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A.G.M RURALCOLLEGEOFENGINEERINGANDTECHNOLOGY, VARUR
NavagrahTeerth, NH-4 P. B. Road Opp, VRL Head Office, VARUR-581207, Hubballi, Dist. Dharwad, Karnataka
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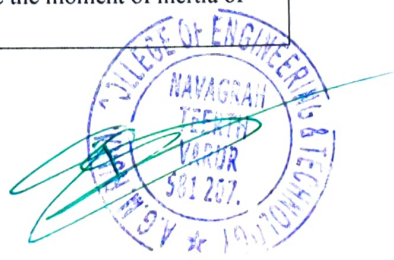
DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING
CO STATEMENT FOR THE SCHEME 2021 (BATCH 2021-2025)

SL.NO	SUB NAME	COs	CO Statement
I SEM			
1	CALCULUS AND LINEAR ALGEBRA	21MAT11.1	Apply the knowledge of calculus to solve problems related to polar curves and its applications in determining the bentness of a curve.
		21MAT11.2	Learn the notion of partial differentiation to calculate rate of change of multivariate functions and solve problems related to composite functions and Jacobian.
		21MAT11.3	Solve first-order linear/nonlinear ordinary differential equations analytically using standard methods.
		21MAT11.4	Demonstrate various models through higher order differential equations and solve such linear ordinary differential equations.
		21MAT11.5	Test the consistency of a system of linear equations and to solve them by direct and iterative methods.
2	ENGINEERING PHYSICS	21PHY12.1	Interpret the types of mechanical vibrations and their applications, the role of Shock waves in various fields.
		21PHY12.2	Demonstrate the quantisation of energy for microscopic system.
		21PHY12.3	App[y LASER and Optical fibers in opto electronic system.
		21PHY12.4	Illustrate merits of quantum free electron theory and applications of Hall effect.
		21PHY12.5	Analyse the importance of XRD and Electron Microscopy in Nano material characterization.
3	BASIC ELECTRICAL ENGINEERING	21ELE13.1	Analyse basic DC and AC electric circuits.
		21ELE13.2	Explain the working principles of transformers and electrical machines.
		21ELE13.3	Explain the concepts of electric power transmission and distribution of power.
		21ELE13.4	Understand the wiring methods, electricity billing, and working principles of circuit protective devices and personal safety measures.
4	ELEMENTS OF CIVIL ENGINEERING AND MECHANICS	21CIV14.1	Understand the various fields of civil engineering.
		21CIV14.2	Compute the resultant of a force system and resolution of a force.
		21CIV14.3	Comprehend the action for forces, moments, and other types of loads on rigid bodies and compute the reactive forces.
		21CIV14.4	Locate the centroid and compute the moment of inertia of regular and built-upsections.



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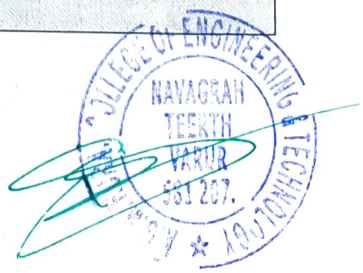
5	ENGINEERING GRAPHICS	21CIV14.5	Analyze the bodies in motion.
		21EVN15.1	To understand the basic principles and conventions of engineering drawing
		21EVN15.2	To use drawing as a communication mode
		21EVN15.3	To generate pictorial views using CAD software
		21EVN15.4	To understand the development of surfaces
		21EVN15.5	To visualise engineering components
6	ENGINEERING PHYSICS LABORATORY	21PHYL16.1	Understand the measuring techniques.
		21PHYL16.2	Operate different instruments and be capable to analyse the experimental results.
		21PHYL16.3	Construct the circuits and their analysis.
7	BASIC ELECTRICAL ENGINEERING LABORATORY	21ELE17.1	Verify KCLand KVLand maximum power transfer theorem for DC circuits.
		21ELE17.2	Compare power factors of different types of lamps.
		21ELE17.3	Demonstrate the measurement of the impedance of an electrical circuit and power consumed by a 3-phase load.
		21ELE17.4	Analyze two-way and three-way control of lamps.
		21ELE17.5	Explain the effects of open and short circuits in simple circuits.
		21ELE17.6	Interpret the suitability of earth resistance measured.
8	COMMUNICATIVE ENGLISH	21EGH18.1	Understand and apply the Fundamentals of Communication Skills in their communication skills. Understand and useall types of English vocabulary and language proficiency.
		21EGH18.2	Identify the nuances of phonetics, intonation and enhance pronunciation skills.
		21EGH18.3	To impart basic English grammar and essentials of language skills as per present requirement.
		21EGH18.4	Understand and useall types of English vocabulary and language proficiency.
		21EGH18.5	Adoptthe Techniques of Information Transfer through presentation.
9	INNOVATION AND DESIGN THINKING	21ITD19.1	Appreciate various design process procedure
		21ITD19.2	Generate and develop design ideas through different technique
		21ITD19.3	Identify the significance of reverse Engineering to Understand products
		21ITD19.4	Draw technical drawing for design ideas
II SEM			



