstrate competency in these four types of databases. In the second part of the course, students will model star and snow flake schema using a decision based approach. Finally, The students will be able to demonstrate competency in ETL.
CS 4261	Natural Language Processing & Text analytics	3	0	2	4	The course is an introduction to Natural Language Processing (NLP). The main objective of the course is to learn the fundamental concepts used in processing natural language. NLP requires learning material from several fields: linguistics, machine learning and statistical analysis, and core natural language techniques. The course includes algorithms and data structures required to develop practical computer systems capable of performing intelligent tasks on natural language: analyse, understand and generate written text. The course also includes techniques to do the text analytics and develop various applications like sentiment analysis/recommendation system, question answering, conversational interfaces, Machine translation, spell checker, text summarization and coreference resolution. Implementation of NLP applications using the Natural Language Toolkit or NLTK and Python is covered.
DS 402	Big Data Concepts	2	0	4	4	The course covers techniques to build and maintain reliable and scalable systems capable of handling large amounts of data using Apache Hadoop, its extensions, libraries and related technologies
DS 412	Inferential Statistics for Data Science	2	0	4	4	Basic principles for statistical inference with practical applications of data. Includes point estimation, confidence intervals, hypothesis testing, ANOVA and simple linear regression. Includes use of statistical R software.

DS 432	Predictive Modeling for data Science	2	0	4	4	This course will focus on predictive modeling methods most relevant to data science. Students will implement these methods using statistical software.
Cyber Security						
COURSE CODE	COURSE NAME	L	T	P	C	DESCRIPTION
CS 4151	Cyber Security	3	0	2	4	The course starts with discussion of Cyber security threat landscape on the Internet and covers most of the areas of web, application and network security which a student working in this domain should know. The subject covers some protocols including HTTP, TLS, DNS, SMTP, FTP etc. and talks about specific cyber security attacks including Phishing, Spoofing, Denial of Service and many more. Students will also learn some security frameworks and modeling techniques to understand threat in a system and develop their countermeasures. Cyber security laws will help them with the necessary information that will be required when they will work in Cyber policing in future. Overall this course will help them understand Cyber security in detail.
CS 4241	Cyber Forensics	3	0	2	4	The course covers the procedures for identification, preservation, and extraction of electronic evidence, auditing and investigation of network and host system intrusions, analysis and documentation of information gathered, and preparation of expert testimonial evidence. The course will also provide hands on experience on various forensic tools and resources for system administrators and information system security officers.
CS 461	Introduction to Information Security	3	0	2	4	This course will introduce the concepts of the Cryptography and Information Security. It consists of topics on various cryptographic models available, Mail Protocols Standards, IP Security Architecture; Firewall Design Principles. Students will also learn implementation

						<p>of some of the mechanisms through practical's.</p> <ul style="list-style-type: none"> • To provide introduction to the concept of Network Security Model and Cryptography systems. • To give the knowledge of Digital Signature and other Security Measures available. • To familiarize with the various techniques like PGP and S/MIME. • To showcase IP Security Architecture & Transport Layer Security to identify the vulnerability of the Internet systems and recognize the mechanisms of the attacks. • To explain the firewall design principles and various intrusion detection system
CS 511	Systems and Network Security	3	0	2	4	<p>In this course, students are introduced to the core concepts of system and network security. The course focuses on the fundamental knowledge of systems and networks. It includes a wide range of network attacks and corresponding defense mechanisms to build deep understanding of network security among the readers. The course also contains current network security technologies such as firewalls, IPSEC, intrusion detection and prevention systems, network security models, multilevel security, and security management and monitoring. The attacks and defensive mechanisms are divided into various layers while explanation and deep focus has been given in understanding of the practical tools and techniques to make the reader capable to play an active job role as a system security or network security professional. System security concepts such as operating system hardening, trusted computing, and access control are added for better understanding of operating system security issues. After completion of this course the students are expected to be capable in performing network scans, enumerations install and apply defensive strategies to protect systems and networks in an organization. Students are also expected to carry</p>

						forward research in the domains of interest after thorough understanding of the security concepts in this course.
	Malware Analysis					To be updated

Big Data Engineering

COURSE CODE	COURSE NAME	L	T	P	C	DESCRIPTION
CS 3102	Dimensional and NoSQL Databases	2	0	4	4	<p>This course starts with exploring the difference between centralized and distributed databases and the need for distributed databases. This further leads to the origins, characteristics of NoSQL databases. The four classes of NoSQL Databases are considered here namely, key-value store, column store, document store and graph based stores. The second part of the course looks at decision making in an enterprise and the shift in approach that is required from traditional OLTP systems to OLAP systems. In this regard, Data Warehouse conceptual modeling will be taught. Finally the data engineering pipeline ETL required will be a hands-on task which will be delivered on relational and NoSQL databases done in the first part of the course.</p> <p>The course gives a hands-on approach to the four types of NoSQL databases namely, key-value store, column based, document store and graph based databases. The students will be able to demonstrate competency in these four types of databases. In the second part of the course, students will model star and snow flake schema using a decision based approach. Finally, The students will be able to demonstrate competency in ETL.</p>

CS 4121	Web Intelligence & Algorithms	3	0	2	4	The aim of the course is to introduce algorithmic techniques used in various web applications to extract intelligence. The course has special focus on search engines, recommender systems and on linked data and the semantic web. The student will also learn practical implementations of the algorithms and design and development of intelligent systems
CS 451	Data Mining	3	0	2	4	This course provides an introduction to fundamental aspects of data mining which is extraction of valid, novel, potentially useful, understandable patterns from data sources such as, databases, texts, web, images, etc. This course covers the importance of data preprocessing, major tasks in data preprocessing, association rule mining, different types of clustering techniques, decision tree construction, and evaluation of classifier performance and outlier detection techniques. The theoretical aspects are supported by a lab component.
CS 481	Information Retrieval	3	1	0	4	The course is an advanced course on the theory and practice of modern Information Retrieval Systems. It aims to cover both basic and advanced algorithms and techniques for text retrieval systems as well as web retrieval systems. The course also delivers on advanced retrieval systems that are multilingual, multimedia and XML in nature.
DS 402	Big Data Concepts	2	0	4	4	The course covers techniques to build and maintain reliable and scalable systems capable of handling large amounts of data using Apache Hadoop, its extensions, libraries and related technologies
Artificial Intelligence						
COURSE CODE	COURSE NAME	L	T	P	C	DESCRIPTION

CS 322	Artificial Intelligence	3	0	2	4	This course is offered to students of sixth semester of B. Tech. (CSE) specializing in Artificial Intelligence. The course starts by introducing the concept of agents. It goes on to cover fundamental knowledge of Artificial Intelligence including the basic search algorithms for problem solving including uninformed and informed search. It then discusses various approaches for knowledge representation including rule based systems, semantic nets and frames. These knowledge representations are then used for inferencing and reasoning using forward chaining, backward chaining, AND/OR graphs and graph traversal for semantic nets. These ideas are then extended to develop fuzzy sets and fuzzy logic. Fuzzy inferencing system is discussed using the Mamdani technique. The course concludes with a detailed description of genetic algorithms including different representation of solutions, different forms of selection, different operators. Lastly, Holland's theorem for proof of converges for classical GA is also discussed.
CS 4111	Computer Vision	3	0	2	4	This course introduces the basic concepts of Computer Vision to the students of undergraduate level.
CS 4131	Machine Learning	3	0	2	4	This course is for students of seventh semester of B. Tech. (CSE) specializing in Artificial Intelligence and an open elective to other students. The course introduces the concept of supervised (classification and regression), unsupervised and semi-supervised learning. Concepts like features, feature vectors and feature spaces are introduced. The course then develops supervised learning algorithms like nearest neighbor, decision trees, Bayesian learning, linear regression, polynomial and other non-linear regression, logistic regression, support vector machines, perceptron and multi-layer perceptron. Modern approaches of

						deep learning using CNN and autoencoders are also discussed. Techniques for dimension reduction using PCA and different feature selection methods are also discussed. Various unsupervised learning methods are discussed like K-means, DBSCAN, hierarchical clustering, expectation maximization. The course concludes with a discussion on reinforcement learning with a significant discussion on the exploration versus exploitation dilemma.
CS 4261	Natural Language Processing & Text analytics	3	0	2	4	The course is an introduction to Natural Language Processing (NLP). The main objective of the course is to learn the fundamental concepts used in processing natural language. NLP requires learning material from several fields: linguistics, machine learning and statistical analysis, and core natural language techniques. The course includes algorithms and data structures required to develop practical computer systems capable of performing intelligent tasks on natural language: analyse, understand and generate written text. The course also includes techniques to do the text analytics and develop various applications like sentiment analysis/recommendation system, question answering, conversational interfaces, Machine translation, spell checker, text summarization and coreference resolution. Implementation of NLP applications using the Natural Language Toolkit or NLTK and Python is covered.
CS 4271	Neural Networks and Deep Learning	3	0	2	4	This course introduces the concepts of Neural Networks and Deep Learning to the students of undergraduate level.
	Cloud Computing					
COURSE CODE	COURSE NAME	L	T	P	C	DESCRIPTION

CS 3132	Cloud Computing Concepts	3	0	2	4	<p>Cloud Computing will cover the concepts, historical development, service models, deployment models, and reference architecture. It includes various technological foundation such as virtualization, service-oriented architecture, and other core components. This course will also cover the various attacks on cloud environment along with security aspects of cloud computing. Applied areas are covered to explain the usability of cloud computing. The course will be supported by use of open-source software for virtualization and cloud computing lab.</p>
CS 4231	Fog and Edge Networks	3	0	2	4	<p>In this course, we will study significant tools and applications that comprise today's cloud computing, fog and edge platform, with a special focus on using the cloud for networks and mankind applications. The course content will come directly from research papers, articles, and documentation of cloud, fog and edge, data center, architectures, technologies and applications. We will work together to develop a deep understanding of this content through class presentations and discussions of this material.</p>
CS 4221	Cloud Services and Technologies	1	0	6	4	<p>Cloud technologies are seeing widespread adoption by business across all the domains . • This course will provide a background on how owning & operating a data center has many pain points for businesses. With that context, it will provide clarity on why adopting the cloud eases these pain points. • This course will also focus on adoption models, deployment models, virtualization, containerization, DevOps and automation. • The course will then compare monolithic architecture VS microservices architecture, writing and deploying programs on the cloud, API management and the nuances across Google cloud platform, Amazon Web Services and Microsoft Azure. • The prerequisite for attending this course is</p>

						knowledge of SDLC and programming in python.
CS 4211	Parallel & Distributed Computing	3	0	2	4	This course introduces the basic concepts of parallel and distributed computing to the students of undergraduate level.
	Advance Computer Networks					To be updated

Geomatics

COURSE CODE	COURSE NAME	L	T	P	C	DESCRIPTION
GIS 411	Remote Sensing Fundamentals and Analysis	3	0	2	4	This course designed to introduce remote sensing to students from B.Tech. CSE with geomatics specialization. It provides basic concepts and fundamentals of physical principles of remote sensing along with the digital image processing concepts for remote sensing analysis. The course provides a firm basis for understanding and effective utilization of remote sensing datasets and techniques in any field of application.
GIS 421	Fundamentals of Geographic Information Systems (GIS)	2	0	4	4	This course designed to introduce Geographic Information Systems (GIS) to students from B.Tech. CSE with geomatics specialization. It provides basic principles and techniques of GIS analysis. The course provides a firm basis for understanding and effective utilization of GIS techniques and software for various applications. The lab practical of this course will be emphasized to provide hands-on experience on ArcGIS software.
GIS 431	Advanced Remote Sensing	3	0	2	4	To be updated
GIS 441	Drone Photogrammetry	3	0	2	4	To be updated
GIS 451	Geospatial Programming and Web Map Development	3	0	2	4	To be updated

Other available Professional/Open Electives

COURSE CODE	COURSE NAME	L	T	P	C	DESCRIPTION
CS 3102	Dimensional and NoSQL Databases	2	0	4	4	<p>This course starts with exploring the difference between centralized and distributed databases and the need for distributed databases. This further leads to the origins, characteristics of NoSQL databases. The four classes of NoSQL Databases are considered here namely, key-value store, column store, document store and graph based stores. The second part of the course looks at decision making in an enterprise and the shift in approach that is required from traditional OLTP systems to OLAP systems. In this regard, Data Warehouse conceptual modeling will be taught. Finally the data engineering pipeline ETL required will be a hands-on task which will be delivered on relational and NoSQL databases done in the first part of the course.</p> <p>The course gives a hands-on approach to the four types of NoSQL databases namely, key-value store, column based, document store and graph based databases. The students will be able to demonstrate competency in these four types of databases. In the second part of the course, students will model star and snow flake schema using a decision based approach. Finally, The students will be able to demonstrate competency in ETL.</p>
CS 3132	Cloud Computing Concepts	3	0	2	4	<p>Cloud Computing will cover the concepts, historical development, service models, deployment models, and reference architecture. It includes various technological foundation such as virtualization, service-oriented architecture, and other core components. This course will also cover the various attacks on cloud environment along with security aspects of cloud computing. Applied areas are covered to explain the usability of cloud</p>

						computing. The course will be supported by use of open-source software for virtualization and cloud computing lab.
CS 3152	Ethical Hacking	3	0	2	4	<p>In this course, students are introduced to the concept of ethical hacking, gain the knowledge of the Ethical Hacking terminology, difference between ethical hackers and unethical hackers, Steps of ethical hacking. This course also focusing on networking concept and virtualization, virtualization features and practical implementation of virtualization. In this course students can also learn about the information gathering technique, scanning concept, their uses for ethical hacking, how the unethical hackers hack the system password, hiding files and covering their footprints. Students also learn about the trojan, viruses, worms, ransomware etc., understanding the different types of attacks like- SQL Injection, XSS, DOS & DDOS, Wi-fi hacking and many more. Students can understand the concept of cryptography, its types and all about the vulnerability assessment and penetration testing framework for the organizations. In the Last students can learn all about the mitigation techniques of attacks. After completion of this course the students are expected to be capable in performing ethical hacking techniques, perform vulnerability assessment to protect systems and networks in an organization.</p>
CS 322	Artificial Intelligence	3	0	2	4	<p>This course is offered to students of sixth semester of B. Tech. (CSE) specializing in Artificial Intelligence. The course starts by introducing the concept of agents. It goes on to cover fundamental knowledge of Artificial Intelligence including the basic search algorithms for problem solving including uninformed and informed search. It then discusses various approaches for knowledge representation including rule based systems, semantic nets and frames.</p>

						These knowledge representations are then used for inferencing and reasoning using forward chaining, backward chaining, AND/OR graphs and graph traversal for semantic nets. These ideas are then extended to develop fuzzy sets and fuzzy logic. Fuzzy inferencing system is discussed using the Mamdani technique. The course concludes with a detailed description of genetic algorithms including different representation of solutions, different forms of selection, different operators. Lastly, Holland's theorem for proof of converges for classical GA is also discussed.
CS 342	Artificial Neural Network	3	0	2	4	<ul style="list-style-type: none"> This course is an introduction to Artificial Neural Networks. It will focus on the computational fundamentals of artificial neural networks and their applications.
CS 4101	Introduction to Linear and Non Linear Optimization	3	0	2	4	This course is an introduction to linear and nonlinear optimization using mathematical techniques. Many problems from data science, machine learning, engineering, and economics can be formulated as an optimization problem. The objective of this course is to introduce various types of optimization problem, build the theoretical foundation, and build practical; solution methods. The course will also provide opportunity to use freely available software for solving optimization problems.
CS 4111	Computer Vision	3	0	2	4	This course introduces the basic concepts of Computer Vision to the students of undergraduate level.
CS 4121	Web Intelligence & Algorithms	3	0	2	4	The aim of the course is to introduce algorithmic techniques used in various web applications to extract intelligence. The course has special focus on search engines, recommender systems and on linked data and the semantic web. The student will also learn practical implementations of the algorithms and design and development of intelligent systems

CS 4131	Machine Learning	3	0	2	4	<p>This course is for students of seventh semester of B. Tech. (CSE) specializing in Artificial Intelligence and an open elective to other students. The course introduces the concept of supervised (classification and regression), unsupervised and semi-supervised learning. Concepts like features, feature vectors and feature spaces are introduced. The course then develops supervised learning algorithms like nearest neighbor, decision trees, Bayesian learning, linear regression, polynomial and other non-linear regression, logistic regression, support vector machines, perceptron and multi-layer perceptron. Modern approaches of deep learning using CNN and autoencoders are also discussed. Techniques for dimension reduction using PCA and different feature selection methods are also discussed. Various unsupervised learning methods are discussed like K-means, DBSCAN, hierarchical clustering, expectation maximization. The course concludes with a discussion on reinforcement learning with a significant discussion on the exploration versus exploitation dilemma.</p>
CS 4151	Cyber Security	3	0	2	4	<p>The course starts with discussion of Cyber security threat landscape on the Internet and covers most of the areas of web, application and network security which a student working in this domain should know. The subject covers some protocols including HTTP, TLS, DNS, SMTP, FTP etc. and talks about specific cyber security attacks including Phishing, Spoofing, Denial of Service and many more. Students will also learn some security frameworks and modeling techniques to understand threat in a system and develop their countermeasures. Cyber security laws will help them with the necessary information that will be required when they will work in Cyber policing in future.</p>

						Overall this course will help them understand Cyber security in detail.
CS 4201	Blockchain Technology and Application	3	0	2	4	Blockchain is an emerging technology which supports decentralization. This course will focus on core concepts of Blockchain such as distributed consensus mechanisms, cryptographic primitives as well as available blockchain platforms such as Bitcoin, Hyperledger, Ethereum and Algorand. This course will also focus on writing smart contracts in some of these platforms. The prerequisite for attending this course is knowledge of information security and strong background in mathematics.
CS 4231	Fog and Edge Networks	3	0	2	4	In this course, we will study significant tools and applications that comprise today's cloud computing, fog and edge platform, with a special focus on using the cloud for networks and mankind applications. The course content will come directly from research papers, articles, and documentation of cloud, fog and edge, data center, architectures, technologies and applications. We will work together to develop a deep understanding of this content through class presentations and discussions of this material.
CS 4241	Cyber Forensics	3	0	2	4	The course covers the procedures for identification, preservation, and extraction of electronic evidence, auditing and investigation of network and host system intrusions, analysis and documentation of information gathered, and preparation of expert testimonial evidence. The course will also provide hands on experience on various forensic tools and resources for system administrators and information system security officers.
CS 4251	AI in Cyber Security	3	0	2	4	This course gives an overview of AI and ML concepts and how to apply them to solve problems in the area of

						Cybersecurity. This course also gives an overview of Cyber Threat Intelligence and future trends of AI and ML in the field of Cybersecurity.
CS 4261	Natural Language Processing & Text analytics	3	0	2	4	The course is an introduction to Natural Language Processing (NLP). The main objective of the course is to learn the fundamental concepts used in processing natural language. NLP requires learning material from several fields: linguistics, machine learning and statistical analysis, and core natural language techniques. The course includes algorithms and data structures required to develop practical computer systems capable of performing intelligent tasks on natural language: analyse, understand and generate written text. The course also includes techniques to do the text analytics and develop various applications like sentiment analysis/recommendation system, question answering, conversational interfaces, Machine translation, spell checker, text summarization and coreference resolution. Implementation of NLP applications using the Natural Language Toolkit or NLTK and Python is covered.
CS 4271	Neural Networks and Deep Learning	3	0	2	4	This course introduces the concepts of Neural Networks and Deep Learning to the students of undergraduate level.
CS 451	Data Mining	3	0	2	4	This course provides an introduction to fundamental aspects of data mining which is extraction of valid, novel, potentially useful, understandable patterns from data sources such as, databases, texts, web, images, etc. This course covers the importance of data preprocessing, major tasks in data preprocessing, association rule mining, different types of clustering techniques, decision tree construction, and evaluation of classifier performance and outlier detection techniques. The theoretical aspects are supported by a lab component.

CS 461	Introduction to Information Security	3	0	2	4	This course will introduce the concepts of the Cryptography and Information Security. It consists of topics on various cryptographic models available, Mail Protocols Standards, IP Security Architecture; Firewall Design Principles. Students will also learn implementation of some of the mechanisms through practical's. • To provide introduction to the concept of Network Security Model and Cryptography systems. • To give the knowledge of Digital Signature and other Security Measures available. • To familiarize with the various techniques like PGP and S/MIME. • To showcase IP Security Architecture & Transport Layer Security to identify the vulnerability of the Internet systems and recognize the mechanisms of the attacks. • To explain the firewall design principles and various intrusion detection system
CS 481	Information Retrieval	3	1	0	4	The course is an advanced course on the theory and practice of modern Information Retrieval Systems It aims to cover both basic and advanced algorithms and techniques for text retrieval systems as well as web retrieval systems. The course also delivers on advanced retrieval systems that are multilingual, multimedia and XML in nature.
CS 491	Natural Language Processing	3	0	2	4	The course is an introduction to Natural Language Processing (NLP). The main objective of the course is to learn the fundamental concepts used in processing natural language. NLP requires learning material from several fields: linguistics, machine learning and statistical analysis, and core natural language techniques. The course includes algorithms and data structures required to develop practical computer systems capable of performing intelligent tasks on natural language: analyze, understand and generate written text. The course also includes techniques to use the information extracted from natural language in

						various applications like sentiment analysis, question answering, conversational interfaces. Implementation of NLP applications using the Natural Language Toolkit or NLTK and Python is covered.
CS 511	Systems and Network Security	3	0	2	4	In this course, students are introduced to the core concepts of system and network security. The course focuses on the fundamental knowledge of systems and networks. It includes a wide range of network attacks and corresponding defense mechanisms to build deep understanding of network security among the readers. The course also contains current network security technologies such as firewalls, IPSEC, intrusion detection and prevention systems, network security models, multilevel security, and security management and monitoring. The attacks and defensive mechanisms are divided into various layers while explanation and deep focus has been given in understanding of the practical tools and techniques to make the reader capable to play an active job role as a system security or network security professional. System security concepts such as operating system hardening, trusted computing, and access control are added for better understanding of operating system security issues. After completion of this course the students are expected to be capable in performing network scans, enumerations install and apply defensive strategies to protect systems and networks in an organization. Students are also expected to carry forward research in the domains of interest after thorough understanding of the security concepts in this course.
DS 402	Big Data Concepts	2	0	4	4	The course covers techniques to build and maintain reliable and scalable systems capable of handling large amounts of data using Apache Hadoop, its extensions, libraries and related

						technologies
DS 412	Inferential Statistics for Data Science	2	0	4	4	Basic principles for statistical inference with practical applications of data. Includes point estimation, confidence intervals, hypothesis testing, ANOVA and simple linear regression. Includes use of statistical R software.
DS 432	Predictive Modeling for data Science	2	0	4	4	This course will focus on predictive modeling methods most relevant to data science. Students will implement these methods using statistical software.
EL 372	Architecture, Protocols and Design Principles of IOT	3	0	2	4	The course enables student to understand the basics of Internet of things Architecture and protocols. It introduces some of the application areas where Internet of Things can be applied. The course also helps to understand the IoT Reference Architecture and Real World Design Constraints. The course also give the insights of the various embedded and cloud security concepts.
ET 401	Learning Technologies Project Course	0	0	1	4	It is within above framework and in pursuit of knowledge, skill and motivation for effective Teaching-Learning that the course is then designed to engage students in Learning Technologies Projects as drawn from individual students' specialization subject domains from engineering & technology, sciences, management, social sciences, humanities and green environment. Primarily, the learning technologies project categories will cover Projects in Designing System Development Life Cycle (SDLC) and Project-Based Learning.
GIS 401	Geospatial Intelligence	3	0	2	4	Geospatial intelligence is a discipline and an emerging profession that involves use of geospatial technology, critical information, and analytical rigor for a decision advantage in domains of natural resource management, disaster management and strategic defence or security. This course is designed for B.Tech. Compute Science & Engineering (CSE) students to provide exposure on geospatial technology and intelligence

						for various applications in both theoretical and practical aspects. The course also offers more in-depth knowledge on the use of computer vision and artificial intelligence in geospatial intelligence applications. This course is best fit for B.Tech. CSE students with AI knowledge.
GIS 411	Remote Sensing Fundamentals and Analysis	3	0	2	4	This course designed to introduce remote sensing to students from B.Tech. CSE with geomatics specialization. It provides basic concepts and fundamentals of physical principles of remote sensing along with the digital image processing concepts for remote sensing analysis. The course provides a firm basis for understanding and effective utilization of remote sensing datasets and techniques in any field of application.
GIS 421	Fundamentals of Geographic Information Systems (GIS)	2	0	4	4	This course designed to introduce Geographic Information Systems (GIS) to students from B.Tech. CSE with geomatics specialization. It provides basic principles and techniques of GIS analysis. The course provides a firm basis for understanding and effective utilization of GIS techniques and software for various applications. The lab practical of this course will be emphasized to provide hands-on experience on ArcGIS software.
NU 401	Advanced R & D Project	1	0	6	4	Advanced R&D project is offered as an open elective in seventh semester to the fast learners and carry same credits as the other open electives. It will be based on the R&D project that students have done in 6th semester. The students who have shown promise during the R&D project during the sixth semester will get an opportunity to extend the work in the advanced R&D project. They will be working under the same faculty who had mentored him / her during the R&D project in VI semester. Some of the possible extensions may be, applying the same technique to different problems, fine tuning/improving the techniques to

get the higher precision/accuracy, get to do more recent literature survey, devising instruments to collect data, data gathering & analysis etc. as per discussions with faculty mentor. Finally, students will write a comprehensive report/research article as guided by faculty mentor. Evaluation will be based on mid semester evaluation, end semester evaluation, mentor's evaluation and comprehensive report/research article. They give the presentation and show the demonstration during the final evaluation and submit the final report with plagiarism report.

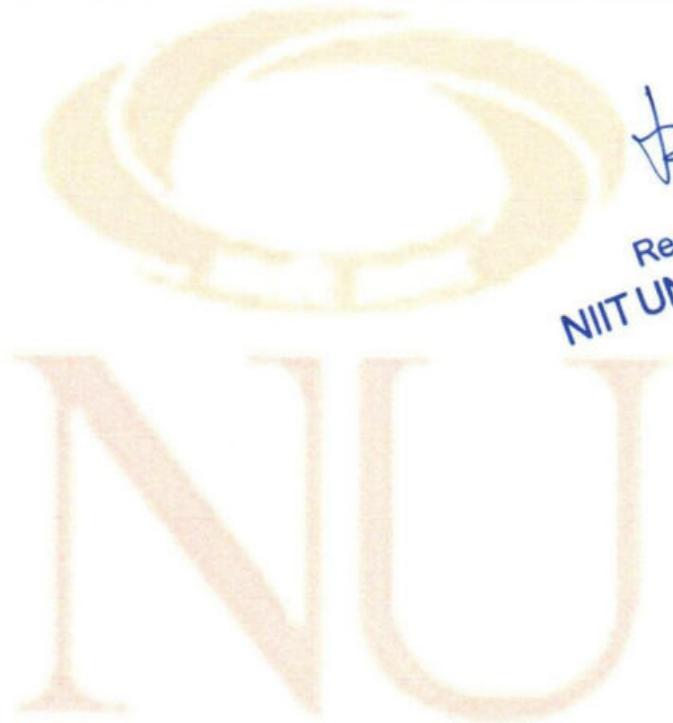
***HSSM Courses**

COURSE CODE	COURSE NAME	L	T	P	C	DESCRIPTION
ECON 102	Economics	3	0	0	3	Nature and scope of economic science, its relationship with other social sciences; quantification of economic variables, theories of consumer behavior and of the firm: linear economic models; market structures; social accounting and basic elements of economic planning.
ENG 102	English Literature	3	0	0	3	Literature is the study of societal behaviour which would help the students to gain insight about the individual's personality, attitude, motivation, learning and perception to become ethical. To learn and appreciate literature of any given language it is necessary to study literature written by the native speakers of that language. When a student studies literature of a period he/she can understand economic social and political situation of that time. Literature in English helps the students to develop a universal insight and make them appreciate values of various countries. The complexities and diversities of human society are well portrayed in this course. This course covers traditional and modern prospects

							of various ideologies and recollects them in an interesting manner.
HSS 201	Professional Ethics & Values	3	0	0	3		This course on Professional Ethics & Values facilitate students in exploring the meaning & concepts of Ethics, Professional Ethics and in understanding the nuances of Self Discipline, Teamwork and Time Management from practical point of view and enables student to think from different vantage points applying ethical framework while undertaking any decision and actions. The course intends to enable students for doing critical analysis with reference to paradigm of Professional Responsibility and Ethical Leadership.
HSS 301	Selected Readings	0	3	0	3		With time and advent of new technologies human kind is losing touch with the wisdom that comes from reading books. The new torch bearers of the world, the younger generation is often seen completely oblivious to the benefits of reading a good book in their leisure time. This course aims at encouraging the healthy habit of reading books in the young generation. The books can be from any genre but will surely give them some food for thought at the end of the day.
MGT 201	Basics of Management	3	0	0	3		Topics to be covered include Introduction to Management: Meaning, Definition, its nature, purpose, importance & Functions; Management as Art, Science. Is management a Profession; Difference between management and administration. Evolution of Management Thought: Contributions of F.W.Taylor, Henri Fayol, Elton Mayo, Chester Barhard, Peter Drucker, Michael Porter to management thought. Various approaches to management. Evolution of Management in India. Functions of Management: Planning - Meaning - Need &

						Importance, types, levels – advantages & limitations. Forecasting - Need & Techniques. Decision making - Types - Process of rational decision making & techniques of decision making. Organizing - Elements of organizing & processes: Types of organizations, Delegation of authority - Need, difficulties in delegation - Decentralization. Staffing - Meaning & Importance. Direction - Nature - Principles. Communication - Types & Importance. Motivation - Importance - theories.
MGT 401	Entrepreneurship	3	0	0	3	The Business Environment in India has undergone a paradigm shift since the adoption of LPG. Indian Inc. catapulted itself to the role of 'Change Agent'. It is catalyst of a Knowledge-driven Market-centric economy. Competition breeds Innovation. Our economic policies encourage First generation Entrepreneurs – be it Micro, Small, Medium besides traditional Large Enterprises. The traditional form of business models like Family-run businesses are also success flag-post ventures in highly competitive global market ecosystem. Yet, there is a Knowledge-Divide. Our traditional theory based concepts are not effectively motivating young students to commercially exploit their Knowledge resource. This course will fill the void by sensitizing the students of the churning of business environment. The course will imbibe the attitudes of Entrepreneurship in budding students and hone their skill sets to Establish, Expand or Diversify and also explore merging concepts of growth of their own business.
ECON 401	Fundamentals of Engineering Economics	3	0	0	3	Engineers seek solutions to problems, and the economic viability of each potential solution is normally considered along with the technical aspects. The goal of this course is to introduce students to the process of integrating

					<p>engineering proposals with economic analysis, to select among several viable alternative projects; and to understand and appreciate the models and measures used in decision making in engineering economics. This course introduces the fundamental concepts of economics and to explain how these will affect the functioning of an organization and contribute to decision making in engineering operations. The topics covered in this course include time value of money, cost-benefit analysis, depreciation, inflation, income taxes and risk analysis.</p>
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Registrar
NIIT UNIVERSITY

Programme Architecture with Course Description						
M.Tech. Cybersecurity						
27/02/2023						
Course Code	Course Title	L	T	P	C	Description
Semester I						
CS 502	Analytics and Big data	3	0	2	4	The course covers techniques to build and maintain reliable and scalable systems capable of handling large amounts of data using Apache Hadoop, its extensions, libraries and related technologies. The second part of the course introduces descriptive and pr
CS 591	System and Network Security	3	0	2	4	In this Course, students are introduced to the core concepts of network security, fundamentals of network security, network defense technologies are examined with emphasis given to the creation of a layered and diversified defense-in-depth architecture th
CS 521	Platform and Cloud Security	3	0	2	4	Students will learn about Platform security and Cloud security that refers to the security architecture, tools and processes of the secure cloud and computing platform. In this they will use security software, systems and processes to enable the security
CS 531	Cryptography	3	0	2	4	The course starts with some Simple Cryptosystems and their Cryptanalysis, OTP and perfect secrecy. Then we will

						study block ciphers and their analysis, stream ciphers, hash functions, their applications in Cryptography, message authentication codes. After
CS 541	Information Security Risk Assessment & Assurance	3	1	0	4	This course gives a clarification about various aspects associated with information security; risk assessment and assurance. The concept of organizational security, different industry standards, functional requirements for security solutions, security man
CS 551	Cyber Security tools	2	0	4	4	Cyber Security Tools course will provide the knowledge of Vulnerability Assessment, Scan Process and Exploits, Popular scripting languages and More Hands-on practice to all about the VAPT.
Semester II Specialization : INFRASEC & VM						
CS 542	Advance Network Security Part-I	3	0	2	4	In this Course, students are introduced to the advanced persistent zero-day vulnerabilities and exploits in various platforms. Intelligence shared by major security vendors will be analysed, along with emerging technology solutions. Log management, and in
CS 5142	Vulnerability Assessment & Penetration Testing	3	0	2	4	This VAPT course encourages the students to identify the Vulnerabilities and how to Penetrate those Vulnerabilities which exiting in the real world. It helps the students in carrying out the assessments required to

					effectively find out and mitigate the ri	
CS 562	Advanced Cyber Security Tools for INFRASEC & VM	0	0	4	4	This course will enable the students learning about malware analysis through hands on laboratory sessions and knowledge of core infra-security tools.
	Electives-I*	3	0	2	4	
	Electives-II*	3	0	2	4	
	Electives-III*	3	0	0	3	

Semester II Specialization : Cyber Defense Operations

CS 532	Advance Network Security	3	0	2	4	This course aims to introduce this emerging area of information technology to the students of computer science and electronics. The course is designed to give a birds' eye of the architecture and elements of Internet-of-Things, rather than restricting its
CS 5132	Cyber Security Operations	3	0	2	4	Objective of this is to provide knowledge of the Security incident monitoring concept, Analysis the Cyber Defense Operations, Fundamentals of SIEM, EDR.
CS 5182	Advanced Cyber Security Tools for Cyber Defense Operations	0	0	4	4	In this course students will learn about the Threat Hunting & malware analysis, hands-on in different tools, Configuration and administration use of QRADAR, Uses of CALDERA and CyTrONE.
	Electives-I*	3	0	2	4	
	Electives-II*	3	0	2	4	
	Electives-III*	3	0	0	3	

Semester II Specialization : IOT & Blockchain Security

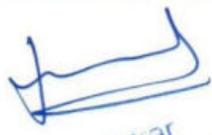
CS 5192	IOT Security	3	0	2	4	In the first part of this course the students will be introduced to IOT technology, its architecture, building blocks, protocols and standards (existing and emerging). This will be supplemented by IoT case-studies. In the second part of this course they w
CS 5112	Blockchain Security	3	0	2	4	The course starts with a review of hash functions, hash pointers and data structures leading to an introduction to block chain. Merkle trees, digital signatures and the idea of using public keys as identities are followed by a simple cryptocurrency as an
CS 5122	Advanced Cyber Security Tools for IOT & Blockchain Security	0	0	4	4	Students will learn about the advanced tools of Cyber Security, Malware Analysis process, Security Testing principal, types and techniques. Students will also learn about the IoT security tools for the cyber security and Blockchain tools and techniques for t
	Electives-I*	3	0	2	4	
	Electives-II*	3	0	2	4	
	Electives-III*	3	0	0	3	
Semester III (Infosys)						
	Internship (NUCS 601)				1	
					2	
Semester IV (Infosys)						
	Internship (NUCS 602)				1	
					5	

Professional/Open Electives

COURSE CODE	COURSE NAME	L	T	P	C	DESCRIPTION
CS 5152	AI and ML in Cyber Security	3	0	2	4	This course helps give an overview of the various technologies that make up AI, where they have come from, and what AI has evolved into today. In this course students will get an introduction of Cybersecurity and then learn how AI is being applied to the Cybersecurity. After finishing this course students will be able to use Cognitive Computing, Machine Learning, and Deep Learning, and know how they apply to the cybersecurity space. Also, they will understand the important trends in both fields and how AI is the future of cybersecurity.
CS 5172	Industrial Control Systems & SCADA Security	3	0	0	3	ICS are found in many industries such as electric, water and wastewater, oil and natural gas, chemical, pharmaceutical, pulp and paper, food and beverage, and discrete manufacturing (e.g., automotive, aerospace, and durable goods). This course provides a list of many different methods and techniques for securing ICS with varying levels of potential risk and impact.

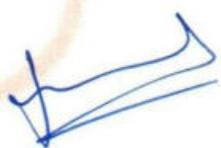

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CS 5202	Threat intelligence	3	0	2	4	<p>Cyber threat intelligence represents a force multiplier for organizations looking to update their response and detection programs to deal with increasingly sophisticated advanced persistent threats. Malware is an adversary's tool but the real threat is the human one and cyber threat intelligence focuses on countering those flexible and persistent human threats with empowered and trained human defenders. During a targeted attack an organization needs a top notch and cutting-edge threat hunting or incident response team armed with the threat intelligence necessary to understand how adversaries operate and to counter the threat.</p>
CS 5212	Advance Network Security-II	3	0	2	4	<p>In this Course, students are introduced to the Firewalls and its different modules functionality, Network Traffic Monitoring and Analysis, Network Risk and Vulnerability Management, VPN technology and its variants, Anti-Virus, Email Security, Advance threat protection and WAF and Anti-Bot technologies. This course is required course for INFRASEC & VM stream.</p>


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CS 552	Security Analytics	3	0	2	4	<p>Learning about Security Analytics as a Vertical in Cyber Security. The course is intended to cover concepts of analytics related to Information / Data Security. It takes the reader from the stage of Exploratory Security Analysis to the stage of Cyber Security Automation through Analytics and Incident Response, learning about simulation, access analytics, text mining and finding patterns in unstructured data. The course provides insight into the next steps in security intelligence and security breaches by using machine learning and using dashboards, finally moving on to Data driven Security.</p>
CS 572	Cyber Forensics	3	0	2	4	<p>The course covers the procedures for identification, preservation, and extraction of electronic evidence, auditing and investigation of network and host system intrusions, analysis and documentation of information gathered, and preparation of expert testimonial evidence. The course will also provide hands on experience on various forensic tools and resources for system administrators and information system security officers.</p>
CS 582	Cyber Crimes & Cyber Laws	3	0	0	3	<p>To understand how the law and other forces determine the structure or constitution of cyberspace of which the</p>

								Internet is the largest and best-known component both locally and internationally? How is cyberspace governed? Cyberspace gives rise to the most distinctive and interesting problems of information technology law as it is the most pervasive conjunction of computing and telecommunications technologies. The Internet is the focus through which this programme studies information technology law.
CS 592	Social Media, Behavioural Aspects	3	0	0	0	3		The course covers the impact of social media on individuals, governments, societies; changing nature of information and its instant reach to disrupt societies through demonstrations, revolutions. False propaganda, spread of terrorism. Also freedom of expression and privacy concerns.


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PhD in Computer Science Engineering

NU provides a full-time PhD program in Computer Science and Engineering (CSE) that caters to candidates with prior education and experience in the field. This program offers a platform for candidates to pursue independent study and research in their specific areas of interest within the domain of computer science and engineering.

The PhD program in CSE at NU promotes original research, encouraging candidates to explore new frontiers and make significant contributions to the field. Through the program, students have ample opportunities to gain practical experience in the classroom, further enhancing their research skills and expertise.

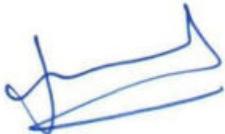
Upon completion of their doctoral degree, research scholars from NU are well-equipped to pursue faculty positions in esteemed academic institutions. They can also choose to continue their involvement in cutting-edge research, taking up positions in academic, government, or corporate research laboratories. The program aims to develop individuals who are at the forefront of advancements in CSE, contributing to the growth and innovation in the field.

By offering a comprehensive program that combines research, practical experience, and academic excellence, NU's PhD program in Computer Science and Engineering prepares candidates for successful careers in academia or research-focused roles in various sectors.

NU's PhD (CSE) program encourages collaboration with renowned research organizations to undertake R&D initiatives that contribute to the advancement of Science and Technology. The program offers doctoral students the opportunity to explore various research areas within the field of Computer Science and Engineering. In order to obtain their doctoral degree, students are expected to publish original research articles in reputable journals and conferences.

Currently, NU offers PhD programs in CSE with a focus on the following thrust areas:

1. Data Science
2. Artificial Intelligence and Machine Learning
3. Image Processing and Computer Vision
4. Natural Language Processing and Text Mining
5. Data Engineering
6. Algorithms
7. Computational Geometry and Graph Theory
8. Cryptography


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9. Cyber Security
10. Computer Networks
11. Cloud Computing
12. Fog and Edge Computing
13. Mobile and Ad hoc Networks
14. Web Intelligence

These thrust areas provide a diverse range of research opportunities for doctoral students, allowing them to delve into specialized topics and contribute to the development and advancement of knowledge within the field of Computer Science and Engineering.





PROGRAM FILE

AREA-Electronics & Communication Engineering (ECE)

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VISION

NIIT University's (NU) B Tech Electronics & Communication Engineering (ECE) programme aims to create professionals who can engineer large, relevant and robust electronics & communications systems. The B Tech ECE programme provides students a strong foundation in the fundamentals of Electronics and Communications Engineering through courses such as Analog & Digital Communications, Digital Logic & Circuits, Coding & Information Theory, etc. The programme provides mastery over advanced topics in Embedded Systems, Wireless Broadband Communications and Digital Signal Processing to enable students to straddle the overlapping fields of Electronics, Communications and Computer Science.

MISSION

The mission of Electronics & Communication Engineering at NIIT University (NU) is to educate and prepare students to excel in the field of electronics and communication engineering through a holistic and interdisciplinary approach. The university aims to develop professionals who can contribute to society by designing, developing, and implementing innovative solutions in the field of electronics and communication.

The specific mission objectives for Electronics & Communication Engineering at NIIT University include:

1. **Academic Excellence:** NU aims to provide a rigorous and comprehensive curriculum that encompasses both theoretical knowledge and practical skills in electronics and communication engineering. The focus is on imparting a strong foundation in core subjects, along with exposure to emerging technologies and industry trends.
2. **Research and Innovation:** The university encourages research and innovation in electronics and communication engineering. It aims to foster a research culture among students and faculty, promoting the development of cutting-edge technologies, applications, and solutions that address real-world challenges.
3. **Industry Collaboration:** NU strives to establish strong collaborations with industries and organizations in the electronics and communication domain. These collaborations facilitate industry exposure, internships, and opportunities for practical learning, ensuring that students are industry-ready and equipped with the skills demanded by the market.
4. **Entrepreneurship and Leadership:** The university aims to nurture an entrepreneurial mindset among students, encouraging them to identify and pursue innovative ideas in electronics and communication engineering. NU provides the necessary support and resources to foster

entrepreneurial ventures and develop leadership skills.

5. **Social Impact:** NU emphasizes the importance of social responsibility and aims to develop engineers who are not only technically proficient but also committed to making a positive impact on society. The university encourages projects and initiatives that address societal challenges through the application of electronics and communication engineering.

Overall, the mission of Electronics & Communication Engineering at NIIT University is to produce competent and socially responsible engineers who can contribute to the advancement of the field, meet industry demands, and make a meaningful difference in the world.

Electronics & Communication Engineering - Programme Educational Objectives

The Programme Educational Objectives (PEOs) for Electronics & Communication Engineering at NIIT University (NU) are as follows:

PEO1. Technical Competence: The program aims to equip students with a strong foundation in electronics and communication engineering, including a deep understanding of core concepts, principles, and theories. Students will develop technical competence in areas such as analog and digital electronics, communication systems, signal processing, microprocessors, and embedded systems.

PEO2. Problem-Solving and Design Skills: The program seeks to develop students' ability to analyze complex engineering problems and design innovative solutions. Students will learn to apply engineering principles, tools, and techniques to address real-world challenges in the field of electronics and communication. They will be trained in designing electronic circuits, communication networks, and systems that meet specific requirements and standards.

PEO3. Professional and Ethical Responsibility: NU aims to instill in students a strong sense of professional and ethical responsibility. They will be trained to understand the impact of their work on society, considering factors such as safety, sustainability, and social implications. Students will also develop effective communication skills, teamwork abilities, and an awareness of professional ethics and standards.

PEO4. Lifelong Learning and Adaptability: The program recognizes the need for graduates to continuously learn and adapt to emerging technologies and industry trends. NU aims to cultivate in students a passion for lifelong learning, encouraging them to stay updated with advancements in electronics and communication engineering. Students will be prepared to engage in self-directed learning, pursue higher education, and adapt to evolving career requirements.

PEO5. Entrepreneurship and Innovation: The program aims to foster an entrepreneurial mindset among students, enabling them to identify opportunities, take risks, and develop innovative solutions. Students will be encouraged to think critically, think beyond traditional boundaries, and develop entrepreneurial skills such as creativity, problem-solving, and resourcefulness.

PEO6. Leadership and Social Impact: NU aims to nurture leadership qualities in students and cultivate their ability to contribute positively to society. Graduates will be equipped to lead teams, initiate projects, and make a meaningful impact on societal challenges using their electronics and communication engineering knowledge.

These UPEOs reflect the aspirations of NU's Electronics & Communication Engineering program, ensuring that graduates possess the necessary knowledge, skills, and attitudes to excel in their professional careers, contribute to the field, and make a positive difference in society.



PROGRAM SPECIFIC OUTCOME (PSOs)

The Programme Specific Outcomes (PSOs) for Electronics & Communication Engineering at NIIT University (NU) are as follows:

PSO1: Technical Knowledge and Skills: Graduates will have a strong foundation in the core areas of electronics and communication engineering. They will demonstrate proficiency in analyzing, designing, and implementing electronic circuits, communication systems, and digital signal processing techniques.

PSO2: Problem Solving and Design Abilities: Graduates will be able to identify, formulate, and solve complex engineering problems related to electronics and communication. They will possess the skills to design and implement innovative solutions, considering factors such as performance, cost-effectiveness, and sustainability.

PSO3: Professional Competence: Graduates will exhibit professional competence in electronics and communication engineering. They will be able to apply engineering principles, tools, and techniques effectively in various industrial and research settings. They will also demonstrate the ability to work collaboratively in multidisciplinary teams.

PSO4: Effective Communication and Leadership Skills: Graduates will possess excellent communication skills, both oral and written, enabling them to effectively convey technical information and ideas to diverse audiences. They will also exhibit leadership qualities and the ability to manage projects and teams efficiently.

PSO5: Adaptability and Lifelong Learning: Graduates will demonstrate the ability to adapt to emerging technologies and changing industry trends in electronics and communication engineering. They will engage in continuous learning and professional development, keeping themselves updated with the latest advancements in the field.

PSO6: Ethical and Social Responsibility: Graduates will understand and adhere to ethical and professional standards in their practice of electronics and communication engineering. They will exhibit social responsibility, considering the societal impact of their work and striving to address the needs and challenges of the community.

These Programme Specific Outcomes ensure that graduates of the Electronics & Communication Engineering program at NU have the necessary knowledge, skills, and attributes to excel in their chosen careers, contribute to the field of electronics and communication engineering, and positively impact society.

POs for B.Tech. ECE Programme

PO1: Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO2: 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.

PO3: 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.

PO4: 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.

PO5: Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

PO6: 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.

PO7: 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.

PO8: Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of engineering practice.

PO9: Individual and teamwork: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO10: 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.

PO11: 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.

PO12: 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.

Programme of Study

Undergraduate Programmes

- BTech Electronics & Communication Engineering

PhD programme in Electronics & Communications

Programme Architecture

Undergraduate Programme



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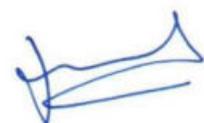
Programme Architecture with Course Description**B.Tech. Electronics & Communications Engineering**

Course Code	Course Title	L	T	P	C	Description
Semester I						
MAT 112	Calculus	3	1	0	4	This course includes the fundamentals and applications of differential calculus, integral calculus, vector calculus, and complex analysis. These concepts seem to have lots of applications in computer science engineering, electronics and communication engineering, among other branches of mathematics and engineering.
EL 111	Fundamentals of Electronics	3	1	0	4	This course is designed to help students gain an understanding of basics of DC and AC circuits. Students will learn to apply network analysis theorems & techniques to analyse and even design the electrical and electronic circuits. Introduction of PN junction devices including diodes and transistors helps develop basic understanding of the working of analog & digital electronic circuits. Students will also get a chance to learn about digital logic families along with Boolean algebra and Number systems which will prepare them for the upcoming courses in their Engineering programme.
CHM 111	Science-I Chemistry	3	0	2	4	This course continues the study of the fundamental principles and laws of chemistry and biology. Topics include Reactions of Organic Compounds, separation, and purification-identification of organic compounds by spectroscopic techniques, oxidation and reduction reactions, photochemistry, supra molecular chemistry, nanoparticles and nano materials, green chemistry, and biomolecules. Upon completion, students should be able to demonstrate an understanding of chemical and biological concepts as needed to pursue further study in chemistry or biology related professional fields. Laboratory experiments and computer-based exercises augment and reinforce the basic principles discussed in lecture as well as provide practical examples.
TA 111	Fundamentals of Computer Programming	2	0	4	4	This is an introductory course on Programming Fundamentals. Its aim is to introduce basic concepts of Programming using high level language like Python. Students will solve problems by developing simple algorithms and then implement them using a Python programming language. The Lab component complements the theory by practicing the concept using Python. Through this course students will learn Object Oriented Programming concepts and how to use Object Oriented Python. Through this course students will become expert to use unique

						features of Python Language along with Python standard libraries and modules and packages.
TA 202	Engineering Graphics	2	0	2	3	Engineering graphics is the language of engineers. Engineers and scientists are constantly engaged in creative and productive work. Proficiency in Engineering Graphics will be of considerable aid in achieving these aids. It introduces students to theories of projection and the concepts of engineering drawing using the most widely used CAD application software AutoCAD. Basic AutoCAD commands will be introduced and emphasized throughout this course. The course will cover the Introduction to AutoCAD commands; Simple drawings; Orthographic and Isometric drawings, Projections of Points, Lines, Planes and Geometric Solids.
TA 102	Communication Skills	2	0	2	3	Communication plays a crucial role in the management of an organization. Without proper communication, no organization can function properly. No matter which medium one communicates in, speaking and listening both should take place. This course aims to hone the communication and professional skills of the young graduates making them ready for professional environment. The course has been designed to have an appropriate blend of theory and practical sessions so that the students gain a sound knowledge of communication theoretical skills and understand ways of applying these skills in future.
NU 111	Community Connect	0	0	2	1	Orientation to Field Visits: Each One Teach One; Importance of Education; Mentoring for Sensitivity & Curiosity; Understanding rural code of conduct; Sharing Technology education for access to learning Accelerated Learning: Observing & selecting the mentee; Remedial teaching; developing lessons & tests for recapitulation; Getting to know children's world; School evaluation systems; alternative systems of learning; Teaching for Community Empowerment. Measurement of Progress: in sensitivity; in degrees of curiosity; in aspirations; in learning styles; in mentoring styles; developing accelerated learning tests.
Semester II						

MAT 101	Algebra & Diff Equation	3	1	0	4	The objective of the course is to give the students a basic knowledge of linear algebra and differential equations and provide them with techniques available to solve differential equations. These concepts seem to have lots of applications in computer science engineering, electronics and communication engineering, among other branches of mathematics and engineering.
PHY 101	Science II Physics	3	0	2	4	This is a comprehensive course in Physics that deals with quantum mechanics, Semiconductor Physics, Magnetism, Dielectrics and LASER. In order to allow the students to get exposed to experimental methods, the course also has a laboratory component. This helps the students to integrate theoretical knowledge and concepts with practical experience. Students will also learn operation of scientific equipment, collection of data and their analysis.
ENV 301	Environmental Science	3	0	0	3	The Multidisciplinary Nature of Environmental Studies- Definition, scope and importance Need for public awareness.
CS 102	Data Structures	3	0	2	4	This course aims to provide the students with solid foundations in the basic concepts of programming: data structures and algorithms. This course offers the students a mixture of theoretical knowledge and practical experience. The study of data structures is carried out within an object-oriented framework with implementations in Python programming language.
TA 212	Workshop Practice	1	0	4	3	This course is designed to help students gain an understanding of where and how computers are used in modern manufacturing, particularly in manufacturing of electronics products. The Workshop Practice course supports to get hands on knowledge of several Workshop Practices like lathe, sheet metal work, machining etc. There are some additional experimental setups related to CNC machining, PCB Development which helps the students to enhance their knowledge. Students also get opportunity to implement their ideas through various application oriented micro projects. This outcome is to be achieved mostly by learning by-doing supplemented by one weekly lecture.
	HSSM-I*	2	0	2	3	
NU 112	Community Connect	0	0	2	1	Orientation to Field Visits: Each One Teach One; Importance of Education; Mentoring for Sensitivity & Curiosity; Understanding rural code of conduct; Sharing Technology education for access to learning Accelerated Learning: Observing & selecting the mentee; Remedial teaching; developing lessons & tests for recapitulation; Getting to know children's world; School

						evaluation systems; alternative systems of learning; Teaching for Community Empowerment. Measurement of Progress: in sensitivity; in degrees of curiosity; in aspirations; in learning styles; in mentoring styles; developing accelerated learning tests.
Semester III						
MAT 221	Probability & Random Process	3	1	0	4	The basic objective of this course is to give an elementary introduction to the theory of probability and random processes and their application for students in engineering
EL 101	Digital Logic and Circuit	3	0	3	4	Digital Logic & Circuits Course at Third semester UG level introduces the fundamentals of logic gates, Boolean Algebra, Karnaugh map etc. It also introduces Combinational & Sequential components like adder, multiplexer, encoders, decoders, flip-flop, latches, registers and their application in designing various combinational & sequential digital circuits. The course introduces the concept of Digital Circuits and focuses on analyzing, designing and utilizing combinational and sequential digital circuits.
EL 112	Analog Electronics	3	0	2	4	This course develops a basic understanding of the fundamentals and principles of analog circuits. Since, the understanding of analog electronics is a critical step towards being able to design new electronic circuits or use them appropriately, therefore, this course seeks to develop foundational concepts and skills on topics like biasing scheme, load line concept. transistor as amplifier, frequency response. This course also deals with the introduction of MOSFET and CMOS. Important topics covered include the amplifier behaviour of BJT and MOSFET, differential amplifier, Feedback amplifier and power amplifier. The understanding of the operational amplifier is important for electronics and communication students which is essential electronic circuit component for various system designs. This course discusses the introduction, properties and applications of operational amplifier.
CS 251	Object Oriented Programming	2	0	4	4	Java is a large-scale object-oriented programming language. This course is designed to provide complete knowledge of Object-Oriented Programming through Java and to enhance the programming skills of the students by giving practical assignments to be done in labs.

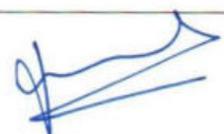


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EL 211	Signal & System	3	1	0	4	This course introduces students to mathematical descriptions of signals & systems, and mathematical tools for analyzing and designing systems that can operate on signals to achieve a desired effect. The focus of the course is on the class of systems called linear time invariant systems. Significant emphasis will be place both on time domain analysis of systems through the operation of convolution and on frequency domain analysis of systems using the Fourier and Laplace transforms. Both continuous-time and discrete-time signals will be considered. Several examples from engineering practice will be used throughout the course
	HSSM-II*	3	0	0	3	
Semester IV						
EL 321	Electromagnetic Theory	3	1	0	4	This course deals essentially with electricity and magnetism Throughout the course the emphasis will be on electromagnetic waves as they play an important role in the theory of communication On successful completion students will be able to demonstrate an understanding of Maxwells equations and their derivation from the empirical laws of electromagnetism. They will also be able to demonstrate the properties of plane electromagnetic waves in a vacuum and in simple media.
EL 212	Linear Circuits and Instrumentation	3	1	0	4	This course introduces the fundamentals of Operational amplifier (OPAMP), Timer ICs and Instrumentation which includes circuit design of amplifier, oscillator, filter designing. In this course student come to know Timer ICs and their application in Multivibrator and Schmitt trigger circuit design. In this course Phase locked loop and its application is discussed. Instrumentation basics also introduced which gives an opportunity for student to learn various instruments, their testing and calibration.
CS 122	Computer Arch. & Organization	3	0	2	4	This course is about the design of computers. It covers both the overall design architecture and their internal detailed organization. Computer Architecture refers to those attributes of a system visible to programmer or that have direct impact on the logical execution of a program. Computer Organization refers to the operational units and their interconnection that realize the architectural specifications. At the end of this course, a student must not only be aware of various aspects of architecture but also must be in a position to evaluate the effects of the same on high level software.

EL 311	Digital Signal Processing	3	0	2	4	Digital Signal Processing Course at Fourth semester UG level introduces introduction to the digital signals and Systems. The course is designed to explain how analog signals are represented by their discrete-time samples, and how to represent discrete-time signals in the frequency domain. The course will illustrate how discrete time, linear shift invariant systems can be characterized using linear difference equations and the impulse response and show how tools such as the z-transform and discrete Fourier transform can be used in the design and analysis of such systems. The course will illustrate how to design filters with desired frequency response. To facilitate the learning, a complete model of a DSP system will be analyzed through all the stages, including input, signal conditioning, anti-aliasing filter, analog-to-digital and digital-to-analog conversion, output smoothing filter, and signal output.
EC 202	Analog and Digital Communications	3	0	3	4	Overview of communication system - Transmitters, Transmission channels & receivers, Concept of modulation, its needs. Review of signal & system concept. Linear & Non-linear Modulation: Amplitude modulation, Time domain representation of AM signal, transmission bandwidth for AM; Calculation of Transmitted power & sideband power & Efficiency. Demodulation of AM signals. Transmission and reception of Angle Modulation: Time and Frequency domain representations. Generation of Pulse modulation: PWM, PPM generation. Introduction to digital modulation technique ASK, FSK, PSK, BPSK, QPSK, QAM, generation method, mathematical representation & modelling. Interferences and fading on signal, various multiple access techniques: TDMA, FDMA etc.
	HSSM-III*	3	0	0	3	
Semester V						
EL 301	Integrated Electronics	3	0	2	4	The course focuses on building the ability to analyze and design electronic circuits. This course starts with an overview scaling of MOSFET. Subsequently it covers fabrication and processing of MOS devices, design rules and layout. This course also emphasis on the design of various inverter and combinational and sequential circuit design using CMOS technology. This course also deals with semiconductor memory, various factors affecting the power consumption as well as delay of the designed CMOS circuits. At last, this course covers the Vhdl and Verilog,

COM 212	Communication Networks	3	0	2	4	This course is to provide students with an overview of the concepts and fundamentals of data communication and computer networks. Topics to be covered include: data communication concepts and techniques in a layered network architecture, communications switching and routing, types of communication. Network congestion, network topologies, network configuration and management, network model components, layered network models (OSI reference model, TCP/IP networking architecture) and their protocols. Various types of networks (LAN, MAN, WAN and Wireless networks) and their protocols.
EC 301	Antenna and Microwave Propagation	3	0	2	4	Antennas and microwave propagation of radio signals are a fundamental aspect of communications as well as any other device that will radiate or receive electromagnetic waves over an air interface. The aim of the course is to make the student able to understand the theories, methods, physical mode of operation in the context of microwave, and the technical construction of the components that are used in wireless systems. Moreover, the course will introduce the microwave network theory and the use of scattering matrix, design criteria for waveguides, microwave components. Furthermore, different types of antennas and their characteristics will be studied, which will help the students to design antennas for different communication systems. The emphasis of this course would be: <ul style="list-style-type: none"> • To explain electromagnetic theory regarding waveguides and working of microwave components. • To analyze microwave network by the use of scattering and transmission parameters. • To explain the basics of antenna and working of various types of Antennas.
EL 202	Microprocessor & Microcontroller	3	0	2	4	This course introduces 8-bit Microprocessors and Microcontrollers to the students of Electronics & Communications at an undergraduate level. The course aims to achieve twin objectives of creating a sound foundation in microprocessors and microcontrollers and keeping the content relevant to contemporary industry. Therefore, the hardware design, programming and the applications of some of the most popular 8-bit processors and controllers will be dealt with in-depth in this course along with troubleshooting techniques.



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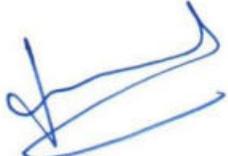
EC 311	Opto Electronics & Optical Communication	3	0	2	4	Basics of optoelectronics, configuration of a fiber optic communication system, Fabrication of optical fibers, Fiber optic cables, Emergence of fiber optics as key technology. The nature of light, Basic optical laws and concepts, Modes, Optical fiber modes. Transmission Characteristics of optical fibers Attenuation, dispersion and Losses Optical sources and Detectors LEDs and ILDs, Photodetectors: PIN and APD WDM concepts, Introduction to optical amplification, optical multiplexing and switching, optical network concepts, introduction to non linear optics
	HSSM-IV*	3	0	0	3	
Semester VI						
EC 302	Control Theory	3	0	2	4	Control Theory is the study of the analysis and regulation of the output behaviors of dynamical systems subject to input signals. The concepts and tools discussed in this course can be used in a wide spectrum of engineering disciplines such as mechanical, electrical, aerospace, manufacturing, and biomedical engineering. The emphasis of this course will be on the basic theories and feedback controller design methods of linear time-invariant systems.
	Professional Elective – I*	3	0	2	4	
	Professional Elective – II*	3	0	2	4	
EC 312	Coding and Information Theory	3	1	0	4	Topics to be covered: 1 Information Theory: Introduction, Uncertainty and Information, Average Mutual Information and Entropy, Information measures for continuous random variables. 2. Source Coding: Source Coding theorem, Huffman Coding, Shannon Fano Coding, Arithmetic coding, L-Z Algorithm, Introduction to Image compression. 3. Channel Capacity and Coding: Introduction, Channel models, Channel Capacity, Channel Coding, Information Capacity Theorem. 4. Error Control Coding: Introduction, Equivalent codes, Parity Check Matrix, Linear Block codes, Perfect codes, Hamming Codes. Low density parity check codes, Optimal Linear codes, MDS codes, Bounds on minimum distance. Cyclic codes. 5. Cryptography: Introduction, Encryption Techniques, Symmetric Cryptography, Data encryption standards, International Data Encryption Algorithm, RC Ciphers, Asymmetric Algorithm, Quantum Cryptography, Biometric Encryption.
NU 302	R & D Project	1	0	6	4	The Research and Development (R & D) projects is a core course for all undergraduate 6th semester students. The purpose of this course is to train the students to perform research and to be familiar

						with the activities and methodologies generally followed during the research work. All Faculty of NU share their research problems and students select a problem according to his/her research interest. The students perform literature survey and find the research gaps and challenges in their respective selected problem and then narrow down to specific gap/challenge on which they want to pursue the research. Subsequently the students design a complete solution and implement the same in consultation with their faculty mentor. Students present these during two mid semester evaluations and submit brief report to explain these points. They give the presentation and show the demonstration during the final evaluation and submit the final report with plagiarism report. The activities during the research process imparts valuable learning objectives, like understanding the research process, develop critical thinking and problem-solving skills in addition to soft skills like communication skills, team-work skills etc. Outcome of the R & D projects as publications, conference paper, prototype, patent encourage the undergraduate students and faculty supervisors. Moreover, it has a positive impact on NU as well as society at large. This will be the base for Advanced R&D project in VII semester.
	HSSM-V*	3	0	0	3	
Semester VII						
	Professional Elective – III*	3	0	2	4	
	Professional Elective – IV*	3	0	2	4	
	Professional Elective – V*	3	0	2	4	
	Open Elective – I*	3	0	2	4	
	Open Elective – II*	3	0	2	4	
EC 461	Capstone Project - I	1	0	6	4	Capstone project at VII semester in BTech ECE program will provide an opportunity for the students to integrate the knowledge gathered during the course of Engineering and apply in designing an application-oriented product. Students under this course will design the product in Communication, VLSI, Embedded Systems, IOT, Robotics and other relevant areas. The designed product is expected to have software as well as hardware implementation. The project will involve many phases which includes identification of the problem statement, defining the problem, research to find out its feasibility, conceptualization of the project which leads to the development of the final product.

Semester VIII

NU 402	Industry Practice/Project	0	0	40	20	Industry Practice is a flagship course of 20 credits in the B Tech Programme of NIIT University. Every student of NIIT University has an opportunity to transfer learning from classroom to the workplace in industry in the final six-month semester of B Tech Programme. During Industry Practice, a student works on the real time project of an organization under direct mentoring by industry professional. This 6-month period makes the transition from student in a University to an employed professional in industry seamless or smooth for a student.
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Specialization Area Courses

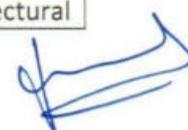
Communication and Signal Processing

COURSE CODE	COURSE NAME	L	T	P	C	DESCRIPTION
EC 401	Advanced Digital Signal Processing	3	0	2	4	This course provides conceptual knowledge of advanced Digital signal processing techniques for students in engineering who possess the prerequisite knowledge of digital signal and systems. The course is designed to study the Various algorithms, methods and techniques used in designing of FIR/IIR filters, Adaptive filter-banks, time-frequency transformations, and multi-rate signal processing.
EL 402	Optical Networks	3	1	0	4	Telecommunication Network architecture, services, Circuit Switching and Packet Switching Optical Network components: Couplers , Isolators and circulators, Multiplexers and filters, optical amplifiers, transmitters, Detectors, switches and wavelength convertors. Modulation and Demodulation: Signal formats, Subcarrier modulation and multiplexing, demodulation, error detection and correction. Networks: Optical Layer, Client layers of Optical Layer: SONET/SDH, Optical transport network , Ethernet, IP, Multiprotocol Label Switching, Resilient Packet Rings, Storage Area Network. WDM Network elements: Optical Line Terminals, Optical Line Amplifiers, Optical Add/Drop Multiplexers, Optical Cross connects, Basic concepts of Network Survivability.
EL 411	Non-linear Optical Communications	3	1	0	4	NULL
EL 441	Introduction to Nano-Optics and Nano-Photonics	3	1	0	4	NULL
EL 302	Digital Image Processing	3	0	2	4	Digital Image Processing course at UG level introduces the fundamentals of Image Processing. The course will cover a wide range of Image Processing techniques in time and frequency domain. Apart from image processing, video handling will also get covered in the course.
CS 4111	Computer Vision	3	0	2	4	This course introduces the basic

							concepts of Computer Vision to the students of undergraduate level.
Wireless Communication							
COURSE CODE	COURSE NAME	L	T	P	C	DESCRIPTION	
EL 401	Wireless Broadband Communication	3	0	2	4	This course will include an overview of Wireless Communication networks area and its applications in communication engineering in future. To understand the various technique, principles, devices, schemes, concepts, algorithms and different methodologies used in Wireless Communication Networks. This course will expose the students to understand mobile radio communication principles and to study the recent trends adopted in broadband communication systems, and various challenges involved in developing broad bandwidth and optimization technique.	
EL 431	Advanced Wireless Broadband Communications	3	0	2	4	This course provides a comprehensive knowledge of modern wireless communication systems and future requirements. Advanced mobile cellular technology will also be covered including Advanced LTE and 5G Technology. The objective of this course is to provide a basic introduction of the OFDM concept, MIMO air interface technology and to determine the type and appropriate model of Wireless Fading channel. The course is designed to analyze and study the Diversity techniques used in receiver and transmitter section of communication systems. The concept of smart antenna and its use in Mobile Communication systems will be covered in this course.	
EL 421	Cellular and Mobile Communication	3	0	2	4	This course provides fundamental concepts of Mobile Communication and specifics of current and proposed Cellular Systems. The course explains to study the layers of system model, access methods and networks to service platforms. The aim of this course is to understand the various terminologies, devices, schemes, concepts, algorithms and different methodologies used in Cellular communication Networks. The course	

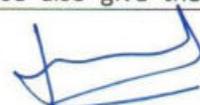
						explains to analyze how various Communication model layers are working in the Mobile Communication Environment. The course also help to understand the 3G and 4G Wireless Standards and explains the detailed study of the Mobile Network and Transport layer, Mobile Agents and protocols. The course will also illustrate the use of various Data Services, Device management and Language support, GPRS, Wireless devices and their Operating system in Cellular Environment
EC 451	Radar Engineering	3	1	0	4	This course has been developed to provide an understanding of radar systems concepts and technologies in radar systems development, acquisition, and related fields. This course consists of a mixture of lectures, demonstrations through simulations and hardware. This course emphasizes on radar principles to detect and track any desired target, identifying radar subsystems and components, determining subsystem implementation characteristic, RADAR signal processing, and parameters estimation. This course will provide insight into methods for requirements allocation and flow-down to radar front-end and back-end subsystems. This course will also provide Electronic Counter Warfare technique involving RADAR technology and principles.
EC 411	Satellite Communication	3	0	2	4	Kepler's laws, Geostationary and non-geostationary orbits, Orbit perturbations Signal impairment: rain attenuation, atmospheric losses, ionospheric effects, Polarization, Antennas, Power supply, Altitude control, Station keeping, Thermal control, Transponders, Receive-only TV antennas, Transmit-receive earth stations, Equivalent isotropic radiated power (EIRP), Transmission losses, Receiver noise, Carrier-to-noise ratio, Link power budget equations, Intermodulation, Inter-satellite links, TDMA, FDMA, and CDMA techniques, ATM over satellite links, TCP/IP over satellite links.

VLSI and Embedded Systems						
COURSE CODE	COURSE NAME	L	T	P	C	DESCRIPTION
EL 312	Advanced Embedded Systems	3	0	2	4	This course is intended for those ECE and CSE students who have already gone through a course on 8-bit microcontrollers. The course will focus on 32-bit embedded systems with real-time operating system (RTOS) and their applications in diverse areas. The course also covers important communication protocols such as USB and Controller-Area Network.
CS 532	Introduction to Internet of Things	3	1	0	4	This course aims to introduce this emerging area of information technology to the students of computer science and electronics. The course is designed to give a birds' eye of the architecture and elements of Internet-of-Things, rather than restricting itself to just describing how a sensor or actuator can be connected to Internet using off-the-shelf boards. However given the interdisciplinary nature of this area the design of this course includes the certain aspects of sensors, actuator and system-on-chip hardware for the benefit of computer science students. Similarly the students coming in from electronics background will revisit communication protocols. The course will also explain the various emerging and mature protocols that are relevant to this field.
EC 431	Advanced VLSI	3	0	3	4	Advanced VLSI course is introduced to convey advanced concepts of circuit design and analysis for analog as well as digital LSI and VLSI systems in CMOS technology. The rapid growth of semiconductor industry, the analysis, design, layout, and optimization of circuits and systems are emphasized in this course. In rapid development of technology, the course is designed. This course is prototype development of advanced VLSI. The course focuses on application by mapping function on to hardware component. FPGAs and ASICs have become a part of Advanced VLSI. This Course covers System on Chips (SoC) design and modelling techniques with emphasis on architectural



						exploration, assertion-driven design and the concurrent development of hardware and embedded software.
EL 302	Digital Image Processing	3	0	2	4	Digital Image Processing course at UG level introduces the fundamentals of Image Processing. The course will cover a wide range of Image Processing techniques in time and frequency domain. Apart from image processing, video handling will also get covered in the course.
CS 4111	Computer Vision	3	0	2	4	This course introduces the basic concepts of Computer Vision to the students of undergraduate level.
EC 441	Power Electronics & Instrumentation	3	0	2	4	NULL
Robotics and IOT						
COURSE CODE	COURSE NAME	L	T	P	C	DESCRIPTION
EL 322	Industrial Control, Robotics and Automation	3	0	2	4	Introduction, Architecture and dynamics of Industrial Automation and Robotics, Measurements of Physical parameters- Temperature, Pressure, Force Sensor, Motion sensing, Signal Conditioning- ADC / DAC, Noise filtering, Signal strength enhancement and Estimation. Introduction to Automatic Control -PID, Feed Forward, and Feedback Control, Supervisory Control and Data Acquisition (SCADA) in Industrial Process, Concepts of Sequence control and ladder structure . Phase-locked Loop (PLL) Controller-Phase Comparator, Loop Filter , Voltage Controlled Oscillator (VCO), Relay Ladder Logic (RLL) for Industrial Control , Ladder Logic to program Programmable Logic Circuits (PLC) – Logical AND , Logical AND with NOT , Industrial STOP/ START , Complex Logic , Syntax and semantics of software for RLL based Industrial Control
EL 352	Real-Time Operating Systems	3	0	2	4	The objective of the course is to introduce the principles shared by many real-time operating systems, and their

						use in the development of embedded multitasking application software
EL 332	IOT and Sensor Networks	3	0	2	4	Internet of Things (IoT) is a system of interrelated computing devices, mechanical and digital machines, or objects that are provided with unique identifiers and the ability to transfer data over a network without requiring human-to-human or human-to-computer interaction. IoT cuts across different application domain ranging from civilian to defence sectors. These domains include agriculture, space, healthcare, manufacturing, construction, water, etc which are presently transitioning their legacy infrastructure to support IoT. IoT-based applications such as innovative shopping system, infrastructure management in both urban and rural areas, remote health monitoring systems, and transportation systems, are gradually relying on IoT based systems. Therefore, it is very important to understand the fundamentals of this emerging technology. The objective of this course module is to acquaint the students with the basics of IoT. This course gets them familiar with various sensors and actuators.
EL 362	Kinematics of Robotics	3	1	0	4	This course is design to enable students acquire knowledge regarding mechanics and dynamical behaviour of various types of robot, kinematic analysis of planar closed-loop and open-loop chains, coordinate transformation, direct and inverse kinematics, Denavit-Hertenberg parameterization, velocity, acceleration and force analysis, Parametrization and Inverse Kinematics of Robots, Independent joint and multivariable Control, Feedback liniarization , Adaptive and Optimal Control
EL 372	Architecture, Protocols and Design Principles of IOT	3	0	2	4	The course enables student to understand the basics of Internet of things Architecture and protocols. It introduces some of the application areas where Internet of Things can be applied. The course also helps to understand the IoT Reference Architecture and Real World Design Constraints. The course also give the



										insights of the various embedded and cloud security concepts.