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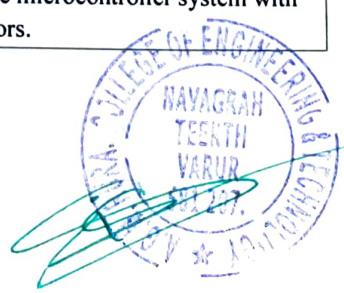
10	ADVANCED CALCULUS AND NUMERICAL METHODS	21MAT21.1	Apply the concept of change of order of integration and change of variables to evaluate multiple integrals and their usage in computing the area and volume.
		21MAT21.2	Illustrate the applications of multivariate calculus to understand the solenoidal and irrotational vectors and also exhibit the inter dependence of line, surface and volume integrals.
		21MAT21.3	Formulate physical problems to partial differential equations and to obtain solution for standard practical PDE's.
		21MAT21.4	Apply the knowledge of numerical methods in modelling of various physical and engineering phenomena.
		21MAT21.5	Solve first order ordinary differential equations arising in engineering problems.
11	ENGINEERING CHEMISTRY	21CHE 22.1	Impart the basic knowledge of chemistry and its principles involved in electrochemistry, energy storage devices and its commercial applications.
		21CHE 22.2	Understand the basic principles of corrosion and its prevention, metal finishing and its technological importance
		21CHE 22.3	Master the knowledge of synthesis, properties and utilization of engineering materials like polymers & Nano materials.
		21CHE 22.4	Apply the knowledge of Green Chemistry principles for production of chemical compounds. understanding the concepts of alternative energy sources.
		21CHE 22.5	Understand the basic concepts of water chemistry & theory, basic principle and applications of volumetric analysis and analytical instruments.
12	PROBLEM SOLVING THROUGH PROGRAMMING	21PSP23/13.1	Elucidate the basic architecture and functionalities of a computer and also recognize the hardware parts.
		21PSP23/13.2	Apply programming constructs of C language to solve the real world problem
		21PSP23/13.3	Explore user-defined data structures like arrays in implementing solutions to problems like searching and sorting
		21PSP23/13.4	Explore user-defined data structures like structures, unions and pointers in implementing solutions
		21PSP23/13.5	Design and Develop Solutions to problems using modular programming constructs using functions
13	BASIC ELECTRONICS AND COMMUNICATION ENGINEERING	21ELN24/14.1	Describe the concepts of electronic circuits encompassing power supplies, amplifiers and oscillators
		21ELN24/14.2	Present the basics of digital logic engineering including data representation, circuits and the microcontroller system with associated sensors and actuators.



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		21ELN24/14.3	Discuss the characteristics and technological advances of embedded systems.
		21ELN24/14.4	Relate to the fundamentals of communication engineering spanning from the frequency spectrum to the various circuits involved including antennas.
		21ELN24/14.5	Explain the different modes of communications from wired to wireless and the computing involved.
14	ELEMENTS OF MECHANICAL ENGINEERING	21EME25/15.1	Acquire a basic understanding role of Mechanical Engineering in the industry and society
		21EME25/15.2	Acquire a basic understanding of the formation of steam and its industrial application.
		21EME25/15.3	Acquire a basic understanding of renewable energy resources and basic concepts of Hydraulic turbines.
		21EME25/15.4	Acquire knowledge of various engineering materials and metal joining techniques.
		21EME25/15.5	Acquire essential experience with heat transfer devices.
		21EME25/15.6	Acquire knowledge on automobile technology in transport application and basics of Refrigeration and Air-Conditioning.
		21EME25/15.7	Acquire essential experience on basic Power transmission systems, including mechanical linkages.
		21EME25/15.8	Acquire knowledge of basic con
15	ENGINEERING CHEMISTRY LABORATORY	21CHEL26/16.1	Determine the pKa and coefficient of Viscosity of a given organic liquid.
		21CHEL26/16.2	Estimate the amount of substance present in the given solution using Potentiometer Conductometric and Colorimetric.
		21CHEL26/16.3	Determine the total hardness and chemical oxygen demand in the given solution by volumetric analysis method
		21CHEL26/16.4	Estimate the percentage of Nickel, copper and Iron in the given analyte solution by titration method.
		21CHEL26/16.5	CO5 Demonstrate flame photometric estimation of sodium & potassium and the synthesis of nanomaterials by Precipitation method.Handling different types of instruments for analysis of materials using small quantities of materials involved in quick and accurate results
16	COMPUTER PROGRAMMING LABORATOR	21CPL27/17.1	1. Define the problem statement and identify the need for computer programming
		21CPL27/17.2	2. Make use of C compiler, IDE for programming, identify and correct the syntax and syntactic errors in programming
		21CPL27/17.3	3. Develop algorithm, flowchart and write programs to solve the given problem