Other available Professional/Open Electives

COURSE CODE	COURSE NAME	L	T	P	C	DESCRIPTION
CS 3132	Cloud Computing Concepts	3	0	2	4	Cloud Computing will cover the concepts, historical development, service models, deployment models, and reference architecture. It includes various technological foundation such as virtualization, service-oriented architecture, and other core components. This course will also cover the various attacks on cloud environment along with security aspects of cloud computing. Applied areas are covered to explain the usability of cloud computing. The course will be supported by use of open-source software for virtualization and cloud computing lab.
CS 4131	Machine Learning	3	0	2	4	1. This course will provide an introduction to machine learning, particularly to approaches that are widespread throughout research and applications of machine learning. 2. The students will be made able to design and implement machine learning solutions to classification, regression, and clustering problems; and be able to evaluate and interpret the results of the algorithms. 3. The course also offers delivering a more in-depth knowledge of the specific analytical techniques relevant to their research projects.
CS 4201	Blockchain Technology and Application	3	0	2	4	Blockchain is an emerging technology which supports decentralization. This course will focus on core concepts of Blockchain such as distributed consensus mechanisms, cryptographic primitives as well as available blockchain platforms such as Bitcoin, Hyperledger, Ethereum and Algorand. This course will also focus on writing smart contracts in some of these platforms. The prerequisite for attending



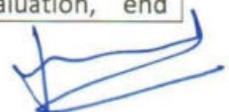
						<p>this course is knowledge of information security and strong background in mathematics.</p>
EC 451	Radar Engineering	3	1	0	4	<p>This course has been developed to provide an understanding of radar systems concepts and technologies in radar systems development, acquisition, and related fields. This course consists of a mixture of lectures, demonstrations through simulations and hardware. This course emphasizes on radar principles to detect and track any desired target, identifying radar subsystems and components, determining subsystem implementation characteristic, RADAR signal processing, and parameters estimation. This course will provide insight into methods for requirements allocation and flow-down to radar front-end and back-end subsystems. This course will also provide Electronic Counter Warfare technique involving RADAR technology and principles.</p>
EL 302	Digital Image Processing	3	0	2	4	<p>Digital Image Processing course at UG level introduces the fundamentals of Image Processing. The course will cover a wide range of Image Processing techniques in time and frequency domain. Apart from image processing, video handling will also get covered in the course.</p>
EL 312	Advanced Embedded Systems	3	0	2	4	<p>This course is intended for those ECE and CSE students who have already gone through a course on 8-bit microcontrollers. The course will focus on 32-bit embedded systems with real-time operating system (RTOS) and their applications in diverse areas. The course also covers important communication protocols such as USB and Controller-Area Network.</p>


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EL 322	Industrial Control, Robotics and Automation	3	0	2	4	Introduction, Architecture and dynamics of Industrial Automation and Robotics, Measurements of Physical parameters- Temperature, Pressure, Force Sensor, Motion sensing, Signal Conditioning- ADC / DAC, Noise filtering, Signal strength enhancement and Estimation. Introduction to Automatic Control -PID, Feed Forward, and Feedback Control, Supervisory Control and Data Acquisition (SCADA) in Industrial Process, Concepts of Sequence control and ladder structure . Phase-locked Loop (PLL) Controller-Phase Comparator, Loop Filter , Voltage Controlled Oscillator (VCO), Relay Ladder Logic (RLL) for Industrial Control , Ladder Logic to program Programmable Logic Circuits (PLC) – Logical AND , Logical AND with NOT , Industrial STOP/ START , Complex Logic , Syntax and semantics of software for RLL based Industrial Control
EL 332	IOT and Sensor Networks	3	0	1	4	Internet of Things (IoT) is a system of interrelated computing devices, mechanical and digital machines, or objects that are provided with unique identifiers and the ability to transfer data over a network without requiring human-to-human or human-to-computer interaction. IoT cuts across different application domain ranging from civilian to defence sectors. These domains include agriculture, space, healthcare, manufacturing, construction, water, etc which are presently transitioning their legacy infrastructure to support IoT. IoT-based applications such as innovative shopping system, infrastructure management in both urban and rural areas, remote health monitoring systems, and transportation systems, are gradually relying on IoT based systems. Therefore, it is very important to understand the fundamentals of this emerging technology. The objective of this course module is to acquaint the students with the basics of IoT. This course gets them familiar with various sensors and actuators.
EL 352	Real-Time Operating Systems	3	1	0	4	The objective of the course is to introduce the principles shared by many real-time operating systems, and their

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EL 362	Kinematics of Robotics	3	1	0	4		This course is design to enable students acquire knowledge regarding mechanics and dynamical behaviour of various types of robot, kinematic analysis of planar closed-loop and open-loop chains, coordinate transformation, direct and inverse kinematics, Denavit-Hertenberg parameterization, velocity, acceleration and force analysis, Parametrization and Inverse Kinematics of Robots, Independent joint and multivariable Control, Feedback liniarization , Adaptive and Optimal Control
EL 372	Architecture, Protocols and Design Principles of IOT	3	0	2	4		The course enables student to understand the basics of Internet of things Architecture and protocols. It introduces some of the application areas where Internet of Things can be applied. The course also helps to understand the IoT Reference Architecture and Real World Design Constraints. The course also give the insights of the various embedded and cloud security concepts.
EL 401	Wireless Broadband Communication	3	0	2	4		This course will include an overview of Wireless Communication networks area and its applications in communication engineering in future. To understand the various technique, principles, devices, schemes, concepts, algorithms and different methodologies used in Wireless Communication Networks.
EL 421	Cellular and Mobile Communication	3	0	2	4		This course provides fundamental concepts of Mobile Communication and specifics of current and proposed Cellular Systems. The course explains to study the layers of system model, access methods and networks to service platforms. The aim of this course is to understand the various terminologies, devices, schemes, concepts, algorithms and different methodologies used in Cellular communication Networks. The course explains to analyze how various Communication model layers are working in the Mobile Communication Environment. The course also help to understand the 3G and 4G Wireless Standards and explains the detailed

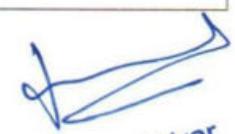
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NU 401	Advanced R & D Project	1	0	6	4	Advanced R&D project is offered as an open elective in seventh semester to the fast learners and carry same credits as the other open electives. It will be based on the R&D project that students have done in 6th semester. The students who have shown promise during the R&D project during the sixth semester will get an opportunity to extend the work in the advanced R&D project. They will be working under the same faculty who had mentored him / her during the R&D project in VI semester. Some of the possible extensions may be, applying the same technique to different problems, fine tuning/improving the techniques to get the higher precision/accuracy, get to do more recent literature survey, devising instruments to collect data, data gathering & analysis etc. as per discussions with faculty mentor. Finally, students will write a comprehensive report/research article as guided by faculty mentor. Evaluation will be based on mid semester evaluation, end



										semester evaluation, mentor's evaluation and comprehensive report/research article. They give the presentation and show the demonstration during the final evaluation and submit the final report with plagiarism report.

***HSSM Courses**

COURSE CODE	COURSE NAME	L	T	P	C	DESCRIPTION
ECON 102	Economics	3	0	0	3	Nature and scope of economic science, its relationship with other social sciences; quantification of economic variables, theories of consumer behavior and of the firm: linear economic models; market structures; social accounting and basic elements of economic planning.
ENG 102	English Literature	3	0	0	3	Literature is the study of societal behaviour which would help the students to gain insight about the individual's personality, attitude, motivation, learning and perception to become ethical. To learn and appreciate literature of any given language it is necessary to study literature written by the native speakers of that language. When a student studies literature of a period he/she can understand economic social and political situation of that time. Literature in English helps the students to develop a universal insight and make them appreciate values of various countries. The complexities and diversities of human society are well portrayed in this course. This course covers traditional and modern prospects of various ideologies and recollects them in an interesting manner.


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HSS 201	Professional Ethics & Values	3	0	0	3	This course on Professional Ethics & Values facilitate students in exploring the meaning & concepts of Ethics, Professional Ethics and in understanding the nuances of Self Discipline, Teamwork and Time Management from practical point of view and enables student to think from different vantage points applying ethical framework while undertaking any decision and actions. The course intends to enable students for doing critical analysis with reference to paradigm of Professional Responsibility and Ethical Leadership.
HSS 301	Selected Readings	0	3	0	3	With time and advent of new technologies human kind is losing touch with the wisdom that comes from reading books. The new torch bearers of the world, the younger generation is often seen completely oblivious to the benefits of reading a good book in their leisure time. This course aims at encouraging the healthy habit of reading books in the young generation. The books can be from any genre but will surely give them some food for thought at the end of the day.
MGT 201	Basics of Management	3	0	0	3	Topics to be covered include Introduction to Management: Meaning, Definition, its nature, purpose, importance & Functions; Management as Art, Science. Is management a Profession; Difference between management and administration. Evolution of Management Thought: Contributions of F.W.Taylor, Henri Fayol, Elton Mayo, Chester Barhard, Peter Drucker, Michael Porter to management thought. Various approaches to management. Evolution of Management in India. Functions of Management: Planning - Meaning - Need & Importance, types, levels - advantages & limitations. Forecasting - Need & Techniques. Decision making - Types - Process of rational decision making & techniques of decision making. Organizing - Elements of organizing & processes: Types of organizations, Delegation of authority - Need, difficulties in delegation - Decentralization. Staffing - Meaning & Importance. Direction - Nature

						Principles. Communication - Types & Importance. Motivation - Importance - theories.
MGT 401	Entrepreneurship	3	0	0	3	<p>The Business Environment in India has undergone a paradigm shift since the adoption of LPG. Indian Inc. catapulted itself to the role of 'Change Agent'. It is catalyst of a Knowledge-driven Market-centric economy. Competition breeds Innovation. Our economic policies encourage First generation Entrepreneurs – be it Micro, Small, Medium besides traditional Large Enterprises. The traditional form of business models like Family-run businesses are also success flag-post ventures in highly competitive global market ecosystem. Yet, there is a Knowledge-Divide. Our traditional theory based concepts are not effectively motivating young students to commercially exploit their Knowledge resource. This course will fill the void by sensitizing the students of the churning of business environment. The course will imbibe the attitudes of Entrepreneurship in budding students and hone their skill sets to Establish, Expand or Diversify and also explore merging concepts of growth of their own business.</p>
ECON 401	Fundamentals of Engineering Economics	3	0	0	3	<p>Engineers seek solutions to problems, and the economic viability of each potential solution is normally considered along with the technical aspects. The goal of this course is to introduce students to the process of integrating engineering proposals with economic analysis, to select among several viable alternative projects; and to understand and appreciate the models and measures used in decision making in engineering economics. This course introduces the fundamental concepts of economics and to explain how these will affect the functioning of</p>



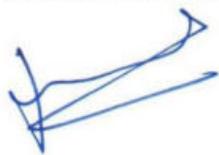
The PhD program in Electronics & Communications (ECE) at NIIT University is designed to foster research in three thriving areas:

1. **New Generation Communication Network:** Research in this area focuses on exploring and developing advanced communication network technologies to meet the demands of future communication systems. Specific research thrusts may include optimizing the utilization of white space in the ISM (Industrial, Scientific, and Medical) band, studying redundancy analysis and spectrum sensing techniques, and designing MIMO (Multiple-Input Multiple-Output) based antenna systems compatible with various Radio Access Networks (RAN) such as GSM-RAN, GSM-Edge RAN, UTRAN, Evolved-UTRAN, and 5G RAN.
2. **Flexible Electronics:** This research domain involves the investigation of materials, technologies, and design methodologies for flexible electronic products. Areas of research may include the study of suitable materials for flexible electronic devices, exploring novel fabrication techniques, and developing applications that leverage the flexibility and conformability of electronic systems.
3. **Green Energy and Energy Harvesting:** Research in this area focuses on developing sustainable and energy-efficient solutions for power generation and energy harvesting. Key research thrusts may involve investigating energy harvesting techniques to power remotely placed sensors and low-power devices, exploring renewable energy sources, and developing energy-efficient systems for various applications.

Within these domains, the specific research thrusts include:

- Designing mobile robots equipped with ad hoc network technology for agricultural applications.
- Exploring suitable materials for flexible electronic products and studying their properties.
- Conducting redundancy analysis and spectrum sensing for efficient utilization of white space in the ISM band.
- Developing MIMO-based antenna designs compatible with multiple combinations of Radio Access Networks (RAN).
- Designing transceiver systems with carrier signals like mm-wave or optical waves to enhance the security of information/data transmission.

The PhD program in Electronics & Communications at NIIT University provides a platform for researchers to contribute to cutting-edge advancements in these areas, addressing real-world challenges and pushing the boundaries of knowledge in the field of electronics and communications.



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PROGRAM FILE

AREA-Biotechnology and Bioinformatics (BT & BI)


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VISION

NIIT University's BTech Biotechnology and Bioinformatics Area program stands out as an immersive course among all BTech Biotechnology colleges in India. It is designed to cater to the evolving needs of the biotechnology sector, combining strong theoretical foundation, extensive hands-on lab experience, and knowledge of business applications of biotechnology. The program's curriculum is flexible and continuously updated to keep pace with the rapidly evolving science and the related biotech industry.

The courses offered in the program cover a wide range of subjects including Microbiology, Biological Chemistry, Analytical Techniques, Environmental Biotechnology, Bioprocess Technology, Immunology, Molecular Biology, and Bioinformatics. This comprehensive coverage ensures students develop competence in the vast arena of biotechnology.

A key focus of the program is to integrate theoretical knowledge with hands-on practical experience. This approach equips students with the necessary skills and expertise to effectively apply their knowledge in real-world scenarios. By emphasizing practical learning, the program prepares students to tackle the challenges of the industry and to solve real-world problems through biotechnology, with confidence.

Overall, NIIT University's BTech Biotechnology program provides students with a holistic and industry-relevant education, making it a preferred choice for those seeking a successful career in the field.

To prepare students for the technical and analytical skills enabling them to be potential employees/performers in industry, education, research, and management.

To equip the students with an adequate background in Biotechnology, Engineering, Humanities, Social Sciences, and Management to enable them to play an effective role as engineers for the benefit of society.

MISSION

The mission of the Biotechnology area at NIIT University is to foster a dynamic and innovative learning environment that prepares students to become proficient professionals in the field of biotechnology. The key aspects of the mission include:

M1: Academic Excellence: The BTech Biotechnology and Bioinformatics area strives for academic excellence by providing a rigorous and comprehensive curriculum that encompasses both theoretical knowledge and practical skills. The aim is to equip students with a strong foundation in biotechnology, enabling them to tackle complex challenges in the industry.

M2: Industry Relevance: The area is committed to staying updated with the latest developments and trends in the biotechnology sector. It collaborates closely with industry partners to ensure that the curriculum aligns with the current industry requirements. By incorporating industry-relevant practices and technologies, the area prepares students to be job-ready and adaptable to the ever-changing landscape of biotechnology.

M3: Research and Innovation: The Biotechnology area encourages research and innovation in various domains of biotechnology. It provides opportunities for students to engage in research projects, encouraging them to explore new frontiers and contribute to advancements in the field. The area also facilitates collaboration with industry and academia to foster an environment of innovation and knowledge exchange.

M4: Ethical and Responsible Practices: The area emphasizes the importance of ethical conduct and responsible practices in biotechnology. It instills ethical values and a sense of social responsibility in students, ensuring that they understand and adhere to ethical guidelines in their professional pursuits. This commitment to ethical practices ensures that graduates make a positive impact on society while contributing to the sustainable growth of the biotechnology industry.

By pursuing these mission objectives, the Biotechnology area at NIIT University aims to produce skilled and ethical professionals who are well-equipped to address the challenges and opportunities in the field of biotechnology.

BTECH BIOTECHNOLOGY AND BIOINFORMATICS - UNDERGRADUATE PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

PEO 1: Prepare graduates who possess a strong foundation in the fundamental principles and concepts of biotechnology, enabling them to understand and apply advanced knowledge in the field.

PEO 2: Develop graduates who are equipped with practical skills and laboratory techniques necessary for conducting research, experimentation, and analysis in various domains of biotechnology.

PEO 3: Nurture graduates who demonstrate critical thinking, problem-solving abilities, and analytical skills to address complex challenges and contribute to innovative solutions in biotechnology.

PEO 4: Cultivate graduates who possess effective communication and teamwork skills, enabling them to collaborate with multidisciplinary teams, present their ideas persuasively, and contribute to the professional growth of the biotechnology industry.

PEO 5: Foster a commitment to ethical practices, environmental sustainability, and societal well-being among graduates, ensuring that they contribute responsibly to the development and application of biotechnology for the benefit of society.

These Program Educational Objectives aim to shape well-rounded graduates who are not only technically competent but also possess the necessary skills, values, and mindset to excel in the field of biotechnology.

PROGRAM SPECIFIC OUTCOME (PSOs)- BTECH BIOTECHNOLOGY AND BIOINFORMATICS

PSO1: Delivering a comprehensive knowledge of fundamentals, practical approaches and their potential application with ethical responsibilities across the area of biotechnology.

PSO2: Development of technical skills through experiments and application-oriented methodology to address real-life questions in biotechnology.

PSO3: Expansion of analytical skills during problem-solving that are relevant to biotechnology and allied courses to understand emerging and advanced concepts in modern biology.

PSO4: Inculcate the evolution of professional and ethical attitude, effective communication skills, leadership and synergism, multidisciplinary approach and ability to relate engineering to broader issues and life-long learning for a successful professional career.

PSO5: Holistic augmentation of an individual who can transform successfully to become an intellectual scientific investigator, a sapient industrial employee or an insightful entrepreneur.

POs FOR B.TECH. IN BTECH BIOTECHNOLOGY AND BIOINFORMATICS

PO1 Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO2 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.

PO3 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.

PO4 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.

PO5 Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

PO6 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.

PO7 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.

PO8 Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO9 Individual and teamwork: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO10 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.

PO11 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.

PO12 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.

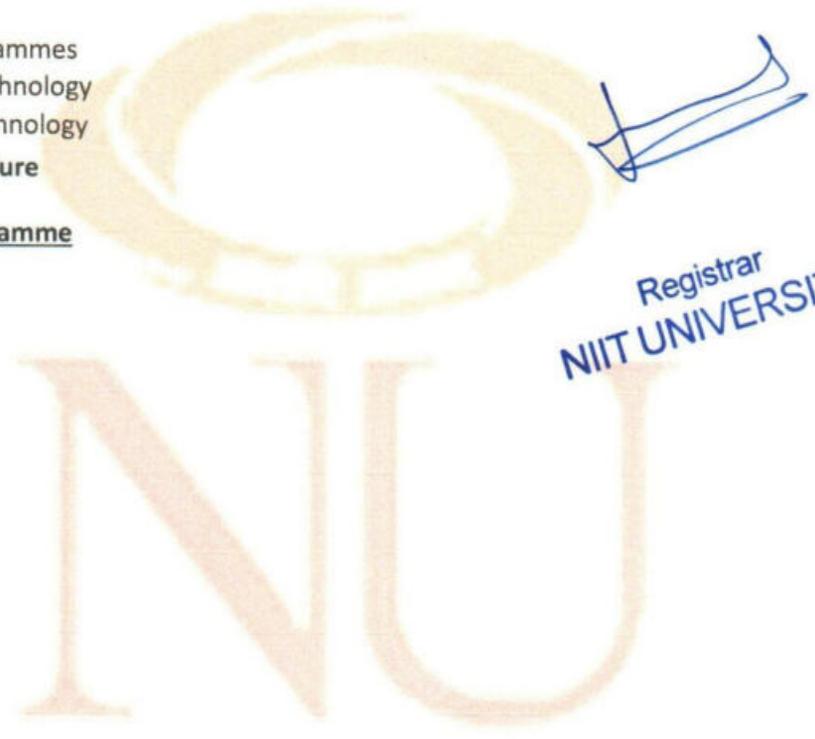
Course of Study

Undergraduate Programmes

- BTech -Biotechnology
- PhD in Biotechnology

Programme Architecture

Undergraduate Programme



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Course Architecture						
B.Tech. Biotechnology						
Course Code	Course Title	L	T	P	C	Description
Semester I						
MAT 011	Remedial Math-I	2	2	0	4	This pre-calculus course covers elements of Polynomial, Rational, Exponential, Logarithmic, Trigonometric functions, and their applications.
BIO 001	Remedial Biology	3	0	3	4	This course will provide a comprehensive overview of microbial world, understanding fundamental structure differences in prokaryotic and eukaryotic cells. Structure of cell organelles, their function with cell cycle and cell division will be studied in details. Function of various biomolecules, their involvement in various biochemical pathways, mineral nutrients and their transport to the cell will be considered. Advances in biotechnology and its application to human welfare will be discussed.
EL 111	Fundamentals of Electronics	3	1	0	4	This course is designed to help students gain an understanding of basics of DC and AC circuits. Students will learn to apply network analysis theorems & techniques to analyse and even design the electrical and electronic circuits. Introduction of PN junction devices including diodes and transistors helps develop basic understanding of the working of analog & digital electronic circuits. Students will also get a chance to learn about digital logic families along with Boolean algebra and Number systems which will prepare them for the upcoming courses in their Engineering programme.
TA 111	Fundamentals of Computer Programming	2	0	4	4	This is an introductory course on Programming Fundamentals. Its aim is to introduce basic concepts of Programming using high level language like Python. Students will solve problems by developing simple algorithms and then implement them using a Python programming language. The Lab component complements the theory by practicing the concept using Python. Through this course students will learn Object Oriented Programming concepts and how to use Object Oriented Python. Through this course students will become expert to use unique features of Python Language along with Python standard libraries and modules and packages.

CHM 111	Chemistry	3	0	3	4	This course continues the study of the fundamental principles and laws of chemistry and biology. Topics include Reactions of Organic Compounds, separation, and purification- identification of organic compounds by spectroscopic techniques, oxidation and reduction reactions, photochemistry, supra molecular chemistry, nanoparticles and nano materials, green chemistry, and biomolecules. Upon completion, students should be able to demonstrate an understanding of chemical and biological concepts as needed to pursue further study in chemistry or biology related professional fields. Laboratory experiments and computer-based exercises augment and reinforce the basic principles discussed in lecture as well as provide practical examples.
TA 202	Engineering Graphics	2	0	2	3	Engineering graphics is the language of engineers. Engineers and scientists are constantly engaged in creative and productive work. Proficiency in Engineering Graphics will be of considerable aid in achieving these aids. It introduces students to theories of projection and the concepts of engineering drawing using the most widely used CAD application software Auto CAD. Basic AutoCAD commands will be introduced and emphasized throughout this course. The course will cover the Introduction to AutoCAD commands; Simple drawings; Orthographic and Isometric drawings, Projections of Points, Lines, Planes and Geometric Solids.
TA 102	Communication Skills	2	0	2	3	Communication plays a crucial role in the management of an organization. Without proper communication, no organization can function properly. No matter which medium one communicates in, speaking and listening both should take place. This course aims to hone the communication and professional skills of the young graduates making them ready for professional environment. The course has been designed to have an appropriate blend of theory and practical sessions so that the students gain a sound knowledge of communication theoretical skills and understand ways of applying these skills in future.


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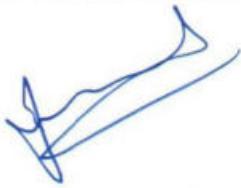
NU 111	Community Connect	0	0	2	1	Orientation to Field Visits: Each One Teach One; Importance of Education; Mentoring for Sensitivity & Curiosity; Understanding rural code of conduct; Sharing Technology education for access to learning Accelerated Learning: Observing & selecting the mentee; Remedial teaching; developing lessons & tests for recapitulation; Getting to know children's world; School evaluation systems; alternative systems of learning; Teaching for Community Empowerment. Measurement of Progress: in sensitivity; in degrees of curiosity; in aspirations; in learning styles; in mentoring styles; developing accelerated learning tests.
Semester II						
MAT 012	Remedial Math-II	2	2	0	4	This pre-calculus course covers elements of Coordinate Geometry, Vectors, Matrix Algebra, Sequences, Probability, Statistics, and their applications.
MAT 022	Remedial Math III	2	2	0	4	This univariate calculus course introduces the concept of Limits, Continuity, Differentiation, Integration, and their applications.
CS 102	Data Structures	3	0	3	4	This course aims to provide the students with solid foundations in the basic concepts of programming: data structures and algorithms. This course offers the students a mixture of theoretical knowledge and practical experience. The study of data structures is carried out within an object-oriented framework with implementations in Python programming language.
BIO 112	Microbiology	3	0	3	4	The objective of this course is to develop comprehensive knowledge of the microbial world and its components. This course introduces various principles, tools and techniques of microbiology that involves examining and characterising the microbes that inhabit our planet. This course will educate students about the vital role of microbiology to understand pathogenic potential of any microorganism and functioning of immune system. This course will also enhance the fundamental understanding of the microbial impact on our ecosystem as well as the 21st century challenges and opportunities that arise from our changing relationship with the microbes.


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TA 212	Workshop Practice	1	0	4	3	This course is designed to help students gain an understanding of where and how computers are used in modern manufacturing, particularly in manufacturing of electronics products. The Workshop Practice course supports to get hands on knowledge of several Workshop Practices like lathe, sheet metal work, machining etc. There are some additional experimental setups related to CNC machining, PCB Development which helps the students to enhance their knowledge. Students also get opportunity to implement their ideas through various application oriented micro projects. This outcome is to be achieved mostly by learning by-doing supplemented by one weekly lecture.
	HSSM-I*	3	0	0	3	
NU 112	Community Connect	0	0	2	1	Orientation to Field Visits: Each One Teach One; Importance of Education; Mentoring for Sensitivity & Curiosity; Understanding rural code of conduct; Sharing Technology education for access to learning Accelerated Learning: Observing & selecting the mentee; Remedial teaching; developing lessons & tests for recapitulation; Getting to know children's world; School evaluation systems; alternative systems of learning; Teaching for Community Empowerment. Measurement of Progress: in sensitivity; in degrees of curiosity; in aspirations; in learning styles; in mentoring styles; developing accelerated learning tests.
Semester III						
CHM 201	Thermodynamics	3	0	0	3	This course provides an introduction to the study of energy transformations in biological systems as well as thermodynamics and kinetics of structure formation and association of biomolecules. This subject has relevance to numerous pertinent biological engineering applications including central role of ATP in life processes, protein folding, aggregation, and binding; assembly of phospholipids bilayer and other biomaterials; the macroscopic mechanical properties of biomaterials including cells; design and operation of devices at the nano- and micro-scales; understanding the basis of mass and energy transport; relevance of receptor-ligand binding; the melting and annealing of genetic material. The concepts employed in this course have relevance to other biotechnological subjects like biochemical and bioprocess engineering.

BIO 201	Biological Chemistry	3	0	3	4	This course in Biochemistry gives an insight about the application of chemistry in understanding the biological processes. Course coverage includes detailed concepts about biomolecules and their metabolism along with its application in interdisciplinary areas such as drug discovery, immunology and cell biology. Biochemistry will focus on laying the fundamentals about chemical structure, enzyme catalysed reactions and application of biomolecules including proteins, lipids, carbohydrates and nucleotides in life processes.
BT 212	Analytical Techniques	3	0	2	4	This course is the amalgamation of both techniques and instrumentation for analysing a wide range of biological and non-biological compounds with immense interdisciplinary application. Concerning biotechnology, it provides a new perspective for detecting, analysing, and purifying biological-derived compounds. This course will provide an opportunity to gain in-depth knowledge in both basics and advanced techniques and instrumentation facilities by learning their principles and having hands-on experience with them. The course deals with centrifugation, spectroscopic, chromatographic, electrophoretic, microscopy, and radioisotopic and non-isotopic techniques.
BIO 202	Molecular Biology	3	0	3	4	This course covers the detailed analysis of molecular mechanism of various stages of cell cycle and their regulation. This course is aimed to understand the basic concept of gene regulation at all levels, and the structure-function relationships of nucleic acids and proteins. In this course Biological systems will be studied at molecular level. Major emphasis will give to understand the concept of DNA damage, DNA repair, replication, genetic recombination, transcriptional and post-transcriptional processes. Molecular biology techniques and the logic of experimental design will be highlighted.
PHY 101	Science II (Physics)	3	0	3	4	This is a comprehensive course in Physics that deals with quantum mechanics, Semiconductor Physics, Magnetism, Dielectrics and LASER. In order to allow the students to get exposed to experimental methods, the course also has a laboratory component. This helps the students to integrate theoretical knowledge and concepts with practical experience. Students will also learn operation of scientific equipment,

						collection of data and their analysis.
	HSSM-II*	3	0	0	3	
Semester IV						
BT 302	Computational Biology	3	0	3	4	Basic concept about biological databases, and submission and retrieval of biological information will be introduced. The principles and method of Nucleotide and Protein sequence retrieval and alignments will be instructed. The student will employ skills to make interpretations and analysis of a problem using uniform schema. Develop the practical skills for studying biological data such as protein, gene, DNA, regulatory regions, gene expression, transcription factor etc. by using open –access databases and software tools. This course will also help an individual develop the knowledge of protein structure prediction and modelling.
BT 311	Genetic Engineering	3	0	3	4	This course aimed is to introduce student to basic techniques and concept of recombinant DNA technology and provide the information of genetic engineering applications in therapeutics, agriculture and medical industries. Current experimentation and advancement in rDNA technology as well as ethical consideration and biosafety regulation for genetic engineering research will be emphasized.
BT 352	Biochemical and Bioprocess Engineering	3	0	3	4	This course provides the opportunity to learn the fundamental concepts and basic principles involved in bioprocess engineering. In this course, the student will learn to convert the biological behaviour and the processes involved in biochemical reactions into mathematical form, which leads to the design, and development of realistic models for industrial application. The concepts of multi-disciplines, such as physics, chemistry, biology, mathematics, and engineering principles, are well applied here. This course addresses the basic engineering calculations, material and energy balance, physical phenomena involved in developing biologically derived products, reaction kinetics, and bioreactor design.


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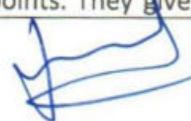
BT 401	Environmental Biotechnology	3	0	3	4	Considering the escalating environment, and energy crises, this course aims to impart the fundamental concepts and application of biotechnology in solving environmental problems. The course highlights the various sources and types of environmental pollution and the basics of waste management strategies, concepts of environmental microbiology, including microbial ecology, its growth, metabolism, routes for transformation and degradation, and methods for their characterization. Principles, processes, and applications of microbial detoxification and bioremediation are discussed. Further, the advanced applications of environmental biotechnology in converting wastes into biofuels and value-added products are also included. This course will offer students a broad sense of understanding of the application of biotechnology in environmental protection and sustainable solution by pollution mitigation and waste utilization.
CS 231	Database Management Systems	3	0	2	4	This is an introductory course on relational database systems. Its aim is to introduce basic concepts of databases and database management systems. At the end of this course it is expected that students will have a reasonably good theoretical as well as practical foundation on database systems. In particular, they will have a good understanding of relational data model, relational query languages, and database processing, SQL and PLSQL, physical database, storage and indexing structures, transaction management, database recovery.
	HSSM-III*	3	0	0	3	
Semester V						
BT 411	Food Biotechnology	3	0	3	3	This course on Food Biotechnology encompasses the detailed understanding of different biological techniques employed in the Food industry. This course will categorize food products including new Food concepts. Along with the concepts on food and nutrition, it will also discuss about the microbes related to food industry and disposal and treatment of waste from Food industry.

BT 331	Plant & Animal Biotechnology	3	0	3	4	This course explores the use of biotechnology to both generate genetic variation in plants and to understand how factors at the cellular level contribute to the expression of genotypes and hence to phenotypic variation. The molecular mechanisms directing plant gene expression under diverse environmental and developmental stimuli, is one of the main focus discussed in detail. This knowledge is central to our ability to modify plant responses and properties for global food security and commercial gains in biotechnology and agriculture. The objective of this course is to introduce students to cutting edge biotechnologies that can be used for animal and human health and research. This class will cover basic cellular and molecular biology techniques and their applications in a real world research setting.
BT 321	Capstone Project -I	1	0	6	4	This course is developed and design for students enrolled in B. Tech. Biotechnology program to have capstone experience. The B. Tech. Biotechnology program aims to enhance the student's chances for employment and advancement in this career field, this capstone project will emphasize the performing of "real-world" projects that incorporate the scientific, ethical, regulatory, and business aspects of biotechnology. This course provides students with an opportunity to apply, integrate, and demonstrate the knowledge and skills they have acquired in Biotechnology and allied fields during their undergraduate program. The problem statements for the project assignments are similar to those that students might typically encounter within industry, government, non-governmental organizations or academic research. Based on the complexity of the project, students will work individually or in small teams on a problem statement, defined by a faculty mentor, industry partner, or governmental sponsors.
	Professional Elective – j*	3	0	3	4	
BT 312	Industrial Biotechnology	3	0	3	4	The course's main objective is to provide fundamental insights into various biological-derived products, which have vast industrial and commercial significance. This course uniquely applies the principle of biochemical processes along with concepts of science and engineering and has scopes in diverse fields, such as food, fuel, chemicals, pharmaceuticals, agriculture, etc. It covers all

						the crucial processes involved in upstream and downstream processing, technology, and process involved in production of commercially important products, like vaccines, antibiotics, enzymes, alcohols, organic acids, etc. It also emphasizes aspects of scale-up and major challenges and prospects in industrial-scale production. This application-oriented course will benefit the students by providing practical knowledge.
	HSSM-IV*	3	0	0	3	

Semester VI

BT 461	Immunology	3	0	3	4	This course on immunology will provide a detailed understanding about the how immune cells respond to different physiological stress. In doing so students will be learning about different types of immunity and immune cells which will later lay the foundation about the understanding of the diverse antigen response by B cell and T cells and various immunological disorders The course content will provide the students with the science of tumor biology, organ transplantation, and vaccines. This course will also acquaint the students about application of immunology in cutting edge areas such as immunophenotyping, ELISA, RIA, Monoclonal antibodies and other related topics.
	Open Elective – I*	3	0	2	4	
	Professional Elective – II*	3	0	2	4	
	Professional Elective – III*	3	0	2	4	
NU 302	R & D Project	1	0	6	4	The Research and Development (R & D) projects is a core course for all undergraduate 6th semester students. The purpose of this course is to train the students to perform research and to be familiar with the activities and methodologies generally followed during the research work. All Faculty of NU share their research problems and students select a problem according to his/her research interest. The students perform literature survey and find the research gaps and challenges in their respective selected problem and then narrow down to specific gap/challenge on which they want to pursue the research. Subsequently the students design a complete solution and implement the same in consultation with their faculty mentor. Students present these during two mid semester evaluations and submit brief report to explain these points. They give the



						presentation and show the demonstration during the final evaluation and submit the final report with plagiarism report. The activities during the research process imparts valuable learning objectives, like understanding the research process, develop critical thinking and problem-solving skills in addition to soft skills like communication skills, team-work skills etc. Outcome of the R & D projects as publications, conference paper, prototype, patent encourage the undergraduate students and faculty supervisors. Moreover, it has a positive impact on NU as well as society at large. This will be the base for Advanced R&D project in VII semester.
	HSSM-V*	3	0	0	3	
Semester VII						
	Professional Elective – IV*	3	0	3	4	
	Professional Elective – V*	3	0	3	4	
BIO 212	Biosafety & Ethics & IPR	3	0	0	3	This course in Biosafety & Ethics & PR will integrate the three domains of Biosafety, Ethics and IPR that governs the fundamental set of laws and rules that are to be followed in Biotechnology. Students will be introduced to legal aspects related to genes and health care. Moreover, equal emphasis will be given to biosafety which will include necessary biosafety measures, biosafety laboratory levels 1 and 2 along with other related topics. Students will also be made aware about patent laws and its various modalities including IPR.
	Open Elective – II	3	0	3	4	
	Open Elective – III	3	0	3	4	
BT 4121	Capstone Project - II	1	0	6	4	Capstone project II supports biotech students with entrepreneurial spirit, desire for creativity, and zest for innovation. In this capstone project student will work individually or in a team to develop an outstanding business plan for a new biotechnology company, a ground-breaking drug, or an emerging technology such as a diagnostic or medical device. The business plan will include background research on the idea and investigation of the following: market opportunity, market strategy, funding, intellectual property, patents and management.
Semester VIII						

NU 402	Industry Practice/Project	0	0	40	20	Industry Practice is a flagship course of 20 credits in the B Tech Programme of NIIT University. Every student of NIIT University has an opportunity to transfer learning from classroom to the workplace in industry in the final six-month semester of B Tech Programme. During Industry Practice, a student works on the real time project of an organization under direct mentoring by industry professional. This 6-month period makes the transition from student in a University to an employed professional in industry seamless or smooth for a student.
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Students with PCM would be considered as Admission with Advanced Standing and will not be required to do the three Maths courses, namely Remedial Math-I, Remedial Math-II and Remedial Math-III. They will have to do a deficiency course in Cell Biology.

Students with PCMB would be considered as Admission with Advanced Standing and will not be required to do the three Maths courses named above as also the Cell Biology course

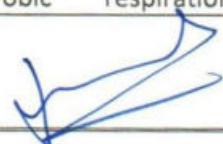
Specialization Area Courses*

Environmental Biotechnology

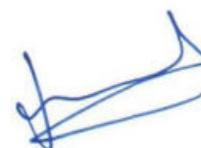
COURSE CODE	COURSE NAME	L	T	P	C	DESCRIPTION
BIO 302	Agricultural Microbiology	3	0	2	4	The objective of this course is to provide both basic and advanced knowledge in the principles and applications of agricultural microbiology. This course primarily focuses on plant microbiology, microbial biotechnology, microbial evolution and diversity. This course will educate students about the vital role played by soil microbiota in an ecosystem. The course also offers comprehensive understanding of soil fertility and various ways to improve it which can solve problems like food scarcity.
BT 481	Industrial Waste Management	3	0	3	4	Types of industries and industrial pollution – Characteristics of industrial wastes – Population equivalent – Bioassay studies – effects of industrial effluents on streams, sewer, land, sewage treatment plants and human health – Environmental legislations related to prevention and control of industrial effluents and hazardous wastes Waste management Approach – Waste Audit – Volume and strength reduction – Material and process modifications – Recycle, reuse and byproduct recovery – Applications. Sources, Characteristics, waste treatment flow sheets for selected industries such as Textiles, Tanneries, Pharmaceuticals, Electroplating industries, Dairy, Sugar, Paper, distilleries, Steel plants, Refineries, fertilizer, thermal power plants – Wastewater reclamation concepts



						Equalisation – Neutralisation – Removal of suspended and dissolved organic solids – Chemical oxidation – Adsorption - Removal of dissolved inorganics – Combined treatment of industrial and municipal wastes – Residue management – Dewatering – Disposal Hazardous wastes - Physico chemical treatment – solidification – incineration – Secure land fill
BT 4131	Wastewater Management	3	0	3	4	This course aims to provide comprehensive knowledge about wastewater generation, treatment strategies, and potential reuse. The course will primarily cover topics including the sources and characteristics of wastewater, principles of various wastewater treatment units and processes involved in wastewater treatment, conventional and advanced treatment systems, and strategies for wastewater reclamation and reuse. This course also emphasizes the biological processes involved in treating and reusing wastewater.
BT 441	Solid Waste Management	3	0	2	4	TBA
Plant Biotechnology						
COURSE CODE	COURSE NAME	L	T	P	C	DESCRIPTION
BT 322	Plant Physiology	3	0	3	4	Introduction to Plant Physiology; overview of plant tissue and cell organelles and their functions. Permiability, osmosis, diffusion and osmotic systems, absorption of water, mechanism of water absorption, ascent of sap Transpiration: Types of transpiration, factors affecting transpiration. General functions of mineral elements in plants, absorption and tranlocation of mineral salts, mechanism of mineral absorption Photosynthesis: Photosynthetic pigments, biosynthesis of chlorophylls, energetics of photosynthesis, light reactions and dark reactions; C3, C4 and CAM pathway; ecophysiology of photosynthesis. Respiratory quotient, types of respiration, mechanism of anaerobic respiration, mechanism of aerobic respiration,



						<p>Meristamatic physiological changes during cell division, phases of growth, regulation of plant growth and development, Auxins, Gibberellins, Cytokinins, Ethylene, Abscisic Acid, Inhibitors. Stimulus, Response and Irritability, Classification of plant movements, Geotropism, Chemotropism. Phytochrome, mode of phytochrome action. Stress and stress tolerance.</p>
BT 332	Plant Tissue Culture	3	0	3	4	<p>Introduction: Definition and technologies; Plant Cell & Tissue Culture Technologies: A brief description, technology and potential application of organ culture, meristem culture, anther/pollen culture, callus & suspension cultures and protoplast culture; Plant propagation; Regeneration through meristem and callus cultures; Somatic embryogenesis: production, preservation and use of somatic embryos as propagules; Artificial Seeds and Automation of Somatic Embryo Production: Principles, technology of automation and the application; Embryo culture; Haploid plant production; Cryopreservation: Storage of germplasm; Protoplast culture; Somatic hybridization; Induction & utilization of somatic variants; Secondary Metabolite Production Through Cell Cultures: Principles and the technology, pharmaceutical, pigments, other natural products and beverage production; Commercialization of tissue culture technology: Concept of commercialization and the need, design of typical tissue culture laboratory and its management.</p>



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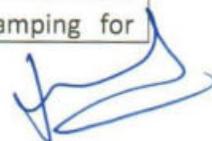
BT 342	Plant Pathology	3	0	3	4	<p>Introduction to Plant pathology, Disease Development, Host Pathogen relationship Physiology of Parasitism, Mechanism of Disease Resistance, Symptomatology and control measures of various diseases Environmental Effects of Disease Development, Susceptibility and resistance Plant disease epidemiology; Resistance of fungi to fungicides, Control methods in organic, sustainable, and integrated pest management Characteristics and classification of the causal agents of diseases (fungi, bacteria, viruses, viroids, phytoplasmas) Plant diseases caused by fungi (downy mildews, powdery mildews, rust, Smut) Plant diseases caused by bacteria (crown gall, citrus canker) Plant diseases caused by viruses (tobacco mosaic, Yellow Vein Mosaic, necrosis) Disease Management Mechanism(s) of pathogenesis and resistance, molecular detection of pathogens; plant-microbe beneficial interactions. Defence Mechanism in Plants Abiotic Diseases in Plants Basic strategies in control of pests of field crops, Integrated insect-pest management Forecasting of pest outbreaks</p>
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Industrial Biotechnology

COURSE CODE	COURSE NAME	L	T	P	C	DESCRIPTION
BT 4101	Microbial Metabolic Engineering	3	0	3	4	<p>Introduction to microbial metabolic engineering; Importance of metabolic engineering; Paradigm shift; Information resources; Scope and future of metabolic engineering; Building blocks of cellular components; Polymeric biomolecules; Protein structure and function; Biological information storage –DNA and RNA; Transport mechanisms and their models; Enzyme kinetics; Mechanisms and their dynamic representation; Regulation of enzyme activity versus regulation of enzyme concentration; Regulation of metabolic networks; Regulation of at the whole cell level; Classical mutagenesis, site directed mutagenesis, Gene shuffling, gene knockout, gene silencing, gene insertion or deletion. Metabolic flux analysis, metabolic control analysis, analysis of structure of metabolic networks, flux analysis</p>



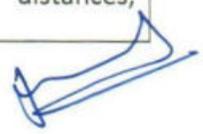
						of metabolic networks, thermodynamics of cellular processes; Enhancement of product yield and productivity – biofuels and industrially important chemicals (antibiotics, amino acids); Improvement of cellular properties (pH, temperature and solvent stability and degradation of pollutants (pesticides)
BT 4121	Protein Engineering	3	0	3	4	Protein engineering is a young and exciting interdisciplinary field where Experimental protein engineering and computational protein design approach will be utilized for developing proteins with altered or novel structural properties and biological functions. This course will expose the students not only to the basics of protein chemistry but also to the current state-of-art approaches used for designing and engineering artificial and new protein molecules. The protein engineering course will mainly emphasizing on the topics such as Protein structure, function, stability, folding, protein evolution, protein engineering examples and applications, Knowledge based protein design, molecular force field, molecular modeling, rotamer libraries, modulating protein structure, modulating intrinsic properties by computational design, Future challenges of computational design
BT 4111	Synthetic Biology	3	0	3	4	Synthetic biology is an emerging, exciting, and interdisciplinary course, which emphasized on designing and construction of new biological entities, such as enzymes, genetic circuits, and cells, or the redesign of existing biological systems.
BT 4141	Biosensors	3	0	3	4	Introduction: Configuration of biosensors; Different generations of biosensors Working principle: Principle, instrumentation and transducer mechanism of different biosensors viz. electrochemical, optical, acoustic, piezoelectric, and calorimetric biosensors. Biological recognition systems: Enzyme, antibody, nucleic acid, cell, and tissue Biosensor material: Properties of ideal materials; Materials for biosensors: polymers, material containing metal complex, sol-gel materials, nano-materials, composite materials, metal oxides, photonic crystals, and zeolite materials Application of biosensors: Food and fermentation processes, environment monitoring, whole-cell patch clamping for



						pharmaceutical drug screening
BT 4151	Enzyme Technology	3	0	3	4	Introduction to Enzymes: General introduction and terminology, Specific activity. Enzyme units-Katal and IU. Enzyme characters- chemical nature of enzymes. Protein nature of enzymes and Non protein enzymes- Ribozymes and DNAzymes. Metalloenzymes and metal activated enzymes. Coenzymes and Cofactors-Prosthetic group, coenzymes involved in different metabolic pathways Application of industrial and clinical enzymes: Thermophilic enzymes, amylases, lipases, proteolytic enzymes in meat and leather industry, enzymes used in various fermentation processes, cellulose degrading enzymes, Metal degrading enzymes. Enzymes as thrombolytic agents, Anti-inflammatory agents, strptokinasaes, asparaginase, Isoenzymes, Transaminases, Amylases, Cholinesterases, Phosphatases, Immobilization of enzymes for ELISA, Biosensors and Biofuel cell development, Molecular design of enzymes: Enzyme engineering by mutagenesis, catalytic efficiency, future challenges, Enzyme Structure activity Relationship (SAR), Application of enzymes having co-factors, Case studies

Bioinformatics

COURSE CODE	COURSE NAME	L	T	P	C	DESCRIPTION
BT 491	Biological Sequence Analysis	3	0	3	4	Biological Databases, search engine, entry and retrieval of data. Pair-wise alignment, local and global alignment, scoring matrix, substitution matrix (PAM and BLOSUM). Dynamic programming, Heuristic method for Database search (BLAST and FASTA), Statistical significance of BLAST hits. Multiple sequence alignment (ClustalW, T-coffee) and its application (consensus, motifs, profile). Evolutionary analysis: distances,



						clustering methods, tree representation. Profiles and Hidden Markov Model: pair wise alignment, motif finding, ORF finding, and clustering gene expression profiles. Gene identification and prediction methods. Artificial neural network: concept, perceptron, back-propagation algorithm, Training and testing ANN. Visualization of proteins (RasMol, PDB-viewer etc) Structural alignment of protein (EC, DALI, SSAP, VAST), Protein structure prediction using ANN and HMM.
BI 421	Genomics & Proteomics	3	0	2	4	This course will develop the practical skills for studying genomics and proteomics data by using open access databases and software tools. The prokaryotic and eukaryotic genomes and their organization together with the comparative genomics and evolutionary makeup of different organism will be studied in detail. Concepts related to the area of protein folding, modelling, protein-ligand interaction, and other proteomics techniques will be conferred.
	Algorithm for Bioinformatics					TBA
BI 411	Data Mining for Bioinformatics	3	0	3	4	An introduction to data mining, Creating Data Mining Models, Working with data mining models, Training data mining models, Viewing data mining models, Editing data mining models, Data Mining Model Security, Implementing security in a data mining models, Exploratory analyses - Principal component analysis, Biplots, Independent component analysis, Exploratory projection pursuit, Multidimensional scaling. Cluster Analysis - Hierarchical methods, Gaussian mixture models, K-means, K-medoids, Vector quantisation, Self-organising maps. Classification - Decision theory, Linear discriminant analysis, Quadratic discriminant analysis, Fisher's LDA, Logistic discrimination, Non-parametric classification tools, Classifier assessment, Tree-based classifiers, Bagging and Boosting. Text / Reference Books
	Molecular Modelling and Drug Discovery					TBA
Food Biotechnology						
COURSE CODE	COURSE NAME	L	T	P	C	DESCRIPTION
BT 4221	Food Microbiology	3	0	3	4	TBA
BT 4231	Food Process	3	0	3	4	TBA

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	Technology					
BT 4241	Food Preservation Technology	3	1	0	4	TBA
BT 4251	Food Process Engineering	3	0	3	4	TBA
BT 4261	Food Analysis and Quality Control	3	0	3	4	TBA
BT 4271	Food Packaging Technology	3	1	0	4	TBA

Medical Biotechnology

COURSE CODE	COURSE NAME	L	T	P	C	DESCRIPTION
BT 4171	Cancer Biology	3	0	3	4	The main objective of the course is to make the students understand about the properties of cancer cells and to distinguish different types of tumors. This course provides detailed understanding about the mechanism of cancer development and progression. This course also delineates ways to treat cancer including cancer chemotherapy and immunotherapy.
BT 4181	Virology	3	1	0	4	The main objective of the course is to make the students understand about the different viruses that exist in nature along with their detection and propagation strategies. This course provides detailed understanding about the virus replication and virus-cell interaction. It also helps to delineate different antivirals and viral vaccines that are needed for combating viral infection.
BT 4191	Biopharmaceuticals	3	0	3	4	This course will help students to understand the basics of Pharmaceutical and Biopharmaceutical product development, manufacturing and their quality compliances. Principal behind drug kinetics and various drug delivery systems will nurture the students' mind in generating new concepts. A detail discussion on development and manufacturing of Biologics will prepare students for the recent development in drug manufacturing process widely followed currently in pharmaceutical and biopharmaceutical industry.
BT 4201	Biomedical Engineering	3	1	0	4	The study of biomedical engineering involves a broad array of diagnostic and therapeutic applications. This course focuses on the integrity of engineering and sciences, a fascinating multidisciplinary area of study that entails the application of engineering techniques in order to assist practitioners like doctors and physicians in their healthcare



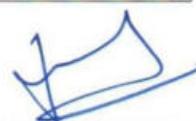
							practices. Study of this branch also helps them in the rehabilitation of disabled patients.
BT 4211	Gene Expression & Regulation	3	0	3	4	TBA	

Other available Professional/Open Electives

COURSE CODE	COURSE NAME	L	T	P	C	DESCRIPTION
BI 421	Genomics & Proteomics	3	0	2	4	This course will develop the practical skills for studying genomics and proteomics data by using open access databases and software tools. The prokaryotic and eukaryotic genomes and their organization together with the comparative genomics and evolutionary makeup of different organism will be studied in detail. Concepts related to the area of protein folding, modelling, protein-ligand interaction, and other proteomics techniques will be conferred.
BI 431	Python & Bio Python	3	0	2	4	IMPORTANCE OF PYTHON The course gives an insight to the python programming language and the bioinformatics tools that this language provides. Course coverage would include a detailed introduction to the language and then will proceed to its applicability to Bioinformatics applications. Python focuses on the problem solving rather than lower level details. Python has been used in a lot of scientific applications, parallel programming, and benchmarking systems. Due to its versatility it has been a preferred language at NASA, Google etc. Applicability to Bioinformatics: Python has great applicability in Bioinformatics applications due to the availability of a rich and updated toolset for bioinformatics libraries making it a powerful platform superseding erstwhile BioPerl. The course holds great value and applicability for students of Computer Science, Biotech and Electronics streams.
BI 441	Molecular Modelling and Drug Design	3	0	3	4	An in-depth overview over the state-of-the art methods and techniques nowadays applied in CADD will be provided. Students will be able to choose the appropriate method (in terms of applicability, accuracy, and economy) for a given problem like, lead optimization, structure-based design, investigation of ligand receptor interaction. They can also perform, understand, and interpret the results of the calculations and bring them in a publication

						ready form. At the end of the course, each student will meet the expectations of pharmaceutical industry in this area
BIO 302	Agricultural Microbiology	3	0	2	4	The objective of this course is to provide both basic and advanced knowledge in the principles and applications of agricultural microbiology. This course primarily focuses on plant microbiology, microbial biotechnology, microbial evolution and diversity. This course will educate students about the vital role played by soil microbiota in an ecosystem. The course also offers comprehensive understanding of soil fertility and various ways to improve it which can solve problems like food scarcity.
BT 4111	Synthetic Biology	3	0	3	4	Synthetic biology is an emerging, exciting, and interdisciplinary course, which emphasized on designing and construction of new biological entities, such as enzymes, genetic circuits, and cells, or the redesign of existing biological systems.
BT 4131	Wastewater Management	3	0	3	4	This course aims to provide comprehensive knowledge about wastewater generation, treatment strategies, and potential reuse. The course will primarily cover topics including the sources and characteristics of wastewater, principles of various wastewater treatment units and processes involved in wastewater treatment, conventional and advanced treatment systems, and strategies for wastewater reclamation and reuse. This course also emphasizes the biological processes involved in treating and reusing wastewater.
BT 4171	Cancer Biology	3	0	3	4	The main objective of the course is to make the students understand about the properties of cancer cells and to distinguish different types of tumors. This course provides detailed understanding about the mechanism of cancer development and progression. This course also delineates ways to treat cancer including cancer chemotherapy and immunotherapy.
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BT 4201	Biomedical Engineering	3	1	0	4	The study of biomedical engineering involves a broad array of diagnostic and therapeutic applications. This course focuses on the integrity of engineering and sciences, a fascinating multidisciplinary area of study that entails the application of engineering techniques in order to assist practitioners like doctors and physicians in their healthcare practices. Study of this branch also helps them in the rehabilitation of disabled patients.
BT 421	Nanotechnology	3	0	2	4	Nanotechnology is an area of scientific and technological opportunity that applies the tools and processes of nanofabrication to advance research in sciences. This course unlocks new promising avenue for students and enable them to create new micro- and nanoscale devices for better understanding the life processes at nanoscale level. The most important objective of this course is to apply nanotools to solve relevant medical/biological problems and refining these applications. Developing new tools in the field of bioenergy and environment is another primary objective in nanotechnology.
BT 4281	Geographical Bioinformatics Systems	3	0	2	4	Geographical Bioinformatics Systems (GBS) is an emerging field of research and development that involves use of two well-established fields i.e., Geographic Information Systems (GIS) and Bioinformatics. This course is designed for B.Tech. Biotechnology students to provide exposure on effective utilization of GIS and bioinformatics for disease mapping and analysis in both theoretical and practical aspects. The course also offers more in-depth knowledge on how GIS supports in the fields of public health, healthcare administration,



						and social services. Additionally, students will get hands-on experience on ESRI ArcGIS software for health and human services.
BT 431	PERL & Bio-PERL	2	0	4	4	Perl is a powerful programming language that has pattern matching and processing as its core property. The language has lot of importance in writing scripts that can automate web oriented tasks and can make different kind of applications compatible to each other in terms of data delivery and acceptance. BioPerl is a library that was developed solely to encapsulate complex bioinformatics tasks as perl modules. These modules enable perl applications to directly interact with databases from NCBI and similar and to use functionalities of web tools like BLAST. The Perl/BioPerl course gives a detailed coverage of the Perl programming language and the implications that it has for a student of Bioinformatics. An introduction to the BioPerl library would also give a kickstart to developing applications that integrate the vast amount of live and real genomic data available as publicly accessible databases.
DS 302	Data Science Using R	3	0	0	3	The field commonly known as Data Science lies at the intersection of mathematics, computer science, and domain expertise. Within the data science (DS) world, there are a multitude of areas of study, and exploration. This course will introduce the basics of R programming. Students will learn the R skills needed to answer essential questions and perform basic exploratory analysis. The course will cover R functions and data types, then tackle how to operate on data frames and when to use data sub-setting techniques. Students will learn how to apply general data sub-setting features like select and filter, and how to wrangle, analyze and visualize data. The course aim is to make the students conversant with the concept of Data Science and techniques to be used for data analytics including the construction of different statistical Models used for Data Analytics. The course is an in-depth coverage on various Statistical Techniques and goodness of fit tests used for data analytics. The module is practical oriented. For Analysis R software is used. The students will continuously practice their newly



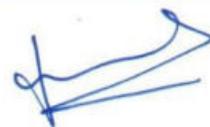
						acquired skills through R Studio.
ET 401	Learning Technologies Project Course	0	0	1	4	It is within above framework and in pursuit of knowledge, skill and motivation for effective Teaching-Learning that the course is then designed to engage students in Learning Technologies Projects as drawn from individual students' specialization subject domains from engineering & technology, sciences, management, social sciences, humanities and green environment. Primarily, the learning technologies project categories will cover Projects in Designing System Development Life Cycle (SDLC) and Project-Based Learning.
NU 401	Advanced R & D Project	1	0	6	4	Advanced R&D project is offered as an open elective in seventh semester to the fast learners and carry same credits as the other open electives. It will be based on the R&D project that students have done in 6th semester. The students who have shown promise during the R&D project during the sixth semester will get an opportunity to extend the work in the advanced R&D project. They will be working under the same faculty who had mentored him / her during the R&D project in VI semester. Some of the possible extensions may be, applying the same technique to different problems, fine tuning/improving the techniques to get the higher precision/accuracy, get to do more recent literature survey, devising instruments to collect data, data gathering & analysis etc. as per discussions with faculty mentor. Finally, students will write a comprehensive report/research article as guided by faculty mentor. Evaluation will be based on mid semester evaluation, end semester evaluation, mentor's evaluation and comprehensive report/research article. They give the presentation and show the demonstration during the final evaluation and submit the final report with plagiarism report.



***HSSM Courses**

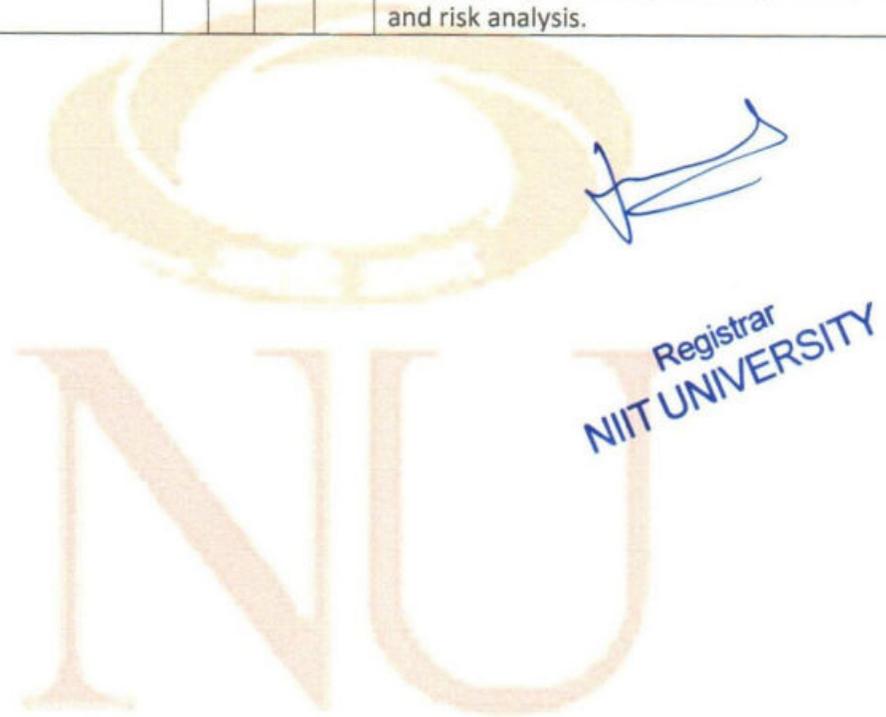
COURSE CODE	COURSE NAME	L	T	P	C	DESCRIPTION
ECON 102	Economics	3	0	0	3	Nature and scope of economic science, its relationship with other social sciences; quantification of economic variables, theories of consumer behavior and of the firm: linear economic models; market structures; social accounting and basic elements of economic planning.
ENG 102	English Literature	3	0	0	3	Literature is the study of societal behaviour which would help the students to gain insight about the individual's personality, attitude, motivation, learning and perception to become ethical. To learn and appreciate literature of any given language it is necessary to study literature written by the native speakers of that language. When a student studies literature of a period he/she can understand economic social and political situation of that time. Literature in English helps the students to develop a universal insight and make them appreciate values of various countries. The complexities and diversities of human society are well portrayed in this course. This course covers traditional and modern prospects of various ideologies and recollects them in an interesting manner.
HSS 201	Professional Ethics & Values	3	0	0	3	This course on Professional Ethics & Values facilitate students in exploring the meaning & concepts of Ethics, Professional Ethics and in understanding the nuances of Self Discipline, Teamwork and Time Management from practical point of view and enables student to think from different vantage points applying ethical framework while undertaking any decision and actions. The course intends to enable students for doing critical analysis with reference to paradigm of Professional Responsibility and Ethical Leadership.
HSS 301	Selected Readings	0	3	0	3	With time and advent of new technologies human kind is losing touch with the wisdom that comes from reading books. The new torch bearers of the world, the younger generation is often seen completely oblivious to the benefits of reading a good book in their leisure time. This course aims at encouraging the healthy habit of reading books in the young generation. The books can be from any genre but will surely give them some food for thought at the end of the day.

MGT 201	Basics of Management	3	0	0	3	<p>Topics to be covered include Introduction to Management: Meaning, Definition, its nature, purpose, importance & Functions; Management as Art, Science. Is management a Profession; Difference between management and administration. Evolution of Management Thought: Contributions of F.W.Taylor, Henri Fayol, Elton Mayo, Chester Barhard, Peter Drucker, Michael Porter to management thought. Various approaches to management. Evolution of Management in India. Functions of Management: Planning - Meaning - Need & Importance, types, levels – advantages & limitations. Forecasting - Need & Techniques. Decision making - Types - Process of rational decision making & techniques of decision making. Organizing - Elements of organizing & processes: Types of organizations, Delegation of authority - Need, difficulties in delegation - Decentralization. Staffing - Meaning & Importance. Direction - Nature - Principles. Communication - Types & Importance. Motivation - Importance - theories.</p>
MGT 401	Entrepreneurship	3	0	0	3	<p>The Business Environment in India has undergone a paradigm shift since the adoption of LPG. Indian Inc. catapulted itself to the role of 'Change Agent'. It is catalyst of a Knowledge-driven Market-centric economy. Competition breeds Innovation. Our economic policies encourage First generation Entrepreneurs – be it Micro, Small, Medium besides traditional Large Enterprises. The traditional form of business models like Family-run businesses are also success flag-post ventures in highly competitive global market ecosystem. Yet, there is a Knowledge-Divide. Our traditional theory based concepts are not effectively motivating young students to commercially exploit their Knowledge resource. This course will fill the void by sensitizing the students of the churning of business environment. The course will imbibe the attitudes of Entrepreneurship in budding students and hone their skill sets to Establish, Expand or Diversify and also explore merging concepts of growth of their own business.</p>



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ECON 401	Fundamentals of Engineering Economics	3	0	0	3	<p>Engineers seek solutions to problems, and the economic viability of each potential solution is normally considered along with the technical aspects. The goal of this course is to introduce students to the process of integrating engineering proposals with economic analysis, to select among several viable alternative projects; and to understand and appreciate the models and measures used in decision making in engineering economics. This course introduces the fundamental concepts of economics and to explain how these will affect the functioning of an organization and contribute to decision making in engineering operations. The topics covered in this course include time value of money, cost-benefit analysis, depreciation, inflation, income taxes and risk analysis.</p>
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Biotechnology PhD Programme

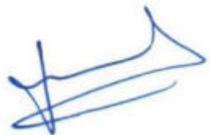
NIIT University's (NU) PhD program in Biotechnology is designed to empower aspiring doctoral students with the knowledge and expertise required to emerge as leaders in the rapidly evolving realms of industrial and academic biotechnology. This program offers a comprehensive curriculum that encompasses multidisciplinary and interconnected subjects such as Microbiology, Molecular Biology, Biochemistry, Bioinformatics, Immunology, Biochemical Engineering, and Genetic Engineering.

In addition to a rigorous coursework component, NU's doctoral program provides valuable opportunities for candidates to enhance their professional and pedagogical skills. This is achieved through immersive laboratory-based research experiences, facilitating the hands-on application of theoretical concepts. Candidates are encouraged to actively participate in in-house seminars and also have the chance to engage with national and international conferences, fostering exposure to cutting-edge research and global perspectives in biotechnology.

By combining theoretical knowledge, practical research experiences, and opportunities for scholarly engagement, NU's Ph.D. program in Biotechnology equips doctoral students with the necessary tools and competencies to make significant contributions to both industry and academia. The program aims to produce exceptional researchers and educators who are poised to drive innovation, advance knowledge, and address the challenges of the biotechnology field with expertise and leadership.

Areas of research

- Medical Biotechnology
- Bioinformatics
- Genomics & Proteomics
- Bioprocess Technology
- Plant & Microbial Biotechnology
- Environmental Biotechnology
- Novel Drug Delivery Systems
- Nano-biotechnology
- Infectious diseases
- Host-Immune Response



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PROGRAM FILE



AREA-Management (UG, PG and PhD)

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VISION

The vision of the Management area program at NIIT University is to cultivate exceptional leaders who possess a strong foundation in management principles and are equipped to tackle complex challenges in the business world. The program aims to develop individuals who can drive innovation, create sustainable business models, and make a positive impact on society. The key elements of the vision for the Management area program include:

1. **Nurturing Leadership:** The program strives to nurture future leaders who demonstrate a strong sense of integrity, ethical values, and social responsibility. It aims to develop individuals who can lead with vision, inspire teams, and drive positive change in organizations and communities.
2. **Integrating Theory and Practice:** The program emphasizes the integration of theoretical knowledge with practical application. It aims to equip students with the skills, tools, and techniques necessary to analyze complex business problems, develop innovative solutions, and implement effective strategies.
3. **Promoting Entrepreneurship and Innovation:** The program encourages an entrepreneurial mindset and fosters innovation and creativity among students. It aims to equip students with the skills and knowledge required to identify and seize opportunities, take calculated risks, and create successful ventures.
4. **Cultivating Global Perspective:** The program recognizes the importance of a global mindset in today's interconnected business landscape. It aims to develop individuals who are culturally sensitive, adaptable to diverse environments, and capable of navigating global markets with competence and agility.
5. **Instilling Lifelong Learning:** The program emphasizes the value of continuous learning and professional development. It aims to foster a culture of lifelong learning among students, equipping them with the ability to adapt to evolving business trends, embrace new technologies, and stay ahead in a rapidly changing world.

By embodying this vision, the Management area program at NIIT University aims to produce well-rounded graduates who possess the knowledge, skills, and values to succeed as leaders in the business world, contribute to the growth of organizations, and make a positive difference in society.

MISSION

The mission of the Management area program at NIIT University is to provide a transformative education that prepares students for successful careers in management and leadership roles. The program aims to develop individuals who possess a strong foundation in management principles, critical thinking abilities, and a global perspective. The key elements of the mission for the Management area program include:

1. **Academic Excellence:** The program strives for academic excellence by delivering a rigorous curriculum that combines theoretical knowledge with practical application. It aims to provide students with a comprehensive understanding of core management concepts, theories, and practices.
2. **Leadership Development:** The program focuses on developing leadership skills among students. It aims to cultivate qualities such as effective communication, problem-solving, decision-making, and teamwork, enabling students to lead with confidence and integrity.
3. **Industry Relevance:** The program is designed to be responsive to the needs of the industry. It aims to equip students with the knowledge and skills required to meet the challenges and opportunities of the rapidly evolving business environment. The curriculum incorporates industry insights, case studies, and practical projects to bridge the gap between theory and practice.

4. **Ethical and Responsible Practices:** The program instills a strong sense of ethical values and social responsibility among students. It emphasizes the importance of ethical conduct, sustainability, and corporate social responsibility in the practice of management.
5. **Entrepreneurship and Innovation:** The program encourages an entrepreneurial mindset and fosters innovation and creativity. It aims to inspire students to identify and create business opportunities, think critically, and develop innovative solutions to address real-world challenges.
6. **Lifelong Learning:** The program promotes a culture of lifelong learning. It aims to instill in students the importance of continuous personal and professional development, enabling them to adapt to changing business trends, embrace new technologies, and pursue lifelong learning opportunities.

By fulfilling this mission, the Management area program at NIIT University strives to produce graduates who are well-prepared to excel as effective managers, leaders, and entrepreneurs. The program aims to contribute to the development of knowledgeable, responsible, and socially conscious professionals who can drive positive change in organizations and make a meaningful impact in society.

Undergraduate Programme Educational Objectives for Management Area:

1. PEO 1: To equip students with a strong foundation in management theories, concepts, and practices, enabling them to understand the fundamentals of various functional areas of business.
2. PEO 2: To develop students' analytical, critical thinking, and problem-solving skills, allowing them to analyze complex business challenges, identify opportunities, and make informed decisions.
3. PEO 3: To nurture effective communication and interpersonal skills in students, enabling them to work collaboratively in teams, lead with confidence, and engage in professional interactions with stakeholders.
4. PEO 4: To foster an understanding of ethical and socially responsible practices in business, cultivating a sense of integrity, professionalism, and corporate citizenship among students.
5. PEO 5: To promote a global mindset and cross-cultural competence in students, enabling them to adapt to diverse business environments, appreciate cultural differences, and operate effectively in a globalized world.

Postgraduate Programme Educational Objectives for Management Area:

1. PEO 1: To enhance students' specialized knowledge in specific areas of management, allowing them to develop expertise and advanced understanding in their chosen fields.
2. PEO 2: To develop students' research and analytical skills, enabling them to conduct in-depth studies, critically evaluate existing knowledge, and contribute to the advancement of management theory and practice.

3. PEO 3: To cultivate leadership and strategic thinking capabilities in students, preparing them for managerial and leadership roles in organizations and empowering them to drive innovation and change.
4. PEO 4: To promote entrepreneurship and innovation among students, fostering an entrepreneurial mindset and equipping them with the skills and knowledge to identify and seize business opportunities.
5. PEO 5: To foster a commitment to lifelong learning and professional development in students, encouraging them to continuously update their knowledge and skills, adapt to evolving business trends, and stay abreast of emerging practices in the field of management.

These Program Educational Objectives for the undergraduate and postgraduate programs in the Management area at NIIT University aim to develop well-rounded graduates who possess a strong foundation in management, critical thinking abilities, leadership skills, ethical values, and a global perspective. The objectives are aligned with the goal of preparing students for successful careers in various sectors of the business world and empowering them to make meaningful contributions to organizations and society.



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PSOs for Undergraduate Programme BBA

PSO 1: Demonstrate management knowledge in core areas of business administration by applying it to real life situations within an organizational context.

PSO 2: Demonstrate capability for learning to learn, creativity, innovation, design thinking and entrepreneurship.

PSO 3: Demonstrate and apply ethical and professional practices in profession and work responsibly towards social welfare and environmental sustainability.

PSOs for Post Graduate Programme (iMBA and other industry linked programmes)

PSO 1: Demonstrate and apply knowledge of diverse management areas for operations and growth of an organisation in a global arena.

PSO 2: Demonstrate the ability to work in collaborative manner with individuals and teams of diverse backgrounds, for meeting the complex challenges of doing business in a globally connected world.

PSO 3: Demonstrate capability for learning to learn, creativity, innovation, design thinking and entrepreneurship.

PSO 4: Demonstrate and apply ethical and professional practices in profession and work responsibly towards social welfare and environmental sustainability.

Programme Outcomes for Management Programmes

PO1 Apply knowledge of management theories and practices to solve business problems.

PO2 Foster Analytical and critical thinking abilities for data-based decision making.

PO3 Ability to develop Value based Leadership ability.

PO4 Ability to understand, analyze and communicate global, economic, legal, and ethical aspects of business.

PO5 Ability to lead themselves and others in the achievement of organizational goals, contributing effectively to a team environment.



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Programme of Study

Undergraduate Programme

Bachelor of Business Administration BBA

Postgraduate Programmes

- Integrated Master of Business Administration (iMBA)
- Information System and Data Engineering (MBA ISDE)
- MBA (Business Analytics) (MBA BA)
- Master of Business Administration (MBA IDS)
- Master of Business Administration
- Postgraduate Diploma in Banking and Relationship Management (PGBRM)
- Post Graduate Diploma in Banking & Finance (PGDBF)

PhD Programme in Management

Programme Architecture

Undergraduate Programme

BBA



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Programme Architecture with Course Description

BBA

COURSE CODE	Course	L	T	P	C	Description
SEMESTER I						
CS 101	Introduction to Computing & Information Systems	2	0	0	2	This course will provide an overview of the fundamental concepts of information systems, and the need for and role of information systems in business organizations. In particular, the course will deal with basic hardware concepts, the architecture of computers, the software hierarchy--from systems software to application programs, networks and applications. This course is to introduce the students with the basic issues related to information systems, its role in organization, support for decision-making and how information technology can be leveraged to provide business value.
POQ 531	Business Statistics - I	3	0	0	3	Statistics is the branch of mathematics which has wide variety of applications in almost every field. It also lays a foundation to other applied courses like Reliability, Quality control, Stochastic process, Data analysis and Data mining etc. The course aim is to provide the basic quantitative and analytical tools necessary for decision making to develop students' diagnostic and analytical skills through suitable logical problems. This will develop the statistical thinking among the students which are used widely for decision making. Students will also learn to apply inference to simple problems. The course also aims to develop their ability to analyze, measure and judge quantities and to provide a probabilistic base for all functional areas of management. Also, it will extend the conceptual knowledge to infer noteworthy results/findings. The focus is on statistical analysis using R software.
ECON 111	Business Economics-I	3	0	0	3	The goal of this course is to equip the student with the methodology of decision making using the concepts of microeconomics. Starting out with an exposition of the theory of decision making by households and firms, the participants will learn to comprehend the working of the markets, the determination of prices and the techniques of decision making that the players in the market can adopt to ensure that sound decisions are made. This course is designed to acquaint the student with the theoretical underpinnings of decision making in alternative market conditions, after considering the preferences of the consumer.



ACC 101	Business and Management Accounting -I	3	1	0	4	This course is as an introductory course on recording, understanding and analysing accounting information to be analysed for performance evaluation and decision making. This course will begin with an introduction to the financial transactions, types of books of Accounts, recording of transactions in books of accounts, framework for financial statement analysis and financial statements preparation (statement of financial position, statement of financial performance and comprehensive income, statement of cash flow etc.). Students will learn the key accounting concepts and policies that determine the figures presented in financial statements. Students will also be introduced to basic financial analysis techniques. They will learn how to prepare and analyse the financial statements of different entities.
TA 102	Communication Skills	3	0	0	3	Communication plays a crucial role in the management of an organization. Without proper communication, no organization can function properly. No matter which medium one communicates in, speaking and listening both should take place. This course aims to hone the communication and professional skills of the young graduates making them ready for professional environment. The course has been designed to have an appropriate blend of theory and practical sessions so that the students gain a sound knowledge of communication theoretical skills and understand ways of applying these skills in future.
MGT 111	Contemporary Business Issues	2	0	0	2	This course will provide an overview of the world of business, in particular at the various types of organizations in terms of their constitution and ownership. The course will also cover the legal and regulatory environment in which organizations work and the impact of the government on business. The course will also discuss the general organisation theory, the fundamental principles of management and the behaviour of groups and individuals within organizational context.
MGT 121	Office Productivity Tools	2	1	0	3	Business productivity depends on how well you and your team are trained on the tools used on a daily basis, tools that are constantly being updated. This course will take students through a comprehensive understanding of the most popular word processing, presentation and collaborative tools in the market. The course will help in developing the ability of the students to use technology to generate better reports, make professional presentations and work

collaboratively through digital platforms.