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		21CPL27/17.4	4. Demonstrate use of functions, recursive functions, arrays, strings, structures and pointers in problem solving.
		21CPL27/17.5	5. Document the inference and observations made from the implementation. Write algorithms ,flowcharts and program for simple problems
17	PROFESSIONAL WRITING SKILLS IN ENGLISH	21EGH28.1	To understand and identify the Common Errors in Writing and Speaking.
		21EGH28.2	To Achieve better Technical writing and Presentation skills
		21EGH28.3	To read Technical proposals properly and make them to Write good technical reports.
		21EGH28.4	Acquire Employment and Workplace communication skills
		21EGH28.5	To learn about Techniques of Information Transfer through presentation in different level
18	SCIENTIFIC FOUNDATIONS OF HEALTH	21SFH29.1	To understand Health and wellness (and its Beliefs)
			To acquire Good Health & It's balance for positive mindset
			To inculcate and develop the healthy lifestyle habits for good health.
			To Create of Healthy and caring relationships to meet the requirements of MNC and LPG world
			To adopt the innovative & positive methods to avoid risks from harmful habits in their campus & outside the campus.
			To positively fight against harmful diseases for good health through positive mindset.
III SEM			
19	TRANSFORM CALCULUS, FOURIER SERIES AND NUMERICAL TECHNIQUES	21MAT31.1	To solve ordinary differential equations using Laplace transform.
		21MAT31.2	Demonstrate Fourier series to study the behaviour of periodic functions and their applications in system communications, digital signal processing and field theory
		21MAT31.3	3. To use Fourier transforms to analyze problems involving continuous-time signals and to apply Z-Transform techniques to solve difference equations
		21MAT31.4	To solve mathematical models represented by initial or boundary value problems involving partial differential equations
		21MAT31.5	. Determine the extremals of functionals using calculus of variations and solve problems arising in dynamics of rigid bodies and vibrational analysis.
20	DATA STRUCTURES AND APPLICATIONS	21CS32.1	. Identify different data structures and their applications
		21CS32.2	Apply stack and queues in solving problems.

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		21CS32.3	Demonstrate applications of linked list.
		21CS32.4	Explore the applications of trees and graphs to model and solve the real-world problem.
		21CS32.5	Make use of Hashing techniques and resolve collisions during mapping of key value pairs
21	ANALOG AND DIGITAL ELECTRONICS	21CS33.1	Design and analyze application of analog circuits using photo devices, timer IC, power supply and regulator IC and op-amp.
		21CS33.2	Explain the basic principles of A/D and D/A conversion circuits and develop the same.
		21CS33.3	Simplify digital circuits using Karnaugh Map, and Quine-McClusky Methods
		21CS33.4	Explain Gates and flip flops and make us in designing different data processing circuits, registers and counters and compare the types.
		21CS33.5	Develop simple HDL programs
22	COMPUTER ORGANIZATION AND ARCHITECTURE	21CS34.1	Explain the organization and architecture of computer systems with machine instructions and programs
		21CS34.2	Analyze the input/output devices communicating with computer system
		21CS34.3	Demonstrate the functions of different types of memory devices
		21CS34.4	Apply different data types on simple arithmetic and logical unit
		21CS34.5	Analyze the functions of basic processing unit, Parallel processing and pipelining
23	OBJECT ORIENTED PROGRAMMING WITH JAVA LABORATORY	21CSL35.1	Use Eclipse/NetBeans IDE to design, develop, debug Java Projects.
		21CSL35.2	Analyze the necessity for Object Oriented Programming paradigm over structured programming and become familiar with the fundamental concepts in OOP.
		21CSL35.3	Demonstrate the ability to design and develop java programs, analyze, and interpret objectoriented data and document results.
		21CSL35.4	Apply the concepts of multiprogramming, exception/event handling, abstraction to develop robust programs.
		21CSL35.5	Develop user friendly applications using File I/O and GUI concepts
24	PROGRAMMING IN C++	21CS382.1	Able to understand and design the solution to a problem using object-oriented programming concepts.
		21CS382.2	Able to reuse the code with extensible Class types, User-defined operators and function Overloading
		21CS382.3	Achieve code reusability and extensibility by means of