SEMESTER II

MAT 202	Business Statistics II	3	0	0	3	Statistics is the branch of mathematics which has wide variety of applications in almost every field. It also lays a foundation to other applied courses like Optimization techniques, Reliability, Quality control, Stochastic process, Data analysis and Data mining etc. The course aims to provide the basic quantitative and analytical tools necessary for decision-making and to develop students' diagnostic and analytical skills through suitable logical problems. The course also aims to develop their ability to analyses, measure and judge quantities and to provide a probabilistic base for all functional areas of management. The focus is on statistical tools.
ECON 112	Business Economics II	3	0	0	3	This course exposes students to an overview of an exchange based economy and draws out the relationship between crucial macroeconomic variables like the level of income, employment, prices, investment, money supply, trade and foreign exchange etc. The design of government policy measures in regulating the economy will be discussed. Specific problems like inflation, growth and the control of business cycles will be addressed with respect to the Indian Economy. The purpose is to provide the student with a fundamental knowledge of the macro economy on the basis of which, policy decisions can be analysed and business can be made.
TA 122	Business Report Writing	2	1	0	3	The course aims to impart necessary skills for writing an effective business report. The course builds on the students' application of critical thought and its written articulation in a structured manner. The focus is on providing the necessary tools needed to demonstrate excellent written communication skills that assist unbiased decision-making. Students will be able to write researched argumentative tracts that take an objective, prompt and decisive stand in various contexts. This course will provide exposure to critical outlook as well as writing and will assist the participants in acquiring the same.

HRM 232	Organisational Behaviour	3	0	0	3	The course will provide an analytical perspective on the behaviour of individuals and groups inside organizations, and the relationship between important organizational characteristics such as structure and design and managerial behaviour. Students will be able to understand and appreciate individual, interpersonal, and group processes for increased effectiveness both within and outside of organizations, and the nature, functioning and design of organization as social collectivities. Students will also learn the key concepts and behavioural practices of Human Resources in organizations.
ACC 102	Business and Management Accounting -II	3	0	0	3	Accounting knowledge is very essential for managing the business. It provides tools and methodology for recording, summarising, analysing and planning on the basis of accounting information and transactions. Business enterprises prepare and use Financial Statements, Marginal Costing and CVP Analysis, Ratio Analysis, Budget and Budgetary Control, Inventory Management etc. for analysing profitability, business trends, cost control and decision making. All these information are used by the stakeholders of the companies. This course intended to impart knowledge of Financial Statements, Financial Statement Analysis, Generally Accepted Accounting Principles, Annual Reports and Accounting for Partnership in detail. The course will also help acquaint the students with cost and management accounting mechanics, process and system, with an emphasis on how to use accounting information for decision making, performance evaluation and control. This course will also provide detail knowledge of Cost Sheet, Marginal Costing and CVP Analysis, Ratio Analysis, Budget and Budgetary Control, Inventory Management. At the completion of course students will be able to apply their Accounting knowledge and skills to prepare and analyse Financial statements and able to use the Management Accounting concepts for decision making, performance evaluation and control.
FIN 112	Financial Management I	3	0	0	3	This course aims at familiarizing the students with the financial environment of business, especially the financial markets, Inculcating knowledge about the decisions and decision variables involved in building the liability side of balance sheet of the firm, Developing the analytical skills by associating the tools and techniques with the situation, Developing skills for interpretation of business information and

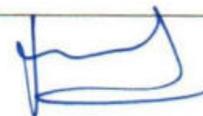
						application of financial theory in financing related decisions.
MGT 122	Business Environment	3	0	0	3	The course aims at imparting knowledge about the various social, political, legal, economic and technological factors which influence the business environment. The course systematically explores the external environment in which businesses operate – legal & regulatory, macroeconomic, cultural, political, technological and natural. Additionally, the course will examine the critical opportunities and threats that arise from an analysis of external business conditions. Students will apply scenario planning to a selected industry and synthesize trends in the external environment in the presence of risk and uncertainty.
SEMESTER III						
BA 201	Advanced Excel	2	1	0	3	The Advanced Excel Course will cover the advanced formulas, functions, charts, etc. It will also cover in-depth knowledge of pivot tables, charts, audit and analyze worksheet data, designing Dashboards, VBA Macro, utilize data tools and create and manage macros. This course will help students to learn more advanced skills for data analysis of business problem for better decision making.
SST 602	Selling Skills & Techniques	3	1	0	4	This course focuses on the selling skills development of students and examines the elements of an effective sales process. The course will extend students' understanding of Sales process and its potential impact on achieving its overarching goal of increased sales and revenues. The various modules of the course prepare students for sales situations and develop their ability to recognize sales opportunities even when they are diverse functional areas. Students will gain skills in analyzing the dynamics of a typical sales organization, identifying appropriate methods for approaching sales situations, designing and implementing sales methods and processes. The course is primarily an interactive discussion including exercises, games, cases, and multiple opportunities to apply the sales concepts that will get discussed. A critical element of the course is group (pairs) project simulating a typical, complex sales management situation; the project includes a written paper with a presentation to the class. The course is focused

						on professional, business-to-business (B2B) sales situations and business to consumer management of sales situations. The faculty will draw on their own experience as a sales professional in business to consumers (B2C) as a basis for developing perspectives, insights, and understanding of B2B and B2C sales themes.
MKT 511	Marketing Management	3	0	0	3	This course will help develop a comprehensive view of different marketing decisions, i.e., product and brand, pricing, promotions and distribution (placing) and how they are interlinked as well as the role they play in the overall organizational context. The course will provide analytical insights into the step-by-step processes involved in the development of marketing plan, ensuring the successful future positioning and launch of new products/services in the market place, and how marketing decisions need to be continuously adapted to changes in the micro and macro environments that businesses operate in.
MGT 101	Business Organisations and Management	3	0	0	3	This course will provide an overview of the world of business, in particular at the various types of organizations in terms of their constitution and ownership. The course will also cover the legal and regulatory environment in which organizations work and the impact of the government on business. The course will also discuss the general organisation theory, the fundamental principles of management and the behaviour of groups and individuals within organizational context.
FIN 201	Financial Management II	3	0	0	3	This course aims at familiarizing the students with the financial environment of business, Inculcating knowledge about the decisions and decision variables involved in building the liability side of balance sheet of the firm, Developing the analytical skills by associating the tools and techniques with the situation, Developing skills for interpretation of business information and application of financial theory in financing related decisions.

TA 112	Communication Proficiency & Professional Skills I	3	0	0	3	This course covers the finer aspects of communication whereby practical or applied aspects of Interpersonal Communication, Soft Skills and Etiquette, and Business Writing are emphasized. The course intends to emphasize on enhancing the personal skills to communicate effectively and cordially. It is an attempt to weave seamlessly academics with the industry requirements.
HRM 301	Human Management Resource	3	0	0	3	The objective of the course is to equip students with knowledge, skill and competencies to manage people along with capital, material, information and knowledge asset in the organization. The course has been designed keeping in mind not the specifically the need of HR Managers but all Managers- Fundamental assumption being that all Managers Finance, Market, approaching are accountable to their organization in terms of impact of their HRM practices and systems. The effectiveness of human resource management in organization depends largely on individual perception, assumption and belief about people. The course will provide students logic and rationale to make fundamental choice about their own assumption and belief in dealing with people.
SEMESTER IV						
NU 222	Industry Practice I	0	0	20	10	To be updated
MGT 232	Business ethics and values in Management	3	0	0	3	This course will enable students to introspect on the important ethical implications of the day-to-day happenings and practices of industry and business. The aim of the course is to stimulate discussion and debate using available theoretical frameworks. The course will sensitise students to the ethical dilemmas and fundamental human values in improving managerial effectiveness. Using real life situations, the course will try to identify the variables in ethically complex business situations through an understanding of the more subtle criteria for making sound decisions. Topics to be covered include Introduction to the concepts in Business Ethics and Human Values, Ethical theories; Moral Development; Managing ethics - Individual and situational influences; Making decisions in business ethics: Situational influences; Group Ethics; Ethical Dilemmas in Management; Ethics in Information Technology and Systems Usage; Employees and business ethics;, Corporate Ethics and Company Philosophies, Economic Justice and Business Ethics, Distributive Justice and India, Global Social Issues-- Environmental Ethics Ethical

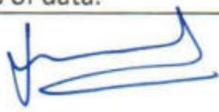
						Attitudes of Indian Managers; Law of karma; Whistle Blowing; Sci-Tech, Law, HRM and Ethics; Corporate Social Responsibility: Applications; Ethics and Corporate Governance, Human values and managerial effectiveness.
MGT 252	Business Laws & Corporate Governance	3	0	0	3	This course familiarises the students with the legal environment in which business operates in India and internationally. The course will provide practical legal knowledge of general business law issues including a basic understanding of how the politico-legal processes and legal infrastructure (contracts, intellectual property, anti-trust, anti-profiteering, bankruptcy etc.) affect business strategy and decision making. The course also discusses the technology and intellectual property dimensions in a global perspective (including patent, copyright, and trademark law) as well as laws relating to trade secrets, unfair competition, and consumer protection. Though the conceptual focus will be on Indian legal system, a conscious effort will be made to familiarise students with the challenges posed by diverse international legal regimes.
SEMESTER V						
MGT 341	Research Methods	3	0	0	3	This course will provide an overview of research methods that are usually employed in management research. The course will introduce the learner to the philosophy, basic concepts and techniques (both qualitative and quantitative) that form the core of management research. The course will delve into theory building, scientific method, research design, framing of research question, research alternatives, sampling, concepts of measurement, development of attitude scales, and their analysis and interpretation, basics of multivariate analysis and statistical inference. Overall, the course will help the learner develop a strong conceptual foundation for the research process. This course is intended to be an introductory gateway to research that the

						learner will conduct during their future research and dissertation work in Marketing, Finance, Organizational Behavior, HRM, Strategy, Systems, Operations and other areas of management. The course comprises several readings from books and journal as well as several research activities during which learners will be required to design empirical study, collect data and test the hypotheses with extensive use of statistical software.
DS 504	Capstone Project	3	0	0	3	There will be a single project based on all the terms, in which students learnt how to apply concepts, techniques and tools of business analytics and data science to identify a business problem, formulate the problem statement, understand the variables and the constraints, select the most appropriate analytical approach and tools & techniques, collect, collate, clean and analyze data, derive correct insights and reach an optimum solution. This course deals with real-life application of advanced analytics topics of statistics.
	Professional Elective I*	3	0	0	3	
	Professional Elective II*	4	0	0	4	
	Professional Elective III*	4	0	0	4	
	Professional Elective IV*	4	0	0	4	
	Professional Elective V*	3	0	0	3	
SEMESTER VI						
NU 332	Industry Practice II	0	0	32	14	
Professional/Open Electives						
COURSE CODE	COURSE NAME	L	T	P	C	Description
BA 302	Spreadsheet Modeling & Decision Analysis	3	0	0	3	Spreadsheet is one of the most powerful data analysis tools that exists. Major corporations and small businesses alike use spreadsheet models to determine where key measures of their success are now, and where they are likely to be in the future. This course is designed to give students introduction to spreadsheet tools and formulas so that students can harness the power of spreadsheets to map the data students have now and to predict the where the data can be in the future.



BA 401	Information Security and Risk Management	3	0	0	3	<p>This course on Information Security and Risk Management deals with the basics of security models, algorithms, protocols, and security mechanisms in computer networks and mobile networks as well as programs and database systems. The focus is on understanding the role of Information Security systems in organizations in general. The course focuses on ensuring that students would be able to play an active role in ensuring security in enterprise systems. Classroom instruction and discussion will closely integrate technical principles with real world applications such as secure e-banking, secure corporate networking, a secure messaging environment and multimedia system security. In addition, case studies will be used to demonstrate that security and trust are not only for protection of information assets, but also means of improving business operation or even starting new businesses. We also discuss security best practices in industry.</p>
BA 411	Machine Learning	3	0	0	3	<p>The course aims to provide a rigorous concepts underlying machine learning, like, what is learning? How can a machine learn? How do we quantify the resources needed to learn a given concept? Is learning always possible? Can we know whether the learning process succeeded or failed? The course also presents several key machine learning algorithms. Specific attention to algorithms appropriate for large scale learning is also covered, with the applications where data is plentiful and computation time becomes the bottleneck. Validations are taken with accuracy and computation time.</p>
BA 504	Financial Analytics	4	0	0	4	<p>This course delves into the area of financial analytics. This course provides a framework to understand and apply various tools and techniques required to answer some crucial real world financial questions. It develops an understanding how to use financial indicators, benchmarks and ratios to detect and prevent a possible fraud in various financial statements. This course also deals with the assessment of credit risk using Python as a tool. This course enables the candidate to appreciate the use of analytics in Banking/Retail/Finance to provide a meaningful business solution.</p>
BA 512	Data Visualization	3	0	0	3	<p>This course will help students understand how data is visualized. This course will also help students acquire the expertise and the tools needed for presenting data-based evidence with impact, across images, graphics, and visualizations of big data and for conveying their ideas in ways that are convincing and catchy.</p>

BA 522	Predictive Analytics	3	0	0	3	This course covers the key concepts used for extracting stored data elements, understand what they imply, and transform their formats and derive new relationships among them to produce a dataset suitable for analytical modelling. The course aims to help students produce a fully processed data set compatible for building powerful predictive models that can be deployed to increase productivity and profitability. Students will also be able to use forecasting models for predicting future values of variables (such as future sales from past data) etc.
BA 532	Programming for Analytics II	3	0	0	3	The course will begin with an introductory course in Python and R and go on to cover the principles of programming and software development for analytics that is reliable and accurate, integrates multiple technologies, scales and performs well, and adapts to changing requirements. The course will mainly deal with typical idioms and design patterns, designing for scalability and change, testing, and performance tuning.
BNK 302	Banking Products & Operations	3	0	0	3	The course in Banking Products and Operations, aim at acquainting students with operational aspects of banking, their rationale and the subtle interrelations between practice and theory of banking as well as Banking products. The student will get an opportunity to know various products & services offered by them to offer & explain the same to its customers.
CS 3102	Dimensional and NoSQL Databases	2	0	4	4	This course aims at furthering database systems concepts through adding complexity and a more hands-on approach. This course is study of data warehousing system and basics of non-relational data models. The goal of the course is to familiarize the students with basics of non-relational database systems.
CS 524	Deep Learning and Neural Networks	3	0	0	3	This course introduces the field of deep learning and neural networks. It covers basic theory, recent developments, tools for implementation and selected applications. The course emphasizes various techniques, which have become feasible with increased computational power and our ability to produce and capture huge volumes of data.


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DS 302	Data Science Using R	3	0	0	3	<p>The field commonly known as Data Science lies at the intersection of mathematics, computer science, and domain expertise. Within the data science (DS) world, there are a multitude of areas of study, and exploration. This course will introduce the basics of R programming. Students will learn the R skills needed to answer essential questions and perform basic exploratory analysis. The course will cover R functions and data types, then tackle how to operate on data frames and when to use data sub-setting techniques. Students will learn how to apply general data sub-setting features like select and filter, and how to wrangle, analyze and visualize data. The course aim is to make the students conversant with the concept of Data Science and techniques to be used for data analytics including the construction of different statistical Models used for Data Analytics. The course is an in-depth coverage on various Statistical Techniques and goodness of fit tests used for data analytics. The module is practical oriented. For Analysis R software is used. The students will continuously practice their newly acquired skills through R Studio.</p>
DS 412	Inferential Statistics for Data Science	2	0	4	4	<p>Basic principles for statistical inference with practical applications of data. Includes point estimation, confidence intervals, hypothesis testing, ANOVA and simple linear regression. Includes use of statistical R software.</p>
FIN 302	Introduction to Banking & Financial Services Industry	3	0	0	3	<p>Unit 1. Introduction to Banking System and Financial Services Industry which consists of financial markets, financial intermediation and financial instruments or financial products. Unit 2. Working of commercial banks, co-operative banks, regional rural banks (RRBs), all-India financial institutions (AIFIs), non-banking financial companies (NBFCs) and microfinance institutions. Unit 3. Introduction to the banking sector which forms the bedrock of the Indian financial system, and the regulatory role and functions of the Reserve Bank of India (under the provisions of the Banking Regulation Act, 1949 and the Reserve Bank of India Act, 1934). Unit 4. The financial markets in India to be covered in brief will include the money market, the Government securities market, the foreign exchange market, the capital Market and the credit market, derivative markets the major players as well as the regulatory bodies. Unit 5: Financial Services such as Venture Capital Financing, Factoring and Forfaiting, Merchant Banking, Mutual Funds, Small Savings, Provident Fund & Pension Fund, Mutual Funds, Insurance</p>

						and other financial Services.
FIN 401	Designing Financial Products	3	0	0	3	The course deals with the aspects of Financial Engineering. The course contains details of instruments, markets, and financial market practices. The pricing issues are also dealt with, focus is more on engineering dimensions. The objective of the course is how existing markets and market practices have changed and outline new financial engineering trends and products.
FIN 411	Introduction to Blockchain Technology	3	0	0	3	After great financial crisis of 2008, the basic market structure of banking and business system was challenged. The business enterprises used emerging technologies to create value around existing monolith enterprise and industry structure. Satoshi Nakamoto a pseudo name who was brainchild behind the block chain technology, gained prominence with invention of bitcoin the digital currency built on block chain frameworks. The block chain technology grew with adaptation by various industry verticals including banking and finance. DEFI, DLT , Bitcoin , payments and lending , trade finance , Insurance and clearing and settlement are some important sub areas which are getting disrupted.
HRM 302	Organization Development and Change Management	3	0	0	3	This course will enable students to introspect on the important change implications of the day-to-day happenings and practices of industry and business. The aim of the course is to stimulate discussion and debate using available theoretical frameworks. This course equips students with the development and maintenance of changes and its impact on people and organisation. The course aims to educate students in the problems and with sufficient role of compliance along with discretionary organizational requirements in the matter. In addition to learning concepts, approaches, techniques and terms, students will examine the underlying reasons and forces shaping changes in, plans and policy.

MGT 441	Capstone Project II	2	0	0	2	There will be a single project based on all the terms, in which students learnt how to apply concepts, techniques and tools of business analytics and data science to identify a business problem, formulate the problem statement, understand the variables and the constraints, select the most appropriate analytical approach and tools & techniques, collect, collate, clean and analyze data, derive correct insights and reach an optimum solution. This course deals with real-life application of advanced analytics topics of statistics.
MKT 302	Introduction to Digital marketing	3	0	0	3	Today, companies must connect with customers and other businesses through digital channels and adjust their marketing mix to succeed. Research indicates that digital marketing budgets are increasing dramatically, and digital media campaigns are becoming a pivotal part of effective marketing plans. The increasing prevalence of the internet and the improving skills of marketers in using this new medium have made the internet everywhere in the lives of both consumers and business. The course familiarize students with an understanding of how the digital media works and develop the critical insights necessary to succeed in e-commerce and digital media marketing. This course will also help students to explore the digital marketing landscape and equip them with necessary skills to effectively use various digital technologies & platforms.
MKT 312	Social Media Marketing	3	0	0	3	Social media technologies are continuously transforming the ways consumers interact with each other and firms. These changes constitute a fundamental shift in the marketplace--consumers have greater opportunities to voice their opinions and connect with other consumers as well as an increased influence over marketers and brands. As a result, the conventional approaches to marketing communications have become more and more challenged. This puts an added emphasis on leveraging social media to engage consumers and propagate ideas, messages, products, and behaviors. This course covers an introduction to the field of social media marketing with a detailed study of the marketing concepts, customer engagement practices, analytics, and other technologies associated with marketing to customers using social media. Students will generate knowledge through online readings, asynchronous discussions with students and their faculty, interactions with online tutorials, and online and hands-on simulations.

MKT 321	Marketing Research	3	0	0	3	This course will provide an overview of research methods used in marketing. The course will introduce the learner to the basic concepts and techniques (both qualitative and quantitative) that form the core of marketing research. The course will delve into theory building, scientific method, research design, framing of research questions, sampling, concepts of measurement, development of attitude scales, and their analysis and interpretation, basics of multivariate analysis and statistical inference. The course will help the learner develop a strong conceptual foundation for marketing research.
MKT 322	Introduction to Digital & Social Media Marketing	3	0	0	3	Today, companies must connect with customers and other businesses through digital channels and adjust their marketing mix to succeed. Research indicates that marketing budget for digital marketing & social media marketing are increasing dramatically. These digital & social media marketing campaigns are becoming a pivotal part of effective marketing plans. The course familiarize students with an understanding of how the digital marketing works and develop the critical insights necessary to succeed in digital & social media marketing. This course explores the digital & social media marketing landscape and equip them with necessary skills to effectively use various digital marketing technologies & social media platforms. Students will acquire knowledge and skills through online readings, asynchronous discussions with other students and their faculty, interactions with online tutorials, and online and hands-on simulations.
MKT 401	Services Marketing	3	0	0	3	This course is meant to prepare students pursuing marketing careers in the services industries and would also be valuable to nonmarketing students desiring to grasp the main ideas of services marketing and how they may be used to create competitive advantage for firms. The course strengthens students ability to utilize marketing techniques to generate, promote, and deliver client value in the service economy by improving their grasp of diverse areas of services marketing. The textbook will be utilized to comprehend the fundamental concepts, and hands on exercises, case studies, and conversations will be used to provide experiential learning. Case studies from diverse sectors will be used to demonstrate concepts.



MKT 411	Consumer Behaviour for Digital Marketers	3	0	0	3	<p>Understanding the consumer behaviour is critical for digital age marketers to design and implement better marketing strategies for products services & ideas. This course borrows perspective from various fields such as psychology, sociology, anthropology, and economics. This has given rise to the need for a sophisticated marketing professional with a strong grasp on consumer behaviour issues. This course aims to develop critical understandings of consumer behaviour that will hold relevance both inside and outside the domain of marketing practice. It focuses upon understanding consumer decision-making processes and the various factors that influence these processes. This course discusses the basic consumer behaviour frameworks, theories, tools, and procedures. Students will learn to apply psychological, social, and cultural concepts to marketing decision making. The course broadly covers five aspects – the inner workings in the mind of a consumer that deals with consumer psychology and learning; the different situational factors that influence the consumer decision; the process by which a consumer makes a decision; the aggregate aftermath of consumer decisions; and finally, the key issues surrounding ethics and social responsibility. Student will also learn about ethical and social responsibility factors as they think through their marketing strategy.</p>
MKT 602	Product & Brand Management	3	0	0	3	<p>The course aims to create an understanding of the relationship between Corporate Strategy on the one hand and the decisions that managers take regarding products and brands. The course will deal with different areas of product management such as product-line decisions, product platform and product life cycle. The course will also cover new product development process, the organizational structures for new product development and product management functions within an organization. The course will help students develop an understanding of the various issues related to Brand Management such as brand associations, brand identity, brand architecture, leveraging brand assets, brand portfolio management etc. The course will develop in students the capability to deal with the strategies and tactics involved in building, leveraging and defending strong brands.</p>

MKT 611	Integrated Marketing Communication	3	0	0	3	<p>This course is designed to equip students with the competency of decision making in matters concerned with consumer/customer communications. This course breaks down the traditional advertising, public relations, and marketing silos by challenging practitioners to apply the optimum mix of media and message to motivate the target audience to act. The rise of the internet and Digital Marketing support the need to embrace integrated marketing communication as a comprehensive approach to reach target audiences. In this course, students will learn to use appropriate messages and communication channels based upon the demographics of target audiences, commensurate with the actual needs and business realities of marketing campaigns. Students will also learn and practice message and touch point integration with special attention to effectiveness and measurable results. The course will use a mix of pedagogical tools like projects, assignments/ exercises and case studies.</p>
MKT 623	Marketing Analytics	3	0	0	3	<p>This course will deal with data analytics techniques including prescriptive analytics and large-scale testing in solving key marketing problems in customer acquisition, development, and retention, and in providing a cohesive framework for studying consumer behavior. This course will discuss how analytics is being used not just about purchase decisions, but also about individual consumers pre- and post-purchase behavior. The course will also delve into the issue of how the expansion of retail stores, factory stores, and the Internet changed customer behavior. The focus will be on applying analytics to large consumer-level database and in learning how to target consumers individually and deriving customer insights.</p>
RSK 601	Security Analysis & Portfolio Management	3	0	0	3	<p>This course is designed to teach the fundamentals of investments along with the analysis and strategies as an investor. The course familiarizes the students to understand how financial markets work and how securities are traded. The course discusses the risk return tradeoff of an individual investor, it also persists how investment in securities market is evaluated based on Fundamental and Technical analysis. It also discusses application of Modern Portfolio Theory, analysis of active and passive investment strategies, and measurement of portfolio performance.</p>

TA 211	Leadership & Team Building Skills	3	0	0	3	<p>This course focuses on business and management while providing an intellectual and experiential forum for developing the Leadership skills and Team building activities. This course provides students with the social science tools needed to solve organizational problems and influence the actions of individuals, groups and organizations. Here to prepare managers to understand how to best organize and motivate the human capital of the firm, manage social networks and alliances, and execute strategic change. In addition, to explore the challenge of personally managing the inevitable stresses and dangers of leadership.</p>
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Programme Architecture

Postgraduate Programme



Programme Architecture iMBA

CODE	Course	L	T	P	C	Description
SEMESTER I						
BA 101	Fundamentals of Business Analysis Techniques	3	0	0	3	This course has been designed such that students understand the extensive use of Microsoft Excel in handling data towards business analysis. In this course they are analysed for trends, patterns, relationships and other useful information, then they can give meaningful business insights. All managers need to analyse data and make quantitative and logic-based decisions in their job through models, graphs and use of simple functions. This course offers students to learn the different tools available within Microsoft Excel and a basic understanding of how and why they need to use them. This course will also include students to write functions and applying optimization techniques to solve problems. It will help them in generating insights via modelling in a wide range of realistic situations. The overall course will be requiring students to bring in laptop in class and will be Microsoft Excel based.
CS 101	Introduction to Computing & Information Systems	2	0	0	2	This course will provide an overview of the fundamental concepts of information systems, and the need for and role of information systems in business organizations. In particular, the course will deal with basic hardware concepts, the architecture of computers, the software hierarchy--from systems software to application programs, networks and applications. This course is to introduce the students with the basic issues related to information systems, its role in organization, support for decision-making and how information technology can be leveraged to provide business value.
ACC 101	Business and Management Accounting -I	3	1	0	4	This course is as an introductory course on recording, understanding and analysing accounting information to be analysed for performance evaluation and decision making. This course will begin with an introduction to the financial transactions, types of books of Accounts, recording of transactions in books of accounts, framework for financial statement analysis and financial statements preparation (statement of financial position, statement of financial performance and comprehensive income, statement of cash flow etc.). Students will learn the key accounting concepts and policies that determine the figures presented in financial statements. Students will also be

						introduced to basic financial analysis techniques. They will learn how to prepare and analyze the financial statements of different entities. This course is intended to provide knowledge of how to read and analyze Audit Reports and Annual Reports of the companies. Students will also acquire the knowledge of Accounting Standards and relevance of corporate governance in the company. The course will emphasize on the above-mentioned concepts and their managerial implications. Students will be introduced to financial analysis techniques which will be helpful for decision making and performance evaluation.
MAT 121	Business Statistics	3	0	0	3	Statistics is the branch of mathematics which has wide variety of applications in almost every field. It also lays a foundation to management studies. The course aims to provide the basic quantitative and analytical tools necessary for decision-making and to develop students' diagnostic and analytical skills through suitable logical problems. The course also aims to develop their ability to analyses, measure and judge quantities and to provide a probabilistic base for all functional areas of management. The focus is on understanding the relevant statistical technique applicable to a given situation and use of software like Excel to arrive at solutions and interpret the same.
ECON 111	Business Economics-I	3	0	0	3	The goal of this course is to equip the student with the methodology of decision making using the concepts of microeconomics. Starting out with an exposition of the theory of decision making by households and firms, the participants will learn to comprehend the working of the markets, the determination of prices and the techniques of decision making that the players in the market can adopt to ensure that sound decisions are made. This course is designed to acquaint the student with the theoretical underpinnings of decision making in alternative market conditions, after considering the preferences of the consumers.
TA 102	Communication Skills	3	0	0	3	Communication plays a crucial role in the management of an organization. Without proper communication, no organization can function properly. No matter which medium one communicates in, speaking and listening both should take place. This course aims to hone the communication and professional skills of the young graduates making them ready for professional environment. The course has been designed to have an appropriate blend of theory and practical sessions so that the students gain a

						sound knowledge of communication theoretical skills and understand ways of applying these skills in future.
HSS 121	Basics of Social Sciences	3	0	0	3	This course will provide an overview of the basics of Social Science. The purpose of this course is to aware students about basics of Psychology, Indian public administration and economic development taken place in India after independence. The course is divided in three Module. First Module is on introduction of Psychology wherein students will learn basis of psychology and its various theories. The second Module will be on Indian Public Administration where the topic will include initiation of administrative system, Indian Administration structure and various reforms introduced in it. The third module will deal with historical development of Indian economy and institution and legal fame work this development.
MGT 111	Contemporary Bussiness Issues	2	0	0	2	This course will provide an overview of the world of business, in particular at the various types of organizations in terms of their constitution and ownership. The course will also cover the legal and regulatory environment in which organizations work and the impact of the government on business. The course will also discuss the general organisation theory, the fundamental principles of management and the behaviour of groups and individuals within organizational context.
SEMESTER II						
MGT 101	Business Organisations and Management	2	0	0	2	This course will provide an overview of the world of business, in particular at the various types of organizations in terms of their constitution and ownership. The course will also cover the legal and regulatory environment in which organizations work and the impact of the government on business. The course will also discuss the general organisation theory, the fundamental principles of management and the behaviour of groups and individuals within organizational context.
ACC 102	Business and Management Accounting -II	3	0	0	3	This course intends to impart knowledge of Financial Statements, Financial Statement Analysis, Generally Accepted Accounting Principles, and Annual Reports. The course will help acquaint the students with cost and management accounting mechanics, processes, and system, with an emphasis on how to use accounting information for decision making,

						performance evaluation and control. This course will also provide detail knowledge of Cost Sheet, Marginal Costing and CVP Analysis, Ratio Analysis, Budget, Budgetary Control, and Inventory Management.
FIN 112	Financial Management I	3	0	0	3	This course aims at familiarizing the students with the financial environment of business, especially the financial markets, Inculcating knowledge about the decisions and decision variables involved in building the liability side of balance sheet of the firm, Developing the analytical skills by associating the tools and techniques with the situation, Developing skills for interpretation of business information and application of financial theory in financing related decisions.
MGT 122	Business Environment	3	0	0	3	The course aims at imparting knowledge about the various social, political, legal, economic and technological factors which influence the business environment. The course systematically explores the external environment in which businesses operate – legal & regulatory, macroeconomic, cultural, political, technological and natural. Additionally, the course will examine the critical opportunities and threats that arise from an analysis of external business conditions. Students will apply scenario planning to a selected industry and synthesize trends in the external environment in the presence of risk and uncertainty.
TA 122	Business Report Writing	2	1	0	3	The course aims to impart necessary skills for writing an effective business report. The course builds on the students' application of critical thought and its written articulation in a structured manner. The focus is on providing the necessary tools needed to demonstrate excellent written communication skills that assist unbiased decision-making. Students will be able to write researched argumentative tracts that take an objective, prompt and decisive stand in various contexts. This course will provide exposure to critical outlook as well as writing and will assist the participants in acquiring the same.
MAT 202	Business Statistics II	3	0	0	3	Statistics is the branch of mathematics which has wide variety of applications in almost every field. It also lays a foundation to other applied courses like Optimization techniques, Reliability, Quality control, Stochastic process, Data analysis and Data mining etc. The course aims to provide the basic quantitative and analytical tools necessary for decision-making and to develop students

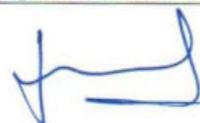
						diagnostic and analytical skills through suitable logical problems. The course also aims to develop their ability to analyses, measure and judge quantities and to provide a probabilistic base for all functional areas of management. The focus is on statistical tools.
ECON 112	Business Economics II	3	0	0	3	This course exposes students to an overview of an exchange based economy and draws out the relationship between crucial macroeconomic variables like the level of income, employment, prices, investment, money supply, trade and foreign exchange etc. The design of government policy measures in regulating the economy will be discussed. Specific problems like inflation, growth and the control of business cycles will be addressed with respect to the Indian Economy. The purpose is to provide the student with a fundamental knowledge of the macro economy on the basis of which, policy decisions can be analysed and business can be made.
TA 112	Communication Proficiency & Professional Skills I	2	0	0	2	This course covers the finer aspects of communication whereby practical or applied aspects of Interpersonal Communication, Soft Skills and Etiquette, and Business Writing are emphasized. The course intends to emphasize on enhancing the personal skills to communicate effectively and cordially. It is an attempt to weave seamlessly academics with the industry requirements.
SEMESTER III						
HRM 301	Human Resource Management	3	0	0	3	The objective of the course is to equip students with knowledge, skill and competencies to manage people along with capital, material, information and knowledge asset in the organization. The course has been designed keeping in mind not the specifically the need of HR Managers but all Managers- Fundamental assumption being that all Managers Finance, Market, approaching are accountable to their organization in terms of impact of their HRM practices and systems. The effectiveness of human resource management in organization depends largely on individual perception, assumption and belief about people. The course will provide students logic and rationale to make fundamental choice about their own assumption and belief in dealing with people.

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MGT 251	Entrepreneurship & Startup Ecosystems in India	3	1	0	4	The Business Environment in India has undergone a paradigm shift since the adoption of LPG. Indian Inc. catapulted itself to the role of 'Change Agent'. It is catalyst of a Knowledge-driven Market-centric economy. Competition breeds Innovation. Our economic policies encourage First generation Entrepreneurs – be it Micro, Small, Medium besides traditional Large Enterprises. The traditional form of business models like Family-run businesses are also success flag-post ventures in highly competitive global market ecosystem. Yet, there is a Knowledge-Divide. Our traditional theory based concepts are not effectively motivating young students to commercially exploit their Knowledge resource. This course will fill the void by sensitizing the students of the churning of business environment. The course will imbibe the attitudes of Entrepreneurship in budding students and hone their skill sets to Establish, Expand or Diversify and also explore merging concepts of growth of their own business.
MKT 202	Marketing Management I	3	0	0	3	This course will help develop a comprehensive view of different marketing decisions, i.e., product and brand, pricing, promotions and distribution (placing) and how they are interlinked as well as the role they play in the overall organizational context. The course will provide analytical insights into the step-by-step processes involved in the development of marketing plan, ensuring the successful future positioning and launch of new products/services in the market place, and how marketing decisions need to be continuously adapted to changes in the micro and macro environments that businesses operate in.
FIN 201	Financial Management II	3	0	0	3	This course aims at familiarizing the students with the financial environment of business, Inculcating knowledge about the decisions and decision variables involved in building the liability side of balance sheet of the firm, Developing the analytical skills by associating the tools and techniques with the situation, Developing skills for interpretation of business information and application of financial theory in financing related decisions.
TA 201	Communication Proficiency & Professional Skills II	2	0	0	2	This course intends to review students' proficiency in communicating in English and recapitulates Listening, Speaking, Reading and Writing (LSRW) and various aspects of Interpersonal Communication, Soft Skills and Etiquette, etc. Moreover, the course will attempt to integrate core language skills with comprehension of various subjects, and

						prerequisites of higher studies and the industry profiles. Hence, the students need to: * Read on various topics and discuss in the classroom * Participate in the application-based activities or assignments Participate in effective conversation
CS 281	Introduction to Data Structure	3	0	0	3	This course aims at providing a solid foundation for design, analysis and implementation of robust and reusable automation framework. The course will discuss how to select and design data structures and concepts of queue, list, searching and sorting that are appropriate for problems that are encountered in business situations or for analysis.
TA 231	Data Analysis and Spreadsheet Modeling	2	1	0	3	This course deals with spreadsheets using excel. Major corporations and small businesses alike use spreadsheet models to determine where key measures of their success are now, and where they are likely to be in the future. But in order to get the most out of a spreadsheet. This course is designed to give an introduction to basic spreadsheet tools and formulas so that students can begin harness the power of spreadsheets to map the data and to predict the data.
SEMESTER IV						
HRM 232	Organisational Behaviour	3	0	0	3	The course will provide an analytical perspective on the behaviour of individuals and groups inside organizations, and the relationship between important organizational characteristics such as structure and design and managerial behaviour. Students will be able to understand and appreciate individual, interpersonal, and group processes for increased effectiveness both within and outside of organizations, and the nature, functioning and design of organization as social collectivities. Students will also learn the key concepts and behavioural practices of Human Resources in organizations.
MGT 321	Production & Operations Management	3	0	0	3	The main aim of the course is to provide an overview of concepts involved in production, operations and supply chain management. These concepts include operation strategy, process design, forecasting, quality management, inventory management, scheduling and supply chain management. Emphasis will be on application on these concepts to actual business situations. The course focuses on the core conversion processes of the organization where value addition takes place for the customer, thereby providing a systematic means of studying and analysing organizational processes. The course also focuses on the different stages of the supply

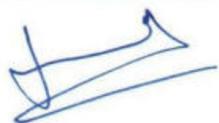
					chain and the associated interactions, helping develop managerial insight in different contexts. The course aims to: impart a frame of reference for operations and supply chain management; impart knowledge of the various functions involved; impart knowledge of the relations with its environment; impart knowledge of the management issues. Taking a process view, the course will examine a variety of industrial applications. The emphasis will be on improving efficiency of processes and also developing a unifying theme for production and operation related issues. The course will also focus on inventory theory and its application in supply chain management. Overall the course will take an analytical and detailed approach using models for decision-making and problem-solving.	
MGT 232	Business ethics and values in Management	3	0	0	3	This course will enable students to introspect on the important ethical implications of the day-to-day happenings and practices of industry and business. The aim of the course is to stimulate discussion and debate using available theoretical frameworks. The course will sensitise students to the ethical dilemmas and fundamental human values in improving managerial effectiveness. Using real life situations, the course will try to identify the variables in ethically complex business situations through an understanding of the more subtle criteria for making sound decisions. Topics to be covered include Introduction to the concepts in Business Ethics and Human Values, Ethical theories; Moral Development; Managing ethics - Individual and situational influences; Making decisions in business ethics: Situational influences; Group Ethics; Ethical Dilemmas in Management; Ethics in Information Technology and Systems Usage; Employees and business ethics;, Corporate Ethics and Company Philosophies, Economic Justice and Business Ethics, Distributive Justice and India, Global Social Issues-- Environmental Ethics Ethical Attitudes of Indian Managers; Law of karma; Whistle Blowing; Sci-Tech, Law, HRM and Ethics; Corporate Social Responsibility: Applications; Ethics and Corporate Governance, Human values and managerial effectiveness.



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MGT 242	International Business Management	3	0	0	3	<p>This course attempts to give glimpse of international business to students. Students will learn about trade relations, international finance, trade theories and legal and labor agreements. Develop understanding of globalization, the way it operates, and its impact on the progress of nations, individuals, and firms. This course provides an overview of political, economic, and cultural differences among nations in the world and how firms are dealing with these differences in doing International Business. Students will know different types of Multi-Lateral Agencies like the WTO, IMF, World Bank etc, and how do they impact development of nations, individuals, and international businesses of firms in this course. Student will comprehend different operational aspects of International Business-like Human Resource, Financials, Supply Chain etc.</p> <p>This course attempts to give glimpse of international business to students. It provides basic understanding international trade, multilateral institutions like WTO, IMF etc, trade agreements, trade blocks, strategies used in international businesses etc.</p> <p>This course attempts to give glimpse of international business to students. It provides basic understanding international trade, multilateral institutions like WTO, IMF etc, trade agreements, trade blocks, strategies used in international businesses etc.</p>
MGT 341	Research Methods	3	0	0	3	<p>This course will provide an overview of research methods that are usually employed in management research. The course will introduce the learner to the philosophy, basic concepts and techniques (both qualitative and quantitative) that form the core of management research. The course will delve into theory building, scientific method, research design, framing of research question, research alternatives, sampling, concepts of measurement, development of attitude scales, and their analysis and interpretation, basics of multivariate analysis and statistical inference. Overall, the course will help the learner develop a strong conceptual foundation for the research process. This course is intended to be an introductory gateway to research that the learner will conduct during their future research and dissertation work in Marketing, Finance, Organizational Behavior, HRM, Strategy, Systems, Operations and other areas of management. The course comprises</p>

						several readings from books and journal as well as several research activities during which learners will be required to design empirical study, collect data and test the hypotheses with extensive use of statistical software.
MKT 212	Marketing Management II	3	0	0	3	The course aims at nurturing marketing skills among the students. It will broaden the learner's horizons in understanding the marketing practices and also enhance their analytical and problem-solving skills for real world marketing problems. By the end of this course, the learners shall be able to understand the underlying marketing concepts, marketing practices of corporate world, problem faced by marketers in dynamic business environment and marketing tactics to deal with such issues through discussion on marketing concepts, corporate world marketing practices and case studies.
MGT 222	Operations Research	3	0	0	3	Operations Research involves "research on operations." Thus, operations research is applied to the problems that concern how to conduct and coordinate the operations (i.e., the activities) within an organization. OR has been applied extensively in such diverse areas as manufacturing, transportation, construction, telecommunications, financial planning, health care, the military, supply chain, sales and public services, etc. The course is offered to make students familiar with basic concept and tools in Operations Research. These techniques assist in solving complex problems and help in decision making. The course will provide students the knowledge of optimization techniques, application of mathematical, computational and communication skills needed for the practical utility of Operations Research. Also, it will introduce students the new research methods and current trends in Operations Research used to solve management problems.
International Immersion/ Industry Immersion (Mandatory)						
SEMESTER V						


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TA 321	Design Thinking and Critical Analysis	3	0	0	3	<p>This course aims at introducing students to design thinking. It is a blend of theory and practice to learn the basics of Design Thinking and does not require any prerequisites except for an open and beginner's mindset. This course will be useful to understand a systematic approach to solving complex problems and usage of tools that leads to innovation. Pedagogy: The course will consist of 45 hours (which will, inter alia include several case discussions and mini projects). The teaching methodology will include classroom lectures, discussions, projects, readings, presentations and case studies of companies to provide adequate and all-round exposure to the role of Design Thinking in today's business. Role of the faculty member will be that of a facilitator to the process of learning and exploration. In fact, each of us, including the instructor is a learner in these sessions and therefore, the aim of the sessions is to add value in the learning for everyone. Every session of the course will involve interaction in the form of class discussion. All course participants will be called upon to contribute to class discussion. It is essential that everyone is familiar with all assigned cases/reading material before class and comes fully prepared in order to ensure their active participation in class discussions.</p>
FIN 301	Corporate Finance	3	0	0	3	#N/A
MKT 311	Sales & Distribution Management	3	0	0	3	<p>As digital technology continues to open up new distribution channels, customer demands, and sales strategies are rapidly evolving. With multichannel networks becoming the norm, leaders must design a go-to-market strategy that sells the right products at the right time through the right combination of channels. Sales & Distribution Management is a comprehensive course focusing on the optimization of sales outcomes by developing and managing a high-performance multichannel network and sales force. The course takes both a strategic and a tactical perspective. The course discusses factors influencing the human dynamics in managing sales and distribution systems; key opportunities and challenges those sales managers face in their day-to-day work; the role of sales & distribution management in the broader corporate environment.</p>
MGT 311	Innovation & Entrepreneurship (Project Based Course)	3	0	0	3	<p>Project in Innovation & Entrepreneurship is a critical course in advancing your problem solving and applied skills. The course offers an opportunity to develop knowledge, skills, and attitude necessary to successfully commercialize</p>

						<p>new products and services. The focus is on advancing your knowledge of how to craft and improve key enterprise choices and outcomes. Sustaining enterprises in an environment of accelerated change is also a critical element of this course. This starts with the identification and framing of a real-world innovation project and problem drawn from your own environment / experiences. You will be challenged to plan how you will successfully implement this project. The course is structured on both a macro organizational level and micro project level to allow you to integrate contemporary lessons from successful enterprises into your practical innovation design and implementation project. Throughout the course, you will be asked to reflect on how the learning material applies to your own business idea to help you build a business plan.</p>
TA 311	Negotiation Skills (Skill Enhancement Course II)	2	0	0	2	<p>The course is aimed at developing analytical and communication skills that are necessary for successful business negotiations. The negotiation is described as a complex three-stage process which consists of preparation, negotiating, and post-negotiation implementation and evaluation. The course combines both theoretical knowledge of leading negotiation scholars and practical experience through learning by doing. The students will be engaged in business games, trainings, group discussions and creative tasks</p>
MGT 351	Business Laws & Applications	3	0	0	3	<p>This course familiarises the students with the legal environment in which business operates in India and internationally. The course will provide practical legal knowledge of general business law issues including a basic understanding of how the politico-legal processes and legal infrastructure (contracts, intellectual property, anti-trust, anti-profiteering, bankruptcy etc.) affect business strategy and decision making. The course also discusses the technology and intellectual property dimensions in a global perspective (including patent, copyright, and trademark law) as well as laws relating to trade secrets, unfair competition, and consumer protection. Though the conceptual focus will be on Indian legal system, a conscious effort will be made to familiarise students with the challenges posed by diverse international legal regimes.</p>



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MKT 321	Marketing Research	3	0	0	3	This course will provide an overview of research methods used in marketing. The course will introduce the learner to the basic concepts and techniques (both qualitative and quantitative) that form the core of marketing research. The course will delve into theory building, scientific method, research design, framing of research questions, sampling, concepts of measurement, development of attitude scales, and their analysis and interpretation, basics of multivariate analysis and statistical inference. The course will help the learner develop a strong conceptual foundation for marketing research
ENV 311	Environment Sustainability and	3	0	0	3	This course aims at making students learn the implication of sustainable development and how the practices to make development sustainable are managed in various settings around the globe. This course will give the students an opportunity to learn about global trends that influence our environment and the living conditions and how different management systems and approaches that are used in various parts of the world which help us manage the environment. The course is intended to make students learn how to meet the demands of present and future as a decision-makers and to analyze ethical challenges associated with environmental dilemmas and apply different decision-making tools relevant to environmental management and regulation. This course will enable the students to understand various approaches of Sustainability and to explore the ways our society may endure in the face of global change, ecosystem degradation and resource limitations. The course aims at delivering key knowledge areas of sustainability theory and practice so to ensure the effectiveness of principles of the long-term welfare of all the habitants of the planet.

SEMESTER VI

	Specialization Area Course I*	3	0	0	3	
	Specialization Area Course II*	3	0	0	3	
	Specialization Area Course III*	3	0	0	3	
	Specialization Area Course IV*	3	0	0	3	
	Open Elective I*	3	0	0	3	



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MGT 312	Project Management	3	0	0	3	Course drives the Students on understanding about the Strategic Planning for Project Proposals by conducting Project requirement analysis, thereby enabling them to analyze the cost benefits, risk analysis and followed by proper planning for the Project Implementation. Project Management introduces project management from the standpoint of a manager who must organize, plan, implement, and control tasks to achieve an organizations schedule, budget, and performance objectives. By completing this course, it will enable the students to experience as a Project Manager role that actually helps their career.
MGT 322	Capstone Project I	2	0	0	2	There will be a single project based on all the terms, in which students will learn how to apply concepts, business problems, formulate the problem statement, understand the variables and the constraints, select the most appropriate analytical approach and tools & techniques, collect, collate, clean, and analyze data, derive correct insights and reach an optimum solution. This course deals with real-life application of advanced analytics topics of statistics.
MGT 361	Business Policy, Planning & Strategy	3	0	0	3	This course focuses on how to establish a vision for the organization and strategically manage its future. Since this would encompasses all functional areas the student will have an opportunity to utilize skills gained in other MBA courses in exploring the strategic management process in this integrative course. Students will gain skills in analyzing an organizations situation identifying appropriate strategies and designing and implementing strategic plans.
TA 302	Professional Life Skills I	0	0	2	1	Professional Life Skills I and II are courses intended to prepare students for placement. It is based on the feedback received by the industry in the previous years' recruitment cycle; with respect to the expectations from the various organisations during the interview process, and the gaps perceived in the students. It also aims to enable students to develop critical, global 21st century employability skills as defined by Tony Wagner, resident expert at Harvard University's Innovation Lab. The skills identified are: <ul style="list-style-type: none"> • Critical Thinking and Problem Solving • Teamwork and Collaboration • Agility and Adaptability • Values and Ethics • Effective Oral and Written Communication • Accessing and Analyzing Information • Self - Presentation and Interview Handling • Aptitude Test Handling

SEMESTER VII

	Specialization Area Course V*	3	0	0	3	
	Specialization Area Course VI*	3	0	0	3	
	Specialization Area Course VII*	3	0	0	3	
	Specialization Area Course VIII*	3	0	0	3	
	Open Elective II*	3	0	0	3	
	Capstone Project II	2	0	0	2	
MGP 402	Social Action (Project Based)	3	0	0	3	<p>Citizenship education can be understood in two ways: as promoting responsible citizens through reflective inquiry, and as active citizenship learned through social action. The responsible citizen approach proposes that schools can prepare students for their civic role by developing their ability to form thoughtful opinions on matters of public policy. Advocates of active citizenship agree that reflective thinking about public matters is important but suggest that students should learn to act on their beliefs. Active citizenship challenges students to identify, plan and carry out responsible community actions. Participation in responsible social action is necessary if students are to become participatory citizens. By putting them "to work", active citizenship provides students with opportunities to test their ideas and learn about personal efficacy through social action. In this course on Social Action Project, students typically work cooperatively with other class members on initiatives they help to identify, plan and direct. A social action project prepares students to identify, plan and carry out solutions to problems within their school, community and beyond. The goal is active citizenship through thoughtful, cooperative, critically engaging, and responsible action.</p> <p>Themes that can be taken up by students: Students will address their unique local priorities with projects to help their communities.</p> <ol style="list-style-type: none"> 1. Gender and Women Environment 2. Financial and digital literacy 3. Animal welfare 4. Environment and Climate change 5. Quality Health/ Vaccination / Blood donation 6. Sports and Leadership 7. Caring for the poor and hungry <p>They are encouraged to play a bigger role in their communities through volunteering and engaging with community influencers and local civil society organisations.</p> <p>Evaluation of students will be done on the</p>

						impact their project makes on society. They will make a presentation to a panel with demonstration of work done and new relationships cultivated with outsiders in the process.
TA 401	Professional Life Skills II	0	0	2	1	Professional Life Skills I and II are courses intended to prepare students for placement. It is based on the feedback received by the industry in the previous years' recruitment cycle; with respect to the expectations from the various organisations during the interview process, and the gaps perceived in the students. It also aims to enable students to develop critical, global 21st century employability skills as defined by Tony Wagner, resident expert at Harvard University's Innovation Lab.
	Total	2	0	2	2	
SEMESTER VIII						
NU 322	Industry Practice	0	0	40	20	
	Total	0	0	40	20	
Specialization Area Courses/Open Electives						
COURSE CODE	COURSE NAME	L	T	P	C	Description
BA 302	Spreadsheet Modeling & Decision Analysis	3	0	0	3	Spreadsheet is one of the most powerful data analysis tools that exists. Major corporations and small businesses alike use spreadsheet models to determine where key measures of their success are now, and where they are likely to be in the future. This cou

BA 401	Information Security and Risk Management	3	0	0	3	This course on Information Security and Risk Management deals with the basics of security models, algorithms, protocols, and security mechanisms in computer networks and mobile networks as well as programs and database systems. The focus is on understandi
BA 411	Machine Learning	3	0	0	3	The course aims to provide a rigorous concepts underlying machine learning, like, what is learning? How can a machine learn? How do we quantify the resources needed to learn a given concept? Is learning always possible? Can we know whether the learning pr
BA 504	Financial Analytics	4	0	0	4	This course delves into the area of financial analytics. This course provides a framework to understand and apply various tools and techniques required to answer some crucial real world financial questions. It develops an understanding how to use financial indicators, benchmarks and ratios to detect and prevent a possible fraud in various financial statements. This course also deals with the assessment of credit risk using Python as a tool. This course enables the candidate to appreciate the use of analytics in Banking/Retail/Finance to provide a meaningful business solution.
BA 512	Data Visualization	3	0	0	3	This course will help students understand how data is visualized. This course will also help students acquire the expertise and the tools needed for presenting data-based evidence with impact, across images, graphics, and visualizations of big data and for conveying their ideas in ways that are convincing and catchy.
BA 522	Predictive Analytics	3	0	0	3	This course covers the key concepts used for extracting stored data elements, understand what they imply, and transform their formats and derive new relationships among them to produce a dataset suitable for analytical modelling. The course aims to help students produce a fully processed data set compatible for building powerful predictive models that can be deployed to increase productivity and profitability. Students will also be able to use forecasting models for predicting future values of variables (such as future sales from past data) etc.
BA 532	Programming for Analytics II	3	0	0	3	The course will begin with an introductory course in Python and R and go on to cover the principles of programming and software development for analytics that is reliable and accurate, integrates multiple technologies, scales and performs well, and adapts to changing requirements. The course will mainly deal with typical idioms and design patterns, designing for scalability and change, testing, and performance

						tuning.
BNK 302	Banking Products & Operations	3	0	0	3	The course in Banking Products and Operations, aim at acquainting students with operational aspects of banking, their rationale and the subtle interrelations between practice and theory of banking as well as Banking products. The student will get an opportunity to know various products & services offered by them to offer & explain the same to its customers.
CS 3102	Dimensional and NoSQL Databases	2	0	4	4	This course aims at furthering database systems concepts through adding complexity and a more hands-on approach. This course is study of data warehousing system and basics of non-relational data models. The goal of the course is to familiarize the students with basics of non-relational database systems.
CS 524	Deep Learning and Neural Networks	3	0	0	3	This course introduces the field of deep learning and neural networks. It covers basic theory, recent developments, tools for implementation and selected applications. The course emphasizes various techniques, which have become feasible with increased computational power and our ability to produce and capture huge volumes of data.
DS 302	Data Science Using R	3	0	0	3	The field commonly known as Data Science lies at the intersection of mathematics, computer science, and domain expertise. Within the data science (DS) world, there are a multitude of areas of study, and exploration. This course will introduce the basics of R programming. Students will learn the R skills needed to answer essential questions and perform basic exploratory analysis. The course will cover R functions and data types, then tackle how to operate on data frames and when to use data sub-setting techniques. Students will learn how to apply general data sub-setting features like select and filter, and how to wrangle, analyze and visualize data. The course aim is to make the students conversant with the concept of Data Science and techniques to be used for data analytics including the construction of different statistical Models used for Data Analytics. The course is an in-depth coverage on various Statistical Techniques and goodness of fit tests used for data analytics. The module is practical oriented. For Analysis R software is used. The students will continuously practice their newly acquired skills through R Studio.

DS 412	Inferential Statistics for Data Science	2	0	4	4	Basic principles for statistical inference with practical applications of data. Includes point estimation, confidence intervals, hypothesis testing, ANOVA and simple linear regression. Includes use of statistical R software.
FIN 302	Introduction to Banking & Financial Services Industry	3	0	0	3	Unit 1. Introduction to Banking System and Financial Services Industry which consists of financial markets, financial intermediation and financial instruments or financial products. Unit 2. Working of commercial banks, co-operative banks, regional rural banks (RRBs), all-India financial institutions (AIFIs), non-banking financial companies (NBFCs) and microfinance institutions. Unit 3. Introduction to the banking sector which forms the bedrock of the Indian financial system, and the regulatory role and functions of the Reserve Bank of India (under the provisions of the Banking Regulation Act, 1949 and the Reserve Bank of India Act, 1934). Unit 4. The financial markets in India to be covered in brief will include the money market, the Government securities market, the foreign exchange market, the capital Market and the credit market, derivative markets the major players as well as the regulatory bodies. Unit 5: Financial Services such as Venture Capital Financing, Factoring and Forfaiting, Merchant Banking, Mutual Funds, Small Savings, Provident Fund & Pension Fund, Mutual Funds, Insurance and other financial Services.
FIN 401	Designing Financial Products	3	0	0	3	The course deals with the aspects of Financial Engineering. The course contains details of instruments, markets, and financial market practices. The pricing issues are also dealt with, focus is more on engineering dimensions. The objective of the course is how existing markets and market practices have changed and outline new financial engineering trends and products.
FIN 411	Introduction to Blockchain Technology	3	0	0	3	After great financial crisis of 2008, the basic market structure of banking and business system was challenged. The business enterprises used emerging technologies to create value around existing monolith enterprise and industry structure. Satoshi Nakamoto a pseudo name who was brainchild behind the block chain technology, gained prominence with invention of bitcoin the digital currency built on block chain frameworks. The block chain technology grew with adaptation by various industry verticals including banking and finance. DEFI, DLT, Bitcoin, payments and lending, trade finance, Insurance and clearing and settlement are some important sub areas which are getting disrupted.

HRM 302	Organization Development and Change Management	3	0	0	3	This course will enable students to introspect on the important change implications of the day-to-day happenings and practices of industry and business. The aim of the course is to stimulate discussion and debate using available theoretical frameworks. This course equips students with the development and maintenance of changes and its impact on people and organisation. The course aims to educate students in the problems and with sufficient role of compliance along with discretionary organizational requirements in the matter. In addition to learning concepts, approaches, techniques and terms, students will examine the underlying reasons and forces shaping changes in, plans and policy.
MKT 302	Introduction to Digital marketing	3	0	0	3	Today, companies must connect with customers and other businesses through digital channels and adjust their marketing mix to succeed. Research indicates that digital marketing budgets are increasing dramatically, and digital media campaigns are becoming a pivotal part of effective marketing plans. The increasing prevalence of the internet and the improving skills of marketers in using this new medium have made the internet everywhere in the lives of both consumers and business. The course familiarize students with an understanding of how the digital media works and develop the critical insights necessary to succeed in e-commerce and digital media marketing. This course will also help students to explore the digital marketing landscape and equip them with necessary skills to effectively use various digital technologies & platforms.
MKT 312	Social Media Marketing	3	0	0	3	Social media technologies are continuously transforming the ways consumers interact with each other and firms. These changes constitute a fundamental shift in the marketplace--consumers have greater opportunities to voice their opinions and connect with other consumers as well as an increased influence over marketers and brands. As a result, the conventional approaches to marketing communications have become more and more challenged. This puts an added emphasis on leveraging social media to engage consumers and propagate ideas, messages, products, and behaviors. This course covers an introduction to the field of social media marketing with a detailed study of the marketing concepts, customer engagement practices, analytics, and other technologies associated with marketing to customers using social media. Students will generate knowledge through online readings,

						asynchronous discussions with students and their faculty, interactions with online tutorials, and online and hands-on simulations.
MKT 321	Marketing Research	3	0	0	3	This course will provide an overview of research methods used in marketing. The course will introduce the learner to the basic concepts and techniques (both qualitative and quantitative) that form the core of marketing research. The course will delve into theory building, scientific method, research design, framing of research questions, sampling, concepts of measurement, development of attitude scales, and their analysis and interpretation, basics of multivariate analysis and statistical inference. The course will help the learner develop a strong conceptual foundation for marketing research.
MKT 322	Introduction to Digital & Social Media Marketing	3	0	0	3	Today, companies must connect with customers and other businesses through digital channels and adjust their marketing mix to succeed. Research indicates that marketing budget for digital marketing & social media marketing are increasing dramatically. These digital & social media marketing campaigns are becoming a pivotal part of effective marketing plans. The course familiarize students with an understanding of how the digital marketing works and develop the critical insights necessary to succeed in digital & social media marketing. This course explores the digital & social media marketing landscape and equip them with necessary skills to effectively use various digital marketing technologies & social media platforms. Students will acquire knowledge and skills through online readings, asynchronous discussions with other students and their faculty, interactions with online tutorials, and online and hands-on simulations.
MKT 401	Services Marketing	3	0	0	3	This course is meant to prepare students pursuing marketing careers in the services industries and would also be valuable to nonmarketing students desiring to grasp the main ideas of services marketing and how they may be used to create competitive advantage for firms. The course strengthens students ability to utilize marketing techniques to generate, promote, and deliver client value in the service

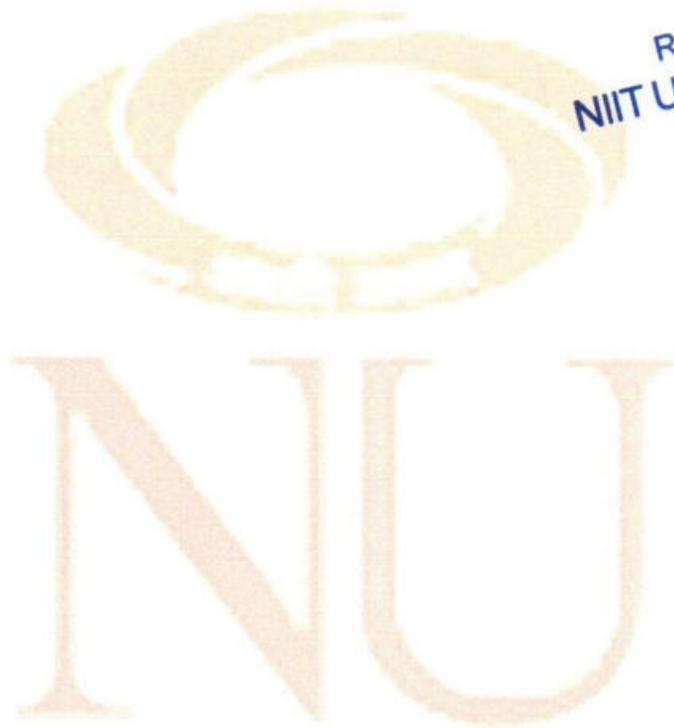
						economy by improving their grasp of diverse areas of services marketing. The textbook will be utilized to comprehend the fundamental concepts, and hands on exercises, case studies, and conversations will be used to provide experiential learning. Case studies from diverse sectors will be used to demonstrate concepts.
MKT 411	Consumer Behaviour for Digital Marketers	3	0	0	3	Understanding the consumer behaviour is critical for digital age marketers to design and implement better marketing strategies for products services & ideas. This course borrows perspective from various fields such as psychology, sociology, anthropology, and economics. This has given rise to the need for a sophisticated marketing professional with a strong grasp on consumer behaviour issues. This course aims to develop critical understandings of consumer behaviour that will hold relevance both inside and outside the domain of marketing practice. It focuses upon understanding consumer decision-making processes and the various factors that influence these processes. This course discusses the basic consumer behaviour frameworks, theories, tools, and procedures. Students will learn to apply psychological, social, and cultural concepts to marketing decision making. The course broadly covers five aspects – the inner workings in the mind of a consumer that deals with consumer psychology and learning; the different situational factors that influence the consumer decision; the process by which a consumer makes a decision; the aggregate aftermath of consumer decisions; and finally, the key issues surrounding ethics and social responsibility. Student will also learn about ethical and social responsibility factors as they think through their marketing strategy.
MKT 602	Product & Brand Management	3	0	0	3	The course aims to create an understanding of the relationship between Corporate Strategy on the one hand and the decisions that managers take regarding products and brands. The course will deal with different areas of product management such as product-line decisions, product platform and product life cycle. The course will also cover new product development process, the organizational structures for new product development and product management functions within an organization. The course will help students develop an understanding of the various issues related to Brand Management such as brand associations, brand identity, brand architecture, leveraging brand assets, brand

						portfolio management etc. The course will develop in students the capability to deal with the strategies and tactics involved in building, leveraging and defending strong brands.
MKT 611	Integrated Marketing Communication	3	0	0	3	This course is designed to equip students with the competency of decision making in matters concerned with consumer/customer communications. This course breaks down the traditional advertising, public relations, and marketing silos by challenging practitioners to apply the optimum mix of media and message to motivate the target audience to act. The rise of the internet and Digital Marketing support the need to embrace integrated marketing communication as a comprehensive approach to reach target audiences. In this course, students will learn to use appropriate messages and communication channels based upon the demographics of target audiences, commensurate with the actual needs and business realities of marketing campaigns. Students will also learn and practice message and touch point integration with special attention to effectiveness and measurable results. The course will use a mix of pedagogical tools like projects, assignments/ exercises and case studies.
MKT 623	Marketing Analytics	3	0	0	3	This course will deal with data analytics techniques including prescriptive analytics and large-scale testing in solving key marketing problems in customer acquisition, development, and retention, and in providing a cohesive framework for studying consumer behavior. This course will discuss how analytics is being used not just about purchase decisions, but also about individual consumers pre- and post-purchase behavior. The course will also delve into the issue of how the expansion of retail stores, factory stores, and the Internet changed customer behavior. The focus will be on applying analytics to large consumer-level database and in learning how to target consumers individually and deriving customer insights.
RSK 601	Security Analysis & Portfolio Management	3	0	0	3	This course is designed to teach the fundamentals of investments along with the analysis and strategies as an investor. The course familiarizes the students to understand how financial markets work and how securities are

Programme Architecture					
MBA (Information System and Data Engineering)					
TERM I					
CODE	CORSE	L	T	P	C
ACC 531	Financial Reporting and Analysis	3	0	0	3
CS 5102	Data Structures and Algorithms	3	0	0	3
CS 561	Programming for Analytics I	3	0	0	3
DS 501	Fundamentals of Data Science	3	0	0	3
GSM 521	Economics for Analysts	3	0	0	3
MGT 513	Business Data Management	3	0	0	3
MKT 511	Marketing Management	3	0	0	3
POQ 531	Business Statistics I	3	0	0	3
	Total				24
TERM II					
BA 501	Big Data Analytics	4	0	0	4
BA 502	Marketing Insights and Analysis	3	0	0	3
BA 522	Predictive Analytics	3	0	0	3
BA 532	Programming for Analytics II	3	0	0	3
CLP 511	Business Communication I	2	0	0	2
FIN 512	Financial Management	3	0	0	3
HRM 531	Managing People at Work	3	0	0	3
POQ 522	Business Statistics II	3	0	0	3
	Total				24
TERM III					
BA 512	Data Visualization	3	0	0	3
BNK 621	Business Policy, Planning & Strategy	3	0	0	3
CS 513	Machine Learning for Data Science	3	0	0	3
CS 523	Essentials of Natural Language Processing	3	0	0	3
HSS 503	Indian Ethos & Business Ethics	3	0	0	3
MGT 504	Research Methods	3	0	0	3
POQ 503	Production & Operations Management	3	0	0	3
	Total				21
TERM IV					
CS 503	Data warehousing and Data Mining	3	0	0	3
CS 504	AWS Big Data Analytics	2	0	0	2
CS 514	Azure Big Data Analytics	3	0	0	3
CS 524	Deep Learning and Neural Networks	3	0	0	3
CS 622	Data Privacy and Data Security Laws	3	0	0	3
DS 504	Capstone Project	3	0	0	3
MKT 514	Digital and Social Media Analytics	3	0	0	3
MKT 623	Marketing Analytics	3	0	0	3
	Total				23
TERM V					
NUIDS 601	Internship I	0	0	0	6
PE 603	Business Law and Applications	3	0	0	3
	Total				9
TERM VI					
CLP 523	Business Communication II	2	0	0	2
NUIDS 602	Internship II	0	0	0	6

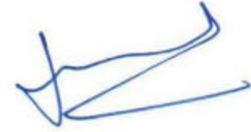
	Total				8
TERM VII					
NUIDS 603	Internship III	0	0	0	6
	Total				6
TERM VIII					
NUIDS 604	Internship III	0	0	0	6
	Total				6

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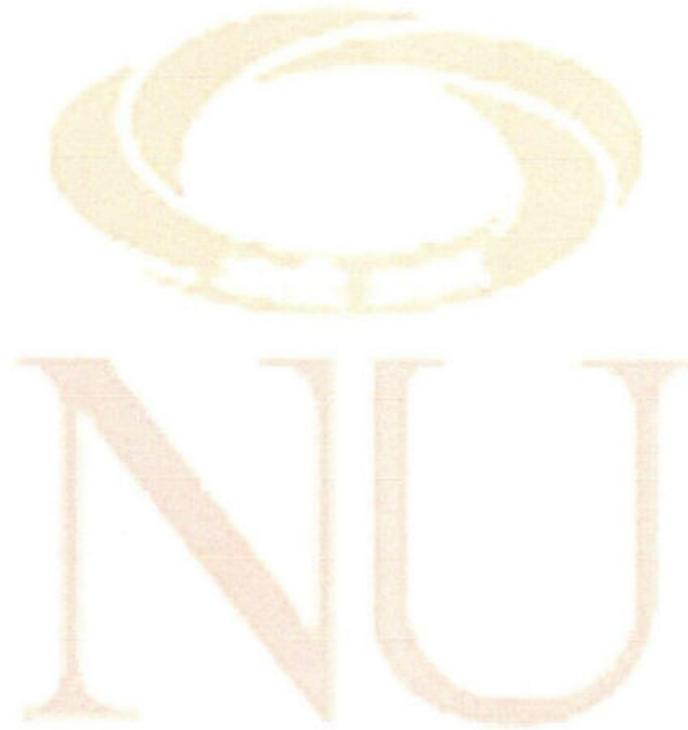


Programme Architecture					
MBA (Business Analytics)					
Course Code	Course Title	L	T	P	C
Term I					
BA 500	Business Analytics Foundation	3	0	0	3
FIN 501	Management Accounting & Control	3	0	0	3
MKT 521	Marketing For Analysts	3	0	0	3
GSM 502	Economics for Managers	3	0	0	3
HRM 531	Managing People at Work	3	0	0	3
CS 571	Foundations of Programming	3	0	0	3
MAT 501	Statistics for Analysts - I	3	0	0	3
CS 581	Data Structures and Programming Techniques	3	0	0	3
	Total Semester L-T-P-C	24	0	0	24
Term II					
MKT 512	Consumer Behavior	3	0	0	3
BA 512	Data Visualization	3	0	0	3
FIN 522	Corporate Finance	4	0	0	4
BA 522	Predictive Analytics	3	0	0	3
MAT 502	Statistics for Analysts -II	3	0	0	3
MGT 513	Business Data Management	3	0	0	3
BA 501	Introduction to Big Data	3	0	0	3
CLP 511	Business Communication - I	2	0	0	2
	Total Semester L-T-P-C	24	0	0	24
Term III					
MGT 504	Research Methods	3	0	0	3
	Stochastic Optimization Processes	4	0	0	4
	Advanced Programming for Analysts	3	0	0	3
POQ 503	Production and Operations Management	3	0	0	3
	Machine Learning for Analysts	4	0	0	4
CS 503	Data Warehousing and Data Mining	3	0	0	3
	Business Communication -II	2	0	0	2
	Total Semester L-T-P-C	22	0	0	22
Term IV					
CS 544	Introduction to Artificial Intelligence	3	0	0	3
CLP 504	Professional Skills and Cross-cultural Dimensions of Business	3	0	0	3
HSS 503	Indian Ethos & Business Ethics	3	0	0	3
BNK 621	Business Policy, Planning and Strategy	3	0	0	3
BA 524	Prescriptive Analytics	3	0	0	3
BA 534	Advanced SQL for BI	3	0	0	3
BA 544	Capstone	4	0	0	4
	Total Semester L-T-P-C	22	0	0	22
Term V					
NUBA 601	Internship I	0	0	0	6
PE 603	Business Law & Applications	3	0	0	3
	Total Semester L-T-P-C	3	0	0	9
Term VI					
NUBA 602	Internship II	0	0	0	6
CS 622	Data Privacy and Data Security Laws	3	0	0	3
	Total Semester L-T-P-C	6	0	0	9
Term VII					
NUBA 603	Internship III	0	0	0	6

	Total Semester L-T-P-C	0	0	0	6
Term VIII					
NUBA 604	Internship IV	0	0	0	6
	Total Semester L-T-P-C	0	0	0	6



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Programme Architecher MBA (NIIT)						
S. No.	Course Code	Course	L	T	P	C
Term I						
1	ACC 531	Financial Reporting and Analysis	3	0	0	3
2	HRM 521	Organizational Dynamics I	3	0	0	3
3	POQ 531	Business Statistics I	3	0	0	3
		Total	9	0	0	9
Term II						
4	MKT 501	Marketing Management I	3	0	0	3
5	HRM 512	Organizational Dynamics II	3	0	0	3
6	POQ 522	Business Statistics II	3	0	0	3
		Total	9	0	0	9
Term III						
7	ITM 513	Information Systems for Managers	3	0	0	3
8	FIN 511	Indian Financial System	3	0	0	3
9	MKT 502	Marketing Management II	3	0	0	3
		Total	9	0	0	9
Term IV						
10	BA 502	Marketing Insights & Analysis	3	0	0	3
11	POQ 503	Production & Operations Mgmt	3	0	0	3
12	FIN 513	Corporate Finance	3	0	0	3
		Total	9	0	0	9
Term V						
13	HRM 502	Human Resource Management	3	0	0	3
14	GSM 502	Economics for Managers	3	0	0	3
15	MGT 504	Research Methods	3	0	0	3
		Total	9	0	0	9
Term VI						
16	POQ 601	Operations Research	3	0	0	3
17	BNK 621	Business Policy, Planning & Strategy	3	0	0	3
18	ECON 602	Indian Economy	3	0	0	3
		Total	9	0	0	9
Term VII						
19		Business Laws & Applications	3	0	0	3
20		Concentration Area Course 1	3	0	0	3
21		Concentration Area Course 2	3	0	0	3
		Total	9	0	0	9
Term VIII						
22		Indian Ethos & Business Ethics	3	0	0	3
23		Concentration Area Course 3	3	0	0	0
24		Concentration Area Course 4	3	0	0	3
		Total	9	0	0	6
Term IX						
25		Global Business Environment & Policies	3	0	0	3
26		Concentration Area Course 5	3	0	0	3
27		Concentration Area Course 6	3	0	0	3
		Total	9	0	0	9
Term X						
28		Communication Proficiency & Professional Skills	3	0	0	3
29		Concentration Area Course 7	3	0	0	3

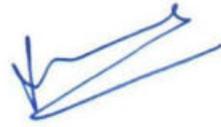
30		Concentration Area Course 8	3	0	0	3
		Total	9	0	0	9
Term XI						
31		Concentration Area Course 9	0	0	0	3
32		Concentration Area Course 10	3	0	0	3
		Total	3	0	0	6
Term XII						
33	NU 704	Independent Project	-			6
		Total	0	0	0	6
		Total				99



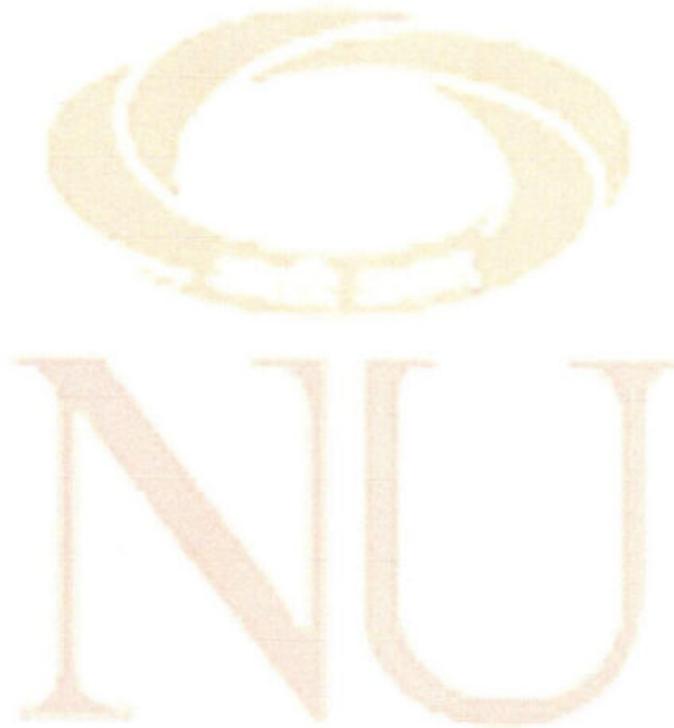

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MBA (INTELLIGENT DATA SCIENCE)					
CODE	CORSE	L	T	P	C
DS 501	Fundamentals of Data Science	3	0	0	3
ACC 531	Financial Reporting & Analysis	3	0	0	3
MKT 511	Marketing Management	3	0	0	3
GSM 521	Economics for Analysts	3	0	0	3
CLP 511	Business Communication I	2	0	0	2
CS 5102	Data Structures & Algorithms	3	0	0	3
CS 561	Programming for Analytics I	3	0	0	3
POQ 531	Business Statistics I	3	0	0	3
	Total				23
BA 502	Marketing Insights and Analysis	3	0	0	3
HRM 531	Managing People at Work	3	0	0	3
FIN 512	Financial Management	3	1	0	4
BA 522	Predictive Analytics	4	0	0	4
POQ 522	Business Statistics II	3	0	0	3
BA 501	Big Data Analytics	4	0	0	4
BA 532	Programming for Analytics II	3	0	0	3
	Total				24
BNK 621	Business Policy, Planning and Strategy	3	0	0	3
CS 513	Machine Learning for Data Science	4	0	0	4
POQ 503	Production & Operations Management	3	0	0	3
MGT 504	Research Methods	3	0	0	3
BA 512	Data Visualization	3	0	0	3
MGT 513	Business Data Management	3	0	0	3
CS 523	Essentials of Natural Language Processing	3	0	0	3
	Total				22
CS 524	Deep Learning & Neural Networks	3	0	0	3
MKT 623	Marketing Analytics	3	0	0	3
CS 504	AWS Big Data Analytics	2	0	0	2
MKT 514	Digital and Social Media Analytics	3	0	0	3
CS 534	Robotic Process Automation	2	0	0	2
CS 514	Azure Big Data Analytics	3	0	0	3
HSS 503	Indian Ethos & Business Ethics	3	0	0	3
DS 504	Capstone Project	1	0	0	3
CS 503	Data Warehousing and Data Mining	3	0	0	3
	Total				25
NUIDS 601	Internship I	1	0	0	6
PE 603	Business Laws & Applications	3	0	0	3
	Total				9
NUIDS 602	Internship II	1	0	0	6
CS 622	Data Security & Data Privacy Laws	3	0	0	3
	Total				9
NUIDS 603	Internship III	1	0	0	6
	Total				6

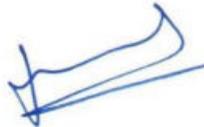
NUIDS 604	Internship IV	1	0	0	6
	Total				6
	Total Programme Credits				124



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Programme Architecture					
Post Graduate Diploma in Banking & Relationship Management					
Course Code	Course Title	L	T	P	C
Term I					
BNK 501	Commercial Banking I	3	0	0	3
BNK 512	Banking Processes & Products I	3	0	0	3
CLP 512	Managerial Communication	3	0	0	3
ECON 501	Economics	3	0	0	3
FIN 501	Management Accounting & Control	4	0	0	4
FIN 511	Indian Financial System	3	0	0	3
MAT 511	Business Statistics	3	0	0	3
MKT 531	Understanding Marketing	3	0	0	3
	Total Semester L-T-P-C	25	0	0	25
Term II					
BNK 543	Banking Processes & Products II	3	0	0	3
BNK 552	Digital Banking	3	0	0	3
FIN 512	Financial Management	3	0	0	3
FIN 542	Investment Analysis & Portfolio Management	3	0	0	3
FIN 543	Financial Planning & Wealth Management	3	0	0	3
MKT 532	Customer Interaction Skills	3	0	0	3
MKT 613	Customer Relationship Management	3	0	0	3
SST 502	Selling Skills and Relationship Management	3	0	0	3
	Total Semester L-T-P-C	24	0	0	24
Term III					
NURM 503	Industry Practice	0	0	0	6
	Total Semester L-T-P-C	0	0	0	6
Term IV					
NURM 504	Industry Practice	0	0	0	6
	Total Semester L-T-P-C	0	0	0	6


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Programme Architecture					
Post Graduate Diploma in Banking & Finance					
Course Code	Course Title	L	T	P	C
Term I					
CPP 501	Communication Proficiency and Professional Skills I				3
FS 501	Organizational Dynamics				3
MKT 501	Marketing Management				3
ACC 531	Financial Reporting and Analysis				3
GSM 502	Economics for Managers				3
BNK 501	Commercial Banking I				3
POQ 521	Quantitative Techniques for Banking				3
	Total Semester L-T-P-C				21
Term II					
CPP 502	Communication Proficiency and Professional Skills II				3
ITM 512	Information System for Bankers I				3
SST 502	Selling Skills and Relationship Management				3
BNK 512	Banking Processes & Products I				3
FIN 532	Financial Management & Analysis				3
BNK 542	Fundamentals of Credit & Risk Management I				3
BNK 522	Commercial Banking II				3
	Total Semester L-T-P-C				21
Term III					
BNK 632	International Finance and Banking				3
BNK 553	Fundamentals of Credit & Risk Management II				3
BNK 543	Banking Processes & Products II				3
BLA 503	Legal Aspects of Banking				3
ITM 503	Information System for Bankers II				3
BNK 563	Advanced Retail Banking				3
FIN 543	Financial Planning & Wealth Management				3
	Total Semester L-T-P-C				21
Term IV					
NUBF 504	Internship				6
	Total Semester L-T-P-C				6



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Management- PhD Programme

The doctoral programmes in Management at NIIT University (NU) offer a rigorous and intellectually stimulating platform for scholars to enhance their understanding of organizational behavior and performance in the dynamic global landscape. As emerging markets challenge traditional management theories developed in developed economies, there are exciting research opportunities for scholars and academicians.

At NU, doctoral candidates are encouraged to explore research topics that not only draw insights from different areas of Management but also from disciplines such as social sciences, physical sciences, engineering, and technology. This interdisciplinary approach allows for a comprehensive understanding of complex managerial and theoretical dilemmas at various levels.

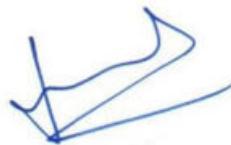
During their doctoral journey, candidates collaborate closely with Faculty Advisors who have expertise aligned with their research areas. This collaboration facilitates both collaborative and independent research, culminating in the completion of their thesis.

NU's doctoral programmes provide scholars with a strong foundation in the literature and theory relevant to their chosen area of specialization. Additionally, scholars gain theoretical and practical knowledge of advanced research skills necessary for publishing their research in reputable academic journals.

By offering a blend of in-depth subject knowledge, interdisciplinary perspectives, and research skills, NU's doctoral programmes empower scholars to contribute to the advancement of knowledge in the field of Management. Graduates are equipped with the necessary expertise to pursue careers as researchers, academicians, and thought leaders in academia, industry, and research organizations.

Indicative Areas of Research for Doctoral Programmes in Management at NIIT University:

1. Finance and Banking:
 - Financial and Banking Regulations
 - Risk Management in Banks
 - Investment Analysis and Portfolio Management
 - Corporate Governance and Financial Reporting
 - Financial Markets and Institutions
 - Behavioral Finance and Decision Making
2. Accounting and Control:
 - Managerial Accounting and Control Systems
 - Financial Reporting and Analysis
 - Auditing and Assurance
 - Corporate Governance and Ethics in Accounting
 - Sustainability Accounting and Reporting
3. Corporate Financial Decisions:
 - Capital Structure and Financing Decisions
 - Dividend Policy and Shareholder Value
 - Corporate Restructuring and Mergers & Acquisitions
 - Financial Risk Management
 - Corporate Investment Decisions and Capital Budgeting
4. Financial Modeling:
 - Financial Forecasting and Scenario Analysis
 - Option Pricing and Derivatives Modeling
 - Risk Modeling and Management
 - Portfolio Optimization and Asset Allocation
5. Corporate Valuations:
 - Business Valuation Techniques
 - Valuation of Intangible Assets
 - Valuation in Mergers & Acquisitions
 - Valuation of Start-ups and High-Growth Companies
6. Bank Risk Management:
 - Credit Risk Modeling and Management



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- Market Risk Management
- Operational Risk Management
- Liquidity Risk Management
- Stress Testing and Risk Assessment in Banks
- 7. International Banking and Finance:
 - Cross-Border Banking and Financial Transactions
 - Global Capital Markets
 - International Financial Institutions and Development Finance
 - Foreign Exchange Markets and Risk Management
 - International Financial Reporting Standards (IFRS)
- 8. Financial Engineering:
 - Derivatives Pricing and Hedging Strategies
 - Risk Management in Complex Financial Instruments
 - Structured Finance and Securitization
 - Quantitative Methods in Financial Engineering
 - Computational Finance and Algorithmic Trading
- 9. Derivatives:
 - Options, Futures, and Swaps Markets
 - Derivatives Trading and Strategies
 - Risk Management using Derivatives
 - Derivatives Pricing Models and Valuation
- 10. Behavioral Finance:
 - Psychology of Financial Decision Making
 - Investor Behavior and Market Anomalies
 - Herding and Behavioral Biases in Financial Markets
 - Overconfidence and Market Efficiency

These are indicative areas of research for the doctoral programmes in Management at NIIT University. The university encourages scholars to explore these areas and related subtopics while also providing flexibility for pursuing research in emerging and interdisciplinary areas within the field of Management.



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PROGRAM FILE

AREA- Educational Technology

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VISION

NIIT University's (NU) MTech (ET) programme enables its students to assess, design and implement new media and technology initiatives to create effective learning solutions. It is specially designed to create an extraordinary learning architecture that promotes customised improvement in work functions as per institutional requirements.

NU's MTech (ET) programme prepares students to become effective learning professionals and domain specialists who can develop superior work-integrated technology solutions for both educators as well as business organisations. It prepares leaders who can ensure effectiveness and efficiency of learning processes, thus giving them a strategic professional advantage.

- Aligns learning exercises to learners' work function
- Leverages the power of technology to get a multiplier effect in learning
- Encourages learners' information orientation and processing capabilities to improve decision making and value creation
- Allows learners to assimilate knowledge in an extended knowledge realm

MISSION

The mission of the Educational Technology programme at NIIT University is to equip students with the knowledge, skills, and expertise required to effectively integrate technology in educational settings. The programme aims to address the evolving needs of the education sector by exploring innovative and effective ways to enhance teaching and learning processes through the strategic use of technology.

The programme focuses on a range of topics relevant to educational technology, including:

1. **Learning Theories and Instructional Design:** Students will gain a deep understanding of learning theories and instructional design principles. They will explore different instructional models and strategies to create engaging and effective learning experiences using technology.
2. **Educational Technology Tools and Platforms:** Students will be introduced to a variety of educational technology tools, software applications, and digital platforms. They will learn how to select, evaluate, and effectively use these tools to enhance teaching, facilitate collaboration, and support personalized learning.
3. **Blended and Online Learning:** The programme will cover the design and implementation of blended and online learning environments. Students will learn about effective strategies for creating engaging online courses, leveraging learning management systems, and facilitating virtual collaboration and communication.
4. **Assessment and Evaluation in Educational Technology:** Students will explore methods and techniques for assessing and evaluating the effectiveness of technology integration in educational contexts. They will learn how to design and administer formative and summative assessments, analyze data, and make data-driven decisions to improve learning outcomes.
5. **Educational Research and Innovation:** The programme emphasizes the importance of research and innovation in educational technology. Students will develop research skills and explore emerging trends and advancements in the field. They will be encouraged to conduct research studies, propose innovative solutions, and contribute to the knowledge base of educational technology.

Overall, the mission of the Educational Technology programme at NIIT University is to prepare graduates who can leverage technology to create engaging and meaningful learning experiences, promote digital literacy, and drive innovation in education. By exploring these topics, students will be

equipped to effectively navigate the dynamic landscape of educational technology and make a positive impact on teaching and learning practices.

Educational Technology programme Postgraduate Programme Educational Objectives

The Programme Educational Objectives (PEOs) at NIIT University are designed to ensure that graduates are well-prepared and equipped to meet the challenges of their respective fields. Here are five important PEOs at NIIT University:

PEO1. Knowledge and Skill Development: The first objective is to provide students with a strong foundation of knowledge and skills in their chosen discipline. This includes theoretical understanding, practical expertise, and the ability to apply their knowledge to real-world situations.

PEO2. Critical Thinking and Problem-Solving: Another objective is to develop graduates who are capable of critical thinking and effective problem-solving. They should be able to analyze complex problems, evaluate different solutions, and make informed decisions based on sound reasoning and evidence.

PEO3. Communication and Collaboration: Graduates are expected to possess strong communication skills, both written and verbal, and the ability to collaborate effectively with others. They should be able to articulate their ideas clearly, work in teams, and engage in productive discussions and debates.

PEO4. Leadership and Ethical Responsibility: NIIT University aims to develop leaders who understand the importance of ethical responsibility. Graduates should demonstrate leadership qualities, exhibit ethical behavior, and make responsible decisions that consider the broader societal impact of their actions.

PEO5. Lifelong Learning and Adaptability: The final objective is to foster a mindset of lifelong learning and adaptability among graduates. They should have the ability to continuously upgrade their knowledge and skills, stay abreast of emerging trends and technologies, and adapt to the evolving demands of their professional careers.

By focusing on these Programme Educational Objectives, NIIT University aims to produce well-rounded graduates who are not only academically proficient but also possess the necessary skills, attitudes, and values to succeed in their chosen fields and make meaningful contributions to society.

PROGRAM SPECIFIC OUTCOME (PSOs)- Educational Technology Programme

The Program Specific Outcomes (PSOs) for the Educational Technology Programme are as follows:

PSO 1: Application of Educational Technology: Graduates will be able to apply educational technology principles and practices to design, develop, and implement effective instructional materials and technologies that enhance teaching and learning experiences.

PSO 2: Integration of Technology in Education: Graduates will be proficient in integrating technology into various educational settings, including traditional classrooms, online environments, and blended learning approaches. They will be able to utilize educational technology tools and platforms to support diverse instructional strategies and facilitate active student engagement.

PSO 3: Design and Evaluation of Educational Materials: Graduates will have the ability to design and evaluate educational materials, such as multimedia presentations, interactive learning modules, and digital assessments. They will demonstrate expertise in selecting appropriate media, applying instructional design principles, and assessing the effectiveness of educational materials in meeting learning objectives.

PSO 4: Collaboration and Communication: Graduates will possess strong collaboration and communication skills necessary for effective teamwork and professional interactions in the field of educational technology. They will be able to collaborate with educators, administrators, and other stakeholders to design and implement technology-enhanced learning experiences.

PSO 5: Research and Innovation in Educational Technology: Graduates will be equipped with research skills and the ability to contribute to the advancement of educational technology.

through research and innovation. They will demonstrate an understanding of research methodologies, ethical considerations, and the ability to critically analyze and interpret research findings in the context of educational technology.

These Program Specific Outcomes ensure that graduates of the Educational Technology Programme have the necessary knowledge, skills, and competencies to excel in their roles as educational technology professionals. They are prepared to effectively integrate technology into educational settings, design innovative instructional materials, collaborate with stakeholders, and contribute to the field through research and innovation.

POs for M.Tech. in Educational Technology programme

PO1: An ability to independently carry out research /investigation and development work to solve practical problems.

PO2: An ability to write and present a substantial technical report/document.

PO3: Students should be able to demonstrate a degree of mastery over the area as per the specialization of the program. The mastery should be at a level higher than the requirements in the appropriate bachelor program.

Course of Study

Postgraduate Programmes

M.Tech- Educational Technology

PhD in Educational Technology

Postgraduate Programme

M.Tech-

Educational Technology

(ET)

Programme Architecture with Course Description						
M.Tech. ET						
Course Code	Course Title	L	T	P	C	Description
Semester I						

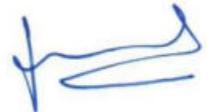
ET 501	Core course in Arts & Sciences I : Principles & Practices of Learning Engineering	2	0	2	3	<p>CT-driven digital economy is propelling convergences between any productive economic activity (a business that it is, which is necessarily process-centric) & innovation, and, thereby, between informational work & learning. Educational Technology (ET) in the form of a networked ET system, which automizes integration of process-centric-business-information-learning-processes with business-processes is a specialization drawn from Learning Engineering (LE). Specifically, LE is the application of interlocking set of cognitive-themes- and organizational-information-flow-themes- driven formal principles and techniques for the planning, analysis, design, construction, control and maintenance of (a) mass-customized, "smarter" (i.e., integrity) information production (i.e., teaching-learning) systems, and (b) learnt information produced there from, which are integrated in enterprise-wide networks of mobility value stream(s). ET entails increased budgets.</p> <p>The course is designed to enable professionals from every quarter to create business effectiveness and productivity, efficiency & economy by (a) leveraging LE, (b) creating (as against adding) value for business by appropriate ET development, (c) introducing cost cutting measures in educating & training flexible workforce, and (d) in tandem with their basic work-domain-specific preparation developing managers/workers as ET professionals, who, given the reality of a continually changing and complex requirements' market, can now contribute to work-desks and company growth as work-process-change-agents and further as business transformation leaders.</p>
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ET 511	Introduction to Experiential Learning & Reflection and Education	1	1	2	3	<p>This course begins with a brief overview of theories of learning; namely, functionalistic theories, associationistic theories, cognitive theories, neurophysiological theory and evolutionary theory and their implications for education and instruction. Following this, the course presents a modified definition of learning, which results from information acquisition driven experience and is in cognitive framework, and builds on it to introduce students to information processing theories pertaining: (a) "pure" cognitive variables integrated sensory, short-term & working-memory; structure and models of long-term memory; and encoding and retrieval processes, and (b) (pertaining) "metacognitive" variables driven - encoding processes and -beliefs & cognition. Particularly the latter, i.e., the meatacogniton based information processing for learning dominates in experiential learning, which is in "research & discovery" emphasizing instruction mode. Thru "reflection" processes this research & discovery mode instruction further transforms the incumbent "deductive" instruction process, which leverages "realistic" instruction process, whose staring point is in real problems faced by teachers and learners during practical experiences. The course discusses implications of these information processing for instruction.</p>
NU 522	Contemporary Issues	2	0	0	2	<p>The course will serve multifarious objectives as briefly presented below.</p> <ol style="list-style-type: none"> 1. In depth investigation of a chosen contemporary social issue or problem of interdisciplinary nature and suggestion of a plausible solution should facilitate research culture. 2. As the chosen problem would invariably be interdisciplinary, students should develop an ability to analyze a problem from holistic perspective. They should discover the interplay of subjectivity and objectivity, which exists in any problem solving. 3. Depending upon number of registrations in the course and the subject discipline of students, more than

					<p>one issues will be studied and discussed though the course. This should give students an opportunity to widen their knowledge about contemporary issues facing global community.</p> <p>4. The course methodology will require students to discuss in a group, give regular seminars and aim at publishing at least one article. This should help them hone oral and written communication skills.</p> <p>Not the least, students should develop a global outlook and awareness.</p>	
ET 502	Core course in Arts & Sciences II: Mobile Learning and Its Applications	2	0	2	3	<p>Mobile computing covers topics of: hardware platforms; operating systems for the mobile phones; application development platforms for mobile phones; and rapid application development tools case studies. Seen within this framework of "computing", mobile technology or mobile device gets viewed as delivering information. However, given that unlike a fixed location desktop computer, which does just that – delivers information, that is – and has "reliable connectivity", mobile device has further attributes of it (mobile device, that is) being "compact" and "portable" and that it "fits" in a pocket or purse. It is these mobile device attributes that bring about a paradigm shift for its user by way of creating interplay – something not traditionally accounted for in mobile technology design – between user and mobile device. To elaborate, user interacts with mobile devices, uses devices to capture the context of the event, uses devices to share the context, communicates with others so as to change things, and more. Underlying principle is that user starts to interplay with mobile device to the technology knowledge, skill and motivation end at which it (mobile device) is integrated into solutions that make user optimal performer. Here, it is useful to appreciate that user could be individual, organization (or even system). The challenge is to ensure that user becomes optimal performer, regardless of context. Ability should be that desired interplay is brought to play wherever and whenever needed. Meeting the need of the moment –</p>

						<p>solution integrity that it calls for - is what is required. If user ignores this requirement, s/he will be ignoring the money (benefit, that is), too.</p> <p>Within above framework, the course begins with the overview of mobile technology topics and then proceeds to detail its challenges for the user when it comes to achieve effective performance. Specifically, the course describes learning and cognition principles, which are controlled by functioning of the brain, and then drawing on them provides overview of multitudes of mobile devices from the point of their interplay with user. Resultant outcome is the convergent model that helps characterize mobile devices in a device-independent manner.</p>
TA 521	Advanced Productivity Tools	1	0	4	3	<p>This course recapitulates basic Lifestyle Practices and Information & Communication Technology (ICT) products with the potential to enhance personal and group productivity, and introduces further advanced practices and products. The emphasis is on collaborative features of such products, and in their integrated use in simulated professional situations. The course also familiarizes students with tools and techniques for enhancing research and teaching. Topics covered are customized for a specific group of students consistent with the up-to-date and application orientation of this course.</p>


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NU 533 A	R&D Project Course I	0	0	0	2	<p>Learning processes and learning outcomes there from and instructional models routinely concern educationists. Of late, literature on learning is also identifying these concerns at workplaces and organizations. For example, now for a product designer it entails crossing pre-determined product-design-information-management-space-boundary drawn exogenous to say the pre-eminent sales' risk, and originating "smarter" individual-design-information endogenously for improved design decision and sales. This makes the design desk process-centric, now a learning design desk – in research & discovery mode.</p> <p>Above, while on the one hand, recognizes, for teaching-learning system, anticipated beneficiaries that are coming with delay (those at work), on the other hand, it presents learning as a relatively permanent change in behavior or in behavioral potentiality that results from experience by way of integrating R&D activities in information acquisition and/or utilization requirements in any productive economic activity, and cannot be attributed to temporary environmental states.</p> <p>Within above framework, under this course students individually or in group work on a R&D Project(s) to develop cognitive-themes- and business-information-flow-themes- driven information origination systems constituting value creating critical business value streams, and design improved business structure and job profiles for them. In the process students are trained to decipher between an effective and ineffective value stream before much is spent on it.</p>
Semester II						



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ET 503	Core course in Arts & Sciences III: Learning Strategically	1	0	2	2	<p>Rise of digital age convergence technology (the Net included) is an ideal mechanism for encouraging learners to assume responsibility for their own learning. As learners find different learning resources using CT they become self-directed, strategic, reflective participants in production of information and knowledge, cognitive growth that it is. Development of self-awareness and self-regulation is critical to cognitive growth. Also metacognitive variables driven motivation and beliefs are integral to cognition. Metacognition includes two related dimensions: knowledge of cognition and regulation G - 6 of cognition. Knowledge of cognition has three components; namely, declarative knowledge about one's own "pure" cognitive variables; procedural knowledge about cognitive strategies; and conditional knowledge about when and how to use strategy. Against this, regulation of cognition includes three components; namely, planning involving how to use strategy, e.g., setting of goal, selecting appropriate strategies and allocating resources; evaluation involving monitoring and controlling of learning, strategy sequencing, and selecting appropriate repair strategies, and evaluation involving products and regulatory processes of one's learning. This course is designed to enable students to understand learning strategies as identified above. In the process, students will come to know strategies that occur before instruction, strategies needed during instruction, and strategies used after instruction. The course will culminate in describing taxonomy of learning strategies, delineate benefits that accrue from strategy instruction, and detail strategy implications for instruction.</p>
TA 511	Web Design And Programming	2	0	2	3	<p>Most of the applications are now expected to have some kind of web interface. Therefore it is important that students of this program are comfortable with the nuts and bolts of website creation. The end objective of this course is enable the student should be able to make a reasonably dynamic website. In the process of doing so the</p>

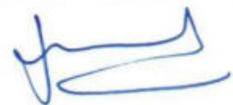
								students will get exposed to a range of tools for creating simple, static website. This will be followed by client side and server side scripting.
TA 531	Communication as Digital Choreography		1	1	2	3		Advances in technology continue to spur great innovation and this has had a direct impact on how Communication operates in today's business context. The course focuses on process and barriers of communication and is customized to help excel in industry specific roles. Through an intensive study of schematics, language, imagery and visual structures, idiomatic usage and extensive practice, one develops the right technique to bring concepts in communication along with harnessing the full range of analytical skills. Creativity and imagineering in using informational resources in transmitting information is emphasized with the audio video component as an integral part of the learning. The course highlights the fact that with convergence of technology, communication has now become a function of the receiver, thus changing the processes further wherein technologies will play a more effective role. This process extended it is not difficult to visualize, non teachers from the field, through real time information flow giving information that flows into the classrooms and enables teachers and learners to construct information and knowledge dynamically as teaching begets learning and so forth. Indeed what one is seeing is a rise of information system on a convergence platform that users can themselves construct, leveraging malleability of digital information and thereby delivering communication as a digital choreograph.



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ET 512	Applied Instructional Design	2	0	2	3	<p>Students will be able to analyze how learning occurs and apply learning theories and instructional design models to learning situations. This course on applied instructional design will provide an instructional perspective to the learning paradigms/theories; examine the cognitive and non-cognitive processes underlying learning behavior and the relation of these processes to instructional design; analyze learning situations and identify associated technology-related design challenges; explore constructivist and other theoretical perspectives and their implications on the design and evaluation of learning environments; perform procedural, learning, and content analysis in order to define the level of learning performance and instructional components; explore selection and application of different models of instructional design and explore selection and application of appropriate media formats for delivering instruction.</p>
ET 522	e-Learning Tools And Techniques for Online Learning	1	0	4	3	<p>e-Learning refers to all forms of learning and teaching that uses the electronic medium, be it the Internet, the stand-alone computer or mobile devices. Of late e-learning is in focus due to several advantages it offers – especially as it enables anytime, anywhere and self-paced learning. The major driver for e-learning has been corporate groups for their organizational training. Currently all players in education and training – school, universities, training institutes are trying to integrate e-learning into their offerings. This is an in-depth course that attempts to give students a comprehensive understanding of the online learning aspects of e-learning such as content creation and management, content delivery and learning management, assessment creation and management, tools for synchronous and asynchronous communication, etc. The course will lay emphasis on online learning management systems, online assessment systems, etc. The students will gain hands-on experience of open-source course management system such</p>

						as Moodle, including creation of Individualized Learning Plans, e-portfolios, etc.
ET 601	Integrity Learning System	1	1	2	3	<p>A practical implication of a networked ET system controlling a business system is that it develops a dynamic learning-decision-making business model/process, and demands informational work activities, hitherto not considered, and information origination resource optimization for regulation. In the presence of requirements of "smarter" processing of cognitive- and business-information-flow- themes driving it and, given the implications of market environmental factors, this information processing becomes complex and gets besieged with uncertainties. Even one generation ago, large "task" centric education & training systems were implemented quickly and with very little documentation, but process-centric education & training systems as above are increasingly burdened with the data & information, that too fraught with uncertainty, and in the wake of information processing (read learning) methods of yesterday not only tend to become ends in themselves, but also slow down the learning processes in business and increase the risks of failures. This calls for application of LE for simplification and speed. Within this framework this course analytically introduces learning business modeling and processes and applies to them "System Dynamics Modeling" as a tool for developing Integrity Learning System design basis for business competitive advantage and continuity planning in complex and changing market environments.</p>
	Professional Elective 1*				3	
Summer Term						



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NU 533 B	R&D Project Course II	0	0	0	4	<p>Learning processes and learning outcomes there from and instructional models routinely concern educationists. Of late, literature on learning is also identifying these concerns at workplaces and organizations. For example, now for a product designer it entails crossing pre-determined product-design-information-management-space-boundary drawn exogenous to say the pre-eminent sales' risk, and originating "smarter" individual-design-information endogenously for improved design decision and sales. This makes the design desk process-centric, now a learning design desk – in research & discovery mode.</p> <p>Above, while on the one hand, recognizes, for teaching-learning system, anticipated beneficiaries that are coming with delay (those at work), on the other hand, it presents learning as a relatively permanent change in behavior or in behavioral potentiality that results from experience by way of integrating R&D activities in information acquisition and/or utilization requirements in any productive economic activity, and cannot be attributed to temporary environmental states.</p> <p>Within above framework, under this course students individually or in group work on a R&D Project(s) to develop cognitive-themes- and business-information-flow-themes- driven information origination systems constituting value creating critical business value streams, and design improved business structure and job profiles for them. In the process students are trained to decipher between an effective and ineffective value stream before much is spent on it.</p>
Semester III						
ET 521	ET Leadership	1	1	2	3	<p>This course highlights the Information technology and Communications Technologies planned and implemented as networking and information systems for learning environment, learning organization in it and in the organization Teaching-Learning interplay driving engagement practices. Understandably teacher/work supervisor here plays roles</p>

						of an achiever, a monitor of sustained performance enhancer, a relations knitter for information system development, and a strategist. These are all leadership roles and indeed need to be appropriately built as ET Leadership responsibilities for effective T-L.
MGT 582	Technology Management	3	0	0	3	The course aims to develop basic understanding of "technology" and the characteristics of technology; why and how business organizations increasingly use technology-based strategies to gain competitive advantage; how technology impacts the organization structure; how organizations 'manage' technology and technology development and what are the tools or techniques of managing technology. At the end of the course, the students will be able to perceive the role of technology in businesses and will have the required understanding of how the organizations must manage technology to stay competitive.
ET 532	Assessment and Certification	2	1	0	3	Course plan includes studies in purpose and scope of evaluation, types and forms, tools of evaluation. Research includes studies in nature of knowledge and inquiry- paradigms and orientations, interdisciplinary inquiry in ET, sources of educational data and units of study, planning, preparation and design of the study, tools and techniques of research, methodologies, analysis, and interpretation along with introduction to statistical methods in research. Research colloquium is required to make presentations for continuous feedback and development of study and paper to make research functional in professional situations and worthy of publication. Colloquiums are in webinars mode when online and face to face when on campus.
	Professional Elective 2*				3	
	Professional Elective 3*				3	
	Open Elective*				3	
NU 533 C	R&D Project Course III	0	0	0	2	Learning processes and learning outcomes there from and instructional models routinely concern educationists. Of late, literature on learning is also identifying these concerns at workplaces and organizations. For example, now for a product designer it entails crossing pre-determined product-design-

						<p>information-management-space-boundary drawn exogenous to say the pre-eminent sales' risk, and originating "smarter" individual-design-information endogenously for improved design decision and sales. This makes the design desk process-centric, now a learning design desk – in research & discovery mode.</p> <p>Above, while on the one hand, recognizes, for teaching-learning system, anticipated beneficiaries that are coming with delay (those at work), on the other hand, it presents learning as a relatively permanent change in behavior or in behavioral potentiality that results from experience by way of integrating R&D activities in information acquisition and/or utilization requirements in any productive economic activity, and cannot be attributed to temporary environmental states.</p> <p>Within above framework, under this course students individually or in group work on a R&D Project(s) to develop cognitive-themes- and business-information-flow-themes- driven information origination systems constituting value creating critical business value streams, and design improved business structure and job profiles for them. In the process students are trained to decipher between an effective and ineffective value stream before much is spent on it.</p>
Semester IV						
NU 612	Internship/ Thesis	0	0	0	12	<p>Leveraging NU core principles of Industry-connect and Research-driven, Internship course (along with R&D Course) positions M. Tech. ET program as a "Virtual R&D platform and Technology Development desk" for collaborating/sponsoring industries.</p> <p>Briefly, a team comprising a learner, her work-supervisor and I/C Industry Connect, ET Area, NU delineates for the M. Tech ET program period value creating business work (VCBW) project(s), identifies customer(s), states value created for the customer(s), defines intermediate deliverables, and indicates expected delivery schedules so</p>

						<p>as to develop VCBW project(s)' statement(s). For the VCBW project(s) statement(s) the learner then determines critical value streams, develops them in to complete, end-to-end set of activities, and studies implications for them of ICET and delayed requirements to develop "smarter" information processing system(s), which is then automatized using CT-enabled networked ET system(s).</p> <p>Above steps describe "Pedagogic Integration Mechanism" (PIM) Linking VCBW-Delivery-with-Internship-(and-R&D-Project)-Instruction. In addition to domain-specific knowledge field and related application-oriented skills, PIM trains the learner for working independently, learning strategically and self-directed learning, and helps acquire skills for learning to learn, learning to think, learning to collaborate and from collaboration, and learning to regulate.</p>
ET 622	Seminar course in Self-directed Learning Reflecting	0	0	0	2	<p>Reflection is a learning process in which student re structures the experience, the problem solved, alternative formed or insight developed. Experiential learning coupled with reflection go to enable learner to become independent worker who acquires ability to stretch ones information processing skills, self directed learner, who learns to process information with integrity and strategic learner, who assumes metacognitive awareness and self regulation. Entirety of the MTech ET Programme provides learner with these abilities and motivation and the seminar course is designed to give the student opportunity to document and articulate this learning experience.</p>
Professional/Open Electives						
COURSE CODE	COURSE NAME	L	T	P	C	DESCRIPTION
ET 641	Neural Basis of Learning	2	0	4	4	Using reading activity this course aims at training students to learn from action (a "real-world" phenomenon), wherein exploration characterizes the learning mode. Effort here is also to make instruction process-oriented by



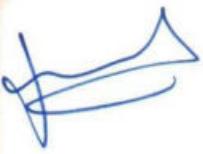
						<p>emphasizing development of processes of learning, thinking, collaboration and self-regulation integrated in regular domain-specific instruction further integrated in regular business work instruction. Learning outcome emphasized is “work-goal” and “work-strategies”, which are “informational” (not seen) and direct and follow from “work-action”.</p> <p>Specifically, students engaged in developing effective value stream(s) for a VCBW project and CT-enabled network ET system(s) automizing them are encouraged to experience learning risk. As a result the students select knowledge-books, research papers, documents, references, etc. using self-chosen strategies. From here on, as they go through reading sessions, the students are monitored only to ensure that they determine explicit work goals, organize work actions in such a way that curiosity arises from them, and use emerging propositions logically in their on-going VCBW project and/or networked ET system planning & development activities (under R&D Project course and/or otherwise), and test and expand. At the end of the reading course, students integrate their work goals and strategies to develop overall goal and strategy and reflect on their usefulness (to VCBW project), in the process integrate on learning achieved and reflect on it, and draw their own conclusions.</p>
NU 400	Directed Independent Study	1	0	0	4	<p>This course covers cloud technology, services, and covers containers and container orchestration - the process of transforming the way the technology industry does. It covers some of the tools and buzzwords in association with these technologies, such as Docker and Kubernetes, and gives an understanding of what they mean. The second part of this course provides foundational security knowledge to recognize, compare, and contrast different types of cybersecurity vulnerabilities and threats and indicators associated with network attacks.</p>

NU 651	Independent Reading & Writing Course I	1	0	0	3	<p>Using reading activity this course aims at training students to learn from experience (a “work”-based phenomenon), wherein research & discovery characterizes the learning mode. Effort here is also to make instruction process-oriented. Such instruction focuses on development of processes of learning, thinking, collaboration and self-regulation integrated in regular domain-specific instruction further integrated in regular business work instruction. Learning outcome emphasized is “work-action” and “work”, and reflection on them later. Specifically, students engaged in developing effective value stream(s) for a VCBW project and CT-enabled network ET system(s) automizing them are encouraged to experience learning risk. As a result the students preferably working collectively originate information on relevant knowledge-books, research papers, documents, references, etc. Students are guided to collect only that much list of referrals as is useful to reduce the learning risk. From here on, as they go through reading sessions, students are monitored only to ensure that they pursue their own curiosity and interest, expand on what they read, and test and apply emerging propositions logically to their on-going VCBW project and/or networked ET system planning & development activities (under R&D Project course and/or otherwise). At the end of the reading course, students reflect on the propositions learnt and their usefulness (to VCBW project), in the process learning achieved, and draw their own conclusions. Finally, adding further rigor to this students’ learning and to make it declarative the students write a research document/ paper/ monograph on their reflection, propositions learnt, their usefulness and emerging conclusions based on the course study. Finally, adding further rigor to this students’ learning and to make it declarative the students write a research document/ paper/ monograph on their reflection, propositions learnt, their usefulness and emerging</p>
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						conclusions based on the course study.
NU 661	Independent Reading & Writing Course-2	0	1	6	4	<p>The Independent Reading & Writing Course-2 is designed to further develop students' reading and writing skills in an independent and self-directed manner. Building upon the foundation established in Independent Reading & Writing Course-1, this course focuses on advanced reading comprehension, critical analysis, and effective writing techniques.</p> <p>Throughout the course, students will engage in a variety of reading materials, including fiction, non-fiction, scholarly articles, and research papers. They will enhance their ability to comprehend complex texts, extract key information, and critically evaluate the author's arguments and evidence.</p>
NU 711	Independent Reading Course II	1	0	0	1	<p>Using reading activity this course aims at training students to learn from action (a "real-world" phenomenon), wherein exploration characterizes the learning mode. Effort here is also to make instruction process-oriented by emphasizing development of processes of learning, thinking, collaboration and self-regulation integrated in regular domain-specific instruction further integrated in regular business work instruction. Learning outcome emphasized is "work-goal" and "work-strategies", which are "informational" (not seen) and direct and follow from "work-action". Specifically, students engaged in developing effective value stream(s) for a VCBW project and CT-enabled network ET system(s) automizing them are encouraged to experience learning risk. As a result the students select knowledge-books, research papers, documents, references, etc. using self-chosen strategies. From here on, as they go through reading sessions, the students are monitored</p>

					<p>only to ensure that they determine explicit work goals, organize work actions in such a way that curiosity arises from them, and use emerging propositions logically in their on-going VCBW project and/or networked ET system planning & development activities (under R&D Project course and/or otherwise), and test and expand. At the end of the reading course, students integrate their work goals and strategies to develop overall goal and strategy and reflect on their usefulness (to VCBW project), in the process integrate on learning achieved and reflect on it, and draw their own conclusions. Finally, adding further rigor to this students' learning and to make it declarative the students will write a research document/paper/monograph on their integration of their work goals and strategies to develop overall goal and strategy and on students' reflection on their usefulness (to VCBW project), in the process integration on learning achieved and on reflection on it, and on their (students') own conclusions.</p>
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Educational Technology PhD Programme

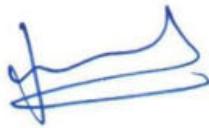
At NIIT University (NU), the PhD scholars in Educational Technology (ET) are engaged in interdisciplinary research that encompasses a wide range of subject areas related to the design, implementation, and assessment of educational media and technological initiatives.

Through this multidisciplinary research methodology, unique learning design models have been created, adopting a process-centric approach to learning. Students are encouraged to pursue a hybrid research model that is highly customized and tailored to address the existing challenges in the educational technology space. As a result, our PhD scholars are equipped to identify new problems and provide insightful solutions through their research findings.

NU's PhD program in ET fosters analytical thinking, critical analysis, and innovative problem-solving skills through research, documentation, implementation, and evaluation. The program explores various areas of research, including:

1. Value-creating Experiential Learning: Investigating the development and implementation of experiential learning models that create value and enhance learning outcomes.
2. Brain-aligned Realistic Project-Based Learning: Exploring project-based learning approaches that align with brain-based principles to create realistic and engaging learning experiences.
3. Connectomnal Instructional Organisation: Researching instructional organization models that leverage connectomics, the study of neural connections, to optimize learning environments.
4. Convergence Technologies for Complex Instructional Designs: Investigating the use of convergence technologies as information delivery systems to support complex instructional designs.
5. Learning and Employability Futures: Exploring the future of learning and its impact on employability, including the development of skills and competencies required for future job markets.
6. Learning Engineering Principles and Practices: Examining the principles and practices of learning engineering, focusing on the design, development, and evaluation of effective learning solutions.
7. Business Process - Teaching Learning Process Integration: Investigating the integration of business process models and methodologies into the teaching and learning process for improved efficiency and effectiveness.

Through their research in these areas, NU's PhD scholars in ET contribute to the advancement of educational technology and its application in diverse educational contexts. They develop innovative solutions, enhance learning experiences, and shape the future of education through their research endeavors.



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PROGRAM FILE

AREA-Geographic Information Systems (GIS)

A blue ink handwritten signature, likely of the Registrar, is positioned above the official stamp.

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VISION

The Master of Technology (MTech) Geographic Information Systems (GIS) programme at NU is designed to meet the growing demand for highly qualified GIS professionals in nation-building efforts. Through NU's global partnerships with leading organizations, the GIS programme ensures that its curriculum, facilities, and industry relevance remain up-to-date. The programme is supported by Esri Inc., California, USA, the world's foremost organization in GIS software development, along with Esri India. Additionally, other GIS organizations involved in GIS development and application in India and abroad are expected to join and support this research-driven and industry-linked programme in the near future.

The MTech in GIS programme equips professionals with the necessary skills to embark on a challenging and rewarding career in the rapidly evolving field of GIS. Candidates gain comprehensive exposure to various GIS components, including Geospatial Modelling and Database, Cartography, GIS Programming, Remote Sensing for GIS, and elective courses such as GIS and Urban Planning, Advanced GIS Platform Programming (Mobile, Web, and Cloud), and Geoinformatics for Environment.

The programme's key focus areas include spatial visualization, GIS technology and applications, GPS fundamentals and techniques, Geospatial Project Management, and field techniques for exploring the geospatial aspects of regions, economy, demography, occupation profiles, and humanities applications of GIS. Graduates are well-prepared for positions as GIS Project Managers, Application Specialists, System Engineers, and GIS Business Development Managers. They also have the opportunity to pursue doctoral research at NU, further advancing their expertise in the field.

By offering a comprehensive curriculum, industry collaborations, and practical training, the MTech in GIS programme at NU prepares graduates to make significant contributions to the GIS field, address complex spatial challenges, and contribute to the nation's development efforts.

The vision of the Geographic Information Systems (GIS) programme at NIIT University is to be a leading and globally recognized hub for GIS education, research, and innovation. The programme aims to foster a culture of excellence in GIS by providing cutting-edge knowledge, practical skills, and a multidisciplinary approach to geospatial technology and its applications.

The GIS programme envisions nurturing a new generation of GIS professionals who are equipped with advanced technical expertise, critical thinking abilities, and a deep understanding of the role of geospatial technology in addressing complex real-world challenges. It aims to empower students with the necessary tools and techniques to analyze, model, visualize, and interpret spatial data for informed decision-making across diverse domains.

The programme aspires to be at the forefront of GIS advancements, leveraging strategic collaborations with renowned global organizations and industry leaders. By staying abreast of the latest developments in GIS technology, tools, and applications, the programme seeks to continuously update its curriculum, facilities, and teaching methodologies to ensure its students are well-prepared for the evolving GIS landscape.

Furthermore, the vision of the GIS programme includes fostering a research-driven environment that encourages innovation, exploration, and interdisciplinary collaboration. It aims to contribute to the advancement of GIS knowledge through high-quality research, publications, and the development of innovative geospatial solutions.

Overall, the vision of the Geographic Information Systems (GIS) programme at NIIT University is to be a center of excellence in GIS education, research, and innovation, producing highly skilled GIS professionals who can make significant contributions to the field, society, and the nation as a whole.

MISSION

The mission of the Geographic Information Systems (GIS) programme at NIIT University is to provide a comprehensive and dynamic educational experience that prepares students to excel in the field of GIS. The programme aims to:

1. **Foster Knowledge and Skills:** The mission is to impart in-depth knowledge and practical skills in geospatial technology, GIS analysis, remote sensing, and related disciplines. By offering a robust curriculum, hands-on training, and industry-relevant projects, the programme equips students with the necessary competencies to become proficient GIS professionals.
2. **Promote Innovation and Research:** The programme encourages a culture of innovation and research in GIS. It strives to cultivate a spirit of inquiry and problem-solving among students, enabling them to explore new frontiers in geospatial technology, develop innovative solutions, and contribute to the advancement of GIS knowledge through research projects and publications.
3. **Foster Industry Collaboration:** The programme aims to establish strong collaborations with leading GIS organizations, industry partners, and research institutions to bridge the gap between academia and industry. By facilitating internships, industry projects, guest lectures, and workshops, the programme provides students with exposure to real-world GIS applications and industry practices.
4. **Cultivate Ethical and Responsible Practices:** The mission is to instill ethical values and a sense of social responsibility in GIS professionals. The programme emphasizes the ethical use of geospatial data, privacy concerns, and the responsible application of GIS technology for the betterment of society and the environment.
5. **Nurture Leadership and Professionalism:** The programme aims to develop leadership qualities, effective communication skills, and a professional mindset in students. It strives to empower students to become future leaders in the GIS field, capable of managing projects, leading teams, and making significant contributions to the GIS community.

Overall, the mission of the Geographic Information Systems (GIS) programme at NIIT University is to provide a transformative educational experience that prepares students to excel in the GIS industry, contribute to research and innovation, and uphold ethical practices in the field.

Geographic Information Systems (GIS) programme Programme Educational Objectives

The Programme Educational Objectives (PEOs) of the Geographic Information Systems (GIS) programme at NIIT University are as follows:

PEO1. **Technical Expertise:** Develop graduates who possess a strong foundation in GIS principles, methodologies, and technologies. The programme aims to equip students with the knowledge and skills necessary to effectively acquire, analyze, interpret, and visualize geospatial data using advanced GIS tools and software.

PEO2. **Problem-Solving and Critical Thinking:** Foster graduates who are capable of applying GIS knowledge and analytical skills to address complex spatial problems across various domains. The programme aims to develop their ability to think critically, evaluate information, and make informed decisions using geospatial analysis and modeling techniques.

PEO3. **Collaboration and Interdisciplinary Approach:** Cultivate graduates who can work collaboratively in multidisciplinary teams, integrating GIS with other disciplines such as urban planning, environmental science, engineering, and social sciences. The programme encourages an interdisciplinary approach to problem-solving and emphasizes effective communication, teamwork, and adaptability in diverse professional settings.

PEO4. Professional Growth and Leadership: Prepare graduates for successful careers in the GIS industry, academia, research, and public sectors. The programme aims to nurture their professional growth by developing leadership qualities, effective project management skills, and a strong understanding of industry practices and standards in GIS.

PEO5. Ethical and Social Responsibility: Instill in graduates a strong sense of ethical conduct, social responsibility, and environmental stewardship in the use and application of GIS technology. The programme emphasizes the responsible and ethical use of geospatial data, respect for privacy concerns, and the promotion of sustainable practices in GIS applications.

By achieving these Programme Educational Objectives, the GIS programme at NIIT University aims to produce well-rounded GIS professionals who can contribute effectively to the field, address real-world challenges, and make a positive impact on society.

Programme Specific Outcomes (PSOs) for the Geographic Information Systems (GIS) programme

PSO1. Proficiency in GIS Technologies: Graduates will demonstrate proficiency in using GIS software, tools, and techniques for data acquisition, spatial analysis, cartography, and visualization. They will be able to apply GIS principles and methodologies to solve real-world spatial problems effectively.

PSO2. Geospatial Data Analysis and Modeling: Graduates will possess the skills to analyze and model geospatial data using advanced techniques such as spatial statistics, geostatistics, and spatial data mining. They will be able to interpret and derive meaningful insights from geospatial data to support decision-making processes.

PSO3. Geodatabase Management and Development: Graduates will be capable of designing and managing geodatabases, including data storage, data integration, and data quality assurance. They will have a deep understanding of geospatial data formats, data standards, and database management systems used in GIS.

PSO4. Spatial Data Visualization and Communication: Graduates will be proficient in creating visually appealing and informative maps, charts, and visualizations to effectively communicate geospatial information. They will possess the skills to present geospatial data in a clear and compelling manner for diverse audiences.

PSO5. Application of GIS in Domain-specific Contexts: Graduates will be able to apply GIS techniques and tools in domain-specific contexts such as urban planning, environmental management, transportation, agriculture, and disaster management. They will understand the unique requirements and challenges of applying GIS in different domains and develop solutions accordingly.

By attaining these Programme Specific Outcomes, graduates of the GIS programme at NIIT University will have the necessary skills and knowledge to excel in the GIS field, contribute to the industry, and address complex spatial challenges across various domains.

POs of Geographic Information Systems (GIS) programme

PO1: An ability to independently carry out research /investigation and development work to solve practical problems.

PO2: An ability to write and present a substantial technical report/document.

PO3: Students should be able to demonstrate a degree of mastery over the area as per the specialization of the program. The mastery should be at a level higher than the requirements in the appropriate bachelor program.



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Programme of Study

Postgraduate Programmes

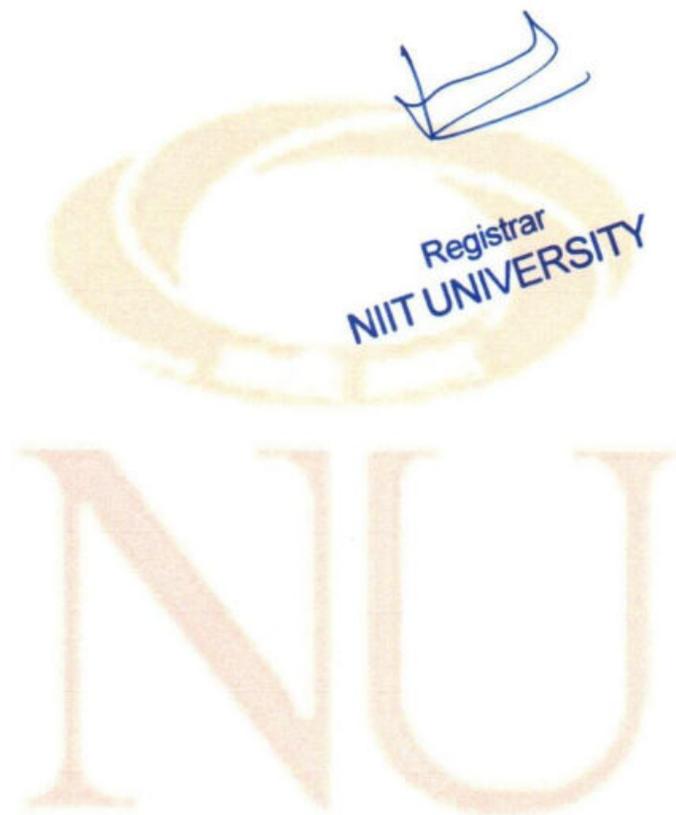
M.Tech GIS

PhD Programme in GIS

Programme Architecture

Postgraduate Programme

M.Tech GIS



Programme Architecture with Course Description

M.Tech. GIS

Course Code	Course Title	L	T	P	C	Description
Semester I						
GIS 561	Cartography and Photogrammetry	2	0	2	3	This course will focus on cartography and visualization that is mapping and visualizing geographical information. Course will include brief historical development of map making; geodesy: understanding important terms and concepts that govern mapping (such as projection, datum, ellipsoid, scale, coordinate systems etc); map reading; Use of remote sensing (satellite imagery) for mapping; Introduction to GIS software, digitizing geospatial information, handling multi layer geospatial data, generating maps using GIS software.
GIS 511	Remote Sensing and Digital Image Processing	3	0	2	4	This course will introduce science and technology of remote sensing; aerial and satellite imaging and digital image processing, interpretation and analysis methods. This course introduces the interactions of electromagnetic radiation with various earth surface materials like rocks, soils, water, snow, etc. These notions are fundamental for the interpretation of remote sensing imagery of different wavelengths. Labs focus on image processing and interpretation and use of these for map making. The course covers existing and upcoming sensors and applications of the data to earth sciences including land use mapping,

						resource exploration, environment, planning and management.
GIS 551	GIS, Geospatial Databases and Technology Trend	2	0	4	4	<p>This course intends to introduce students with the basic concepts of GIS which will help them in understanding the difference between GIS and Information Systems in general, GIS Components and functions of GIS: h/w & s/w requirements, Data types and spatial data models. Idea of conceptual, logical and physical models. Geospatial Databases will give an exposure to RDMS, Database normalization Representation of the real world via a vector and raster representation model. Spatial data and attribute data, their sources, types of attributes (such as nominal, ordinal, interval, ratio). geographical data formats (such as coverage, geo- database, shape file, grid, dxf, dwg, geo-tiff, GML). Spatial Data quality and uncertainty, Non-Spatial Database Creation, Database Design using RDBMS, principal operations in a DBMS (selection, insertion, updating, deletion Normalization rules, Data quality and sources of error in GIS). With a view to introduce students to various Technology Trend, they will be acquainted with GIS Customization, Cloud GIS, Data warehousing, OLAP, SDSS, distributed, spatial modeling, parallel and GPU, Spatial data infrastructure (i.e. integration and standards etc.), Free and Open Source tools and web resources). They will be made familiar with spatial decision problems and decision support systems.</p>

GIS 541	GIS Programming	2	0	4	4	This course focuses on introducing students to basic programming concepts To further meet the challenging requirement of GIS developers in the industry, They will be given exposure to Structure of core .Net program, The course also offers delivering a more in-depth knowledge of the GIS development techniques relevant to their projects.
GIS 571	Geostatistics, Geocomputation and Spatial Analysis	2	0	2	3	This course focuses on introducing students to basic statistics concepts This course further intends to provide them an understanding of Geo-computation and spatial analysis models to meet the challenging requirement of Geocomputation in the industry The course also offers delivering a more in-depth knowledge of the GIS Analysis techniques relevant to their projects. Students will be introduced to various statistical tools of Image Processing. Students would learn Spatial modeling and multi criteria analysis
TA 531	Oral and Written Communication	3	0	0	3	Advances in technology continue to spur great innovation and this has had a direct impact on how communication flows in today's business context. The course focuses on process and barriers of communication and is customized to help excel in industry specific roles. The course highlights the fact that with convergence of technologies, communication has now become a function of the receiver, thus changing the processes further wherein technologies will play a more effective role. This process

						extended, it is not difficult to visualize, non-teachers from the field, through real time information flow giving information that flows into the classrooms and enables teachers and learners to construct information and knowledge dynamically as teaching begets learning and so forth. Indeed, what one is seeing is a rise of information system on a convergence platform that users can themselves construct, leveraging malleability of digital information and thereby delivering communication as a digital choreograph.
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Semester II						
GIS 502	Advanced Remote Sensing and Digital Photogrammetry	2	0	4	4	Students will be introduced to Data Processing for stereo generation, Control requirement for Satellite Triangulation, Sensor Modeling: Physical sensor models, Polynomial Rectification, RFMIRFC Automatic DEM generation (Concept in image matching Area Based Matching, Feature Based Matching, Relation Based Matching). They will be made familiar with structures of DTM (Contours, Grid, and TIN), DEM interpolation techniques (IDW, spline, kriging etc) Grid Sampling criteria, Grid re-sampling methods, DEM derivatives (slope maps, aspect, maps, view sheds, and watershed) and geospatial modelling.
GIS 512	Advanced GIS Programming	2	0	4	4	<ul style="list-style-type: none"> This is an advanced course in GIS programming where students will be able to understand the implementation of web technology in GIS industry. Students will be

						exposed to various applications of Web GIS through real life examples. • The course involves introduction to World Wide Web, Introduction to Javascript, and Javascript API for ArcGIS. • The content of this course will help students to practically understand enterprise level GIS application development.
GIS 532	Geospatial Field Techniques and Application Integration	2	0	4	4	Geospatial field techniques are increasingly being used to validate the results from remote sensing observations that are used to solve complex environmental problems. This course aims to provide first-hand experience of geospatial data collection as well as processing and managing the data thereof. The course consists of conceptual lectures, practical exercises and field based observations and managements. The course covers importance of geospatial measurements, methods and tools used for measuring the geographical space, organization and processing of geospatial data for drawing meaningful information and finally its integration in various application domains/areas.
GIS 542	GIS Project Management -I	2	0	2	3	Course drives the Students on understanding about the Strategic Planning for GIS Project Proposals by conducting detailed Project requirement analysis, thereby enabling them to analyse the cost benefits, risk analysis and followed by proper planning for the GIS Implementation with a focus on the final deployment of the information products expected by the customers. This effort

						augments the value to the internal Customers as well. Students will complete their project work and prepare an extended report that will be submitted to the committee and make a technical presentation of their work. As a final part of the course, students will submit their Project Sign-Off document and the information product by handing off to the client (University). By completing this course, it will enable the students to experience as a GIS Project Manager role that actually helps their career.
	Professional Elective I*	2	0	2	3	
TA 521	Advanced Productivity Tools	3	0	0	3	This advanced course provides students additional expertise in the use of productivity applications to supplement the teaching-learning process. At the end of the course, the students are expected to develop a strong understanding of how to use and effectively integrate various productivity tools into their classroom/business specific curriculum.
Semester III						
	Professional Elective III*	2	0	2	3	
	Professional Elective IV*	2	0	2	3	
	Open Elective I*	3	0	0	3	
GIS 601	GIS Project Management II (Research Project)	2	0	4	4	This course deals with GIS Implementation planning with a focus on final implementation of their 'Information Products' including the digital interfaces to their GIS. This course focuses on introducing students to advance concepts of Project Management. Students

						complete all work on their project, prepare an extended report, defend it before the committee and make a public presentation of their work. In this final project course, students close their projects by finalizing all data and related digital materials for permanent archiving or handing off to the client.
NU 522	Contemporary Issues	2	0	0	2	1. In depth investigation of a chosen contemporary societal issue or problem of interdisciplinary nature and suggestion of a plausible solution should facilitate research culture. 2. As the chosen problem would invariably be interdisciplinary, students should develop an ability to analyze a problem from holistic perspective. 3. They should discover the interplay of subjectivity and objectivity, which exists in any problem solving. 4. This should give students an opportunity to widen their knowledge about contemporary issues facing global community and develop a global outlook and awareness. 5. The course methodology will require students to discuss in a group, give regular seminars and aim at publishing at least one article. This should help them hone oral and written communication skills. Not the least, students should develop a global outlook and awareness.
MGT 582	Technology Management	3	0	0	3	The course aims to develop basic understanding of technology and the characteristics of technology; why and how business organisations increasingly used

								technology- based strategies to gain competitive advantage; how technology impacts the organisation structure; how organisations 'manage' technology and technology development and what are the tools or techniques of management technology. At the end of the course, students will be able to perceive the ever- increasing role of technology in businesses and will have the required strategic understanding of how the organisations must manage technology to stay competitive.
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Semester IV

NU 612	Internship	0	0	0	12	Students work directly with GIS industries.
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Professional/Open Electives

COURSE CODE	COURSE NAME	L	T	P	C	DESCRIPTION
ECON 102	Economics	3	0	0	3	Nature and scope of economic science, its relationship with other social sciences; quantification of economic variables, theories of consumer behavior and of the firm: linear economic models; market structures; social accounting and basic elements of economic planning.
ET 401	Learning Technologies Project Course	0	0	1	4	It is within above framework and in pursuit of knowledge, skill and motivation for effective Teaching-Learning that the course is then designed to engage students in Learning Technologies Projects as drawn from individual students' specialization subject domains from



						engineering & technology, sciences, management, social sciences, humanities and green environment. Primarily, the learning technologies project categories will cover Projects in Designing System Development Life Cycle (SDLC) and Project-Based Learning.
GIS 562	GIS for Monitoring Natural Resource & Environmental Impacts	2	0	2	3	Geospatial technology has been widely adopted by industries, research communities, and decision makers to monitor, to study and to enhance natural resources. With integration capacity of GIS, it also allows assessment of impacts on natural resources on timely basis. The course will introduce students to applications of GIS to various domains related natural resources such as hydrology, air pollution, coastal zones and risk analysis, human resources (community health), etc.
GIS 611	Mobile GIS	2	0	2	3	This course introduces students to concepts in Mobile GIS technology, GPS theory, and the integration of GPS and GIS data. Students will learn how to use hand-held GPS units, hand held personal computers, and GPS software. Students would be able to plan a mobile project for use within an enterprise system and can choose appropriate data management and transaction models to support real-time field data collection. They will be able to create mobile map services that are optimized for use in the field and assess security needs and options for a mobile project. This will help in quickly configuring and deployment of a mobile project. Additionally, this will provide students

							a tool to synchronize data collected in the field with a geodatabase optimized for a mobile project. The course will emphasize the integration of geospatial technologies for field surveys.
GIS 631	Geoinformatics for Environment	2	0	2	3		Geoinformatics is increasingly being used to solve complex environmental problems in domains such as management of natural resources, land use planning and management, nature conservation, and environmental monitoring, require reliable spatial information and methodologies. This course combines information and communication technology (ICT), Geographical Information Systems (GIS), remote sensing, GPS and mapping, environmental and social sciences such as land use planning, geography, etc. This course will provide the students with adequate knowledge about environmental issues and its management. Develop understanding about environmental hazards, their assessment and monitoring, Space Technology (Geoinformatics) for environmental conservation, planning and management.
GIS 641	Artificial Neural Network in GIS	3	0	2	4		This course is an introduction to Artificial Neural Networks to GIS students. It will focus on the computational fundamentals of artificial neural networks and their applications.
MGT 201	Basics of Management	3	0	0	3		Topics to be covered include Introduction to Management: Meaning, Definition, its nature, purpose, importance & Functions;

					<p>Management as Art, Science. Is management a Profession; Difference between management and administration. Evolution of Management Thought: Contributions of F.W.Taylor, Henri Fayol, Elton Mayo, Chester Barhard, Peter Drucker, Michael Porter to management thought. Various approaches to management. Evolution of Management in India. Functions of Management: Planning - Meaning - Need & Importance, types, levels – advantages & limitations. Forecasting - Need & Techniques. Decision making - Types - Process of rational decision making & techniques of decision making. Organizing - Elements of organizing & processes: Types of organizations, Delegation of authority - Need, difficulties in delegation - Decentralization. Staffing - Meaning & Importance. Direction - Nature - Principles. Communication - Types & Importance. Motivation - Importance - theories.</p>	
MGT 601	Business Environment and Fundamentals of Management	3	0	0	3	<p>Basic understanding of business concepts, analytical tools and frameworks sharpen the edge of skills-set and capabilities of a student. This course intends to provide an overview of management of a business organization in a challenging, complex and dynamic environment which is by now well globalised. It would enable the students to be acquainted with the processes, policies and factors governing the performance of a business organization. The students will acquire the basic skills of evaluating the GIS projects in</p>

						<p>terms of its economic and business feasibility and its socio-economic implications at large. The course will use lectures, group projects and case studies to develop learners' analytical thinking and decision-making skills.</p>
NU 400	Directed Independent Study	1	0	0	4	<p>This course covers cloud technology, services, and covers containers and container orchestration - the process of transforming the way the technology industry does. It covers some of the tools and buzzwords in association with these technologies, such as Docker and Kubernetes, and gives an understanding of what they mean. The second part of this course provides foundational security knowledge to recognize, compare, and contrast different types of cybersecurity vulnerabilities and threats and indicators associated with network attacks.</p>



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PhD Programme- in Geographic Information Systems

The demand for Geographic Information Systems (GIS) and spatial data arises from the reliance of key decision makers and administrators on accurate and high-quality geospatial information in various administrative areas. These include disaster management, natural resource management and conservation, infrastructure planning and development, and land use planning.

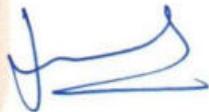
The rapid advancements in GIS and Global Positioning Systems (GPS) have revolutionized the correlation and utilization of map information from diverse sources, providing unprecedented accessibility and ease of use. To leverage these technologies effectively and gain a competitive edge in national and international markets, there is a pressing need to further develop the science of GIS. This necessitates the inclusion of PhD-level candidates in the private and public GIS sectors to address research-based products and contribute to advancements in geospatial technologies.

NIIT University's (NU) Doctor of Philosophy programme in Geographic Information Systems is designed to nurture researchers who can push the boundaries of knowledge in geospatial information sciences. By enhancing theories, exploring new technologies, employing innovative methodologies, conducting sophisticated quantitative analyses, and integrating applications, the PhD in GIS programme aims to cultivate advanced thinking and problem-solving skills among researchers. The ultimate goal is to develop competent doctoral scholars capable of performing advanced quantitative analysis in spatial modelling, spatial computing, and remote sensing.

Through this programme, NU seeks to contribute to the advancement of GIS research and facilitate the development of skilled professionals who can tackle complex challenges in the field. By fostering a research-oriented mindset and providing comprehensive training, the PhD in GIS programme at NU aims to empower scholars to make significant contributions to the evolution and application of geospatial technologies.

Areas of research

- Observation of Dynamic Climate Variation.
- Remote-Sensing based Moving Object Detection.
- Scene Classification in Remote Sensed Image.
- Prediction and Evaluation of Natural Disasters.
- Accurate Indication of Ground Object Mobility.
- Monitoring of Earth State using DL techniques.



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PROGRAM FILE

NU
AREA

MASTERS OF DESIGN
(LEARNING DESIGN)

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NIIT UNIVERSITY

VISION

At the core of every effective communication process lies Learning Design, a creative and strategic approach that permeates various domains such as learning content, marketing, advertisement, product and service brochures, documentary films, and multimedia products. It is the driving force behind successfully reaching the intended users and achieving desired goals. Drawing from the invaluable experience gained through NIIT University's M Tech Programme in Educational Technology, with a specific focus on learning engineering, we aspire to establish a pioneering Program in Learning Design.

The Master of Design (M Des) in Learning Design is tailored to individuals from diverse backgrounds in content development and related fields. This comprehensive course places a strong emphasis on interdisciplinary collaboration and offers a dynamic, project-based studio environment. Learners have the opportunity to enhance their expertise within their chosen design field, including visual communication design, while also expanding their skills and knowledge in design practice. It is imperative for learners to embody a perfect balance of intuition and analysis, recognizing that design is both an art and a science.

Through our visionary approach, we endeavor to empower learners with the ability to harness the potential of Learning Design across various industries, fostering innovation and driving meaningful change in the world of communication and education.

MISSION

Our mission can be summarized as follows:

1. **Promotion and Advancement of Learning Design:** We aim to promote and advance the application of Learning Design as a creative and strategic approach essential to every communication process. Whether it's developing learning content, designing marketing campaigns, creating advertisements, crafting brochures, producing documentaries, or developing multimedia products, our goal is to ensure effective engagement with users and achieve desired outcomes.
2. **Leveraging Expertise and Establishing a Program:** Building on the expertise gained from NIIT University's successful M Tech Programme in Educational Technology, which focuses on learning engineering, we are committed to establishing a related Program in Learning Design. The Master of Design (M Des) in Learning Design is designed to cater to learners from diverse content development and related fields.
3. **Interdisciplinary Collaboration and Project-Based Studio Environment:** Our program emphasizes the fusion of interdisciplinary collaboration, providing a stimulating project-based studio environment. Learners have the opportunity to enhance their skills and expertise in their chosen design field, with a specific emphasis on visual communication design, while also expanding their knowledge in design practice.
4. **Balancing Intuition and Analysis:** We recognize that successful design requires a harmonious blend of intuition and analysis, acknowledging that design is both an art and a science. Our program framework acknowledges the social and natural worlds as the greater context for all design problems.
5. **Rigorous Process and Future-Oriented Thinking:** Through a comprehensive curriculum comprising coursework and research, our graduate learners acquire a rigorous process for documenting, analyzing, and understanding the past and present. Equipped with this

knowledge, they propose more desirable systems and interactions for the future, addressing the evolving needs of society.

6. Empowering Agents of Positive Change: Our mission is to equip learners with the necessary skills, knowledge, and mindset to become agents of positive change in the field of Learning Design. We aim to foster a community of innovative thinkers capable of designing impactful experiences that transcend traditional boundaries and drive our society forward.

By pursuing these mission objectives, the MDes area in NIIT University aims to produce skilled and ethical professionals who are well-equipped to address the challenges and opportunities in the field of biotechnology.

Program Educational Objectives (POEs) for the Master of Design (M Des) in Learning Design:

POE1. Design Expertise: Graduates will possess a comprehensive understanding of Learning Design principles, theories, and methodologies. They will demonstrate mastery in applying design thinking and creative problem-solving strategies to develop innovative and effective solutions for diverse learning contexts.

POE2. Interdisciplinary Collaboration: Graduates will have the ability to collaborate effectively with professionals from various disciplines, including educators, technologists, and subject matter experts. They will demonstrate proficiency in integrating different perspectives and expertise to create holistic and impactful learning experiences.

POE3. User-Centered Design: Graduates will prioritize the needs, preferences, and diverse backgrounds of learners in their design processes. They will be skilled in conducting user research, usability testing, and iterative design iterations to ensure the development of inclusive and engaging learning solutions.

POE4. Technological Fluency: Graduates will be proficient in leveraging a wide range of technologies and tools to enhance learning experiences. They will possess expertise in instructional design, multimedia development, learning management systems, and emerging technologies, allowing them to create immersive and interactive learning environments.

POE5. Ethical and Responsible Design: Graduates will understand the ethical considerations and social impact of their design decisions. They will demonstrate a commitment to designing ethically responsible and culturally sensitive learning materials that promote inclusivity, accessibility, and respect for diverse learners.

These Program Educational Objectives (PEOs) encapsulate our program's aim to cultivate graduates who possess a strong foundation in Learning Design, are adept at collaboration and user-centered approaches, proficient in leveraging technology, and committed to ethical and responsible design practices. Through these objectives, we strive to equip our graduates with the skills and knowledge necessary to shape the future of education and create meaningful and transformative learning experiences.

Program Specific Outcomes (PSOs)

Program Specific Outcomes for the Master of Design (M Des) in Learning Design program:

PSO1. Learning Design Expertise: Graduates will demonstrate a deep understanding of learning design principles, theories, and methodologies. They will be proficient in applying design thinking and pedagogical strategies to develop effective and engaging learning experiences across diverse educational settings.

PSO2. Design Thinking and Innovation: Graduates will exhibit proficiency in utilizing design thinking methodologies to identify and address complex challenges in learning design. They will demonstrate the ability to generate innovative solutions that align with learning objectives, leverage emerging technologies, and meet the evolving needs of learners.

PSO3. Instructional Material Development: Graduates will possess advanced skills in designing and developing instructional materials tailored to specific learning objectives and target audiences. They will demonstrate expertise in content organization, sequencing, and the use of multimedia elements to enhance learning outcomes and promote learner engagement.

PSO4. Evaluation and Assessment: Graduates will be able to design and implement effective evaluation and assessment strategies for learning interventions. They will demonstrate proficiency in developing assessment tools, conducting data analysis, and utilizing evaluation results to inform instructional design decisions and improve learning outcomes.

PSO5. Collaboration and Leadership: Graduates will exhibit strong collaborative and leadership skills essential for working in multidisciplinary teams. They will effectively communicate and collaborate with educators, subject matter experts, and other stakeholders to create cohesive and impactful learning design solutions. They will also demonstrate leadership qualities in driving innovation, managing projects, and promoting positive change in learning design practices.

These Program Specific Outcomes (PSOs) highlight the core objectives of the Master of Design (M Des) in Learning Design program. By achieving these outcomes, graduates will be well-equipped to design and implement effective learning experiences, leverage technology for instructional design, and lead innovative initiatives that enhance educational practices and outcomes.

Programme Outcomes (POs)

1. To develop in-depth knowledge about various aspects of Design.
2. To understand how Design is important for Business.
3. Develop brainstorming and prototyping skills to spur ideas and creativity.
4. To learn to experiment first, Fail fast and redeploy again in iterative cycles.
5. To learn to work in teams.
6. Learn how to understand customers and their needs.

Programme of Study

Postgraduate Programme

- Master of Design (M Des) in Learning Design

PARENT FEEDBACK ON CURRICULUM AND INFRASTRUCTURE

Programme Architecture

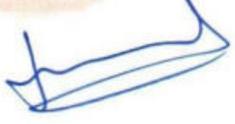
Postgraduate Programme

MASTERS OF DESIGN

(LEARNING DESIGN)

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MASTERS OF DESIGN (LEARNING DESIGN)					
M.Des.					
Course Code	Course Title	L	T	P	C
Semester I					
LD 501	Learning Science I	4	0	0	4
LD 511	Foundations of Learning Design	0	4	0	4
NU 522	Contemporary Issues	2	0	0	2
TA 541	Communication for Marketing	3	0	0	3
LD 521	Design Methods I	1	2	0	3
LD 531	Project: Intervention Lab	0	0	4	2
NU 651	Independent Reading & Writing Course-I				3
	Total Semester L-T-P-C	10	6	4	21
Semester II					
LD 502	Learning Science 2	4	0	0	4
LD 522	The Edge of Learning Design	0	4	0	4
LD 532	Design Methods 2	1	2	2	4
ET 512	PE - Applied Instructional Design	2	0	2	3
ET 542	PE - Gamification	1	0	2	3
LD 542	Project: Curriculum Lab	1	0	4	3
	Total Semester L-T-P-C	9	6	10	21
Semester III					
LD 601	Advanced Gaming	4	0	0	4
LD 611	Immersive Learning	4	0	0	4
LD 621	Design Methods 3	1	2	2	4
ET 532	PE - Assessment & Certification	2	1	0	3
TA 601	PE - Applied Visual Techniques	1	0	4	3
LD 631	Project: Immersion Lab	1	0	4	3
	Total Semester L-T-P-C	13	3	10	21
Semester IV					
NULD 602	Internship	0	0	0	12
	Total Semester L-T-P-C	0	0	0	12


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