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			Inheritance and Polymorphism
		21CS382.4	Identify and explore the Performance analysis of I/O Streams.
		21CS382.5	. Implement the features of C++ including templates, exceptions and file handling for providing programmed solutions to complex problems
25	CONSTITUTION OF INDIA AND PROFESSIONAL ETHICS (CIP)	21CIP37/47.1	Analyse the basic structure of Indian Constitution.
		21CIP37/47.2	Remember their Fundamental Rights, DPSP's and Fundamental Duties (FD's) of our constitution.
		21CIP37/47.3	know about our Union Government, political structure & codes, procedures.
		21CIP37/47.4	Understand our State Executive & Elections system of India.
		21CIP37/47.5	Remember the Amendments and Emergency Provisions, other important provisions given by the constitution.
26	NATIONAL SERVICE SCHEME	21NS83.1	Under stand the importance of his / her responsibilities towards society.
		21NS83.2	Analyze the environmental and societal problems/issues and will be able to design solutions for the same.
		21NS83.3	Evaluate the existing system and to propose practical solutions for the same for sustainable development.
		21NS83.4	Implement government or self-driven projects effectively in the field.
IV SEM			
28	DESIGN AND ANALYSIS OF ALGORITHMS	21CS42.1	Analyze the performance of the algorithms, state the efficiency using asymptotic notations and analyze mathematically the complexity of the algorithm.
		21CS42.2	Apply divide and conquer approaches and decrease and conquer approaches in solving the problems analyze the same
		21CS42.3	Apply the appropriate algorithmic design technique like greedy method, transform and conquer approaches and compare the efficiency of algorithms to solve the given problem
		21CS42.4	Apply and analyze dynamic programming approaches to solve some problems. and improve an algorithm time efficiency by sacrificing space.
		21CS42.5	Apply and analyze backtracking, branch and bound methods and to describe P, NP and NPComplete problems.
29	MICROCONTROLLE	21CS43.1	Explain C-Compilers and optimization

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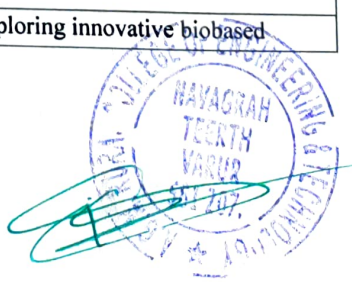
	R AND EMBEDDED SYSTEMS	21CS43.2	Describe the ARM microcontroller's architectural features and program module.
		21CS43.3	. Apply the knowledge gained from programming on ARM to different applications
		21CS43.4	Program the basic hardware components and their application selection method.
		21CS43.5	Demonstrate the need for a real-time operating system for embedded system applications.
30	OPERATING SYSTEMS	21CS44.1	Identify the structure of an operating system and its scheduling mechanism
		21CS44.2	Demonstrate the allocation of resources for a process using scheduling algorithm
		21CS44.3	. Identify root causes of deadlock and provide the solution for deadlock elimination
		21CS44.4	Explore about the storage structures and learn about the Linux Operating system.
		21CS44.5	Analyze Storage Structures and Implement Customized Case study
31	PYTHON PROGRAMMING LABORATORY	21CSL46.1	Demonstrate proficiency in handling of loops and creation of functions.
		21CSL46.2	Identify the methods to create and manipulate lists, tuples and dictionaries
		21CSL46.3	Discover the commonly used operations involving regular expressions and file system.
		21CSL46.4	Interpret the concepts of Object-Oriented Programming as used in Python.
		21CSL46.5	Determine the need for scraping websites and working with PDF, JSON and other file formats.
32	UNIX SHELL PROGRAMMING	21CS482.1	Know the basics of Unix concepts and commands.
		21CS482.2	Evaluate the UNIX file system.
		21CS482.3	Apply Changes in file system.
		21CS482.4	Understand scripts and programs
		21CS48.5	Analyze Facility with UNIX system process
33	BIOLOGY FOR ENGINEERS	21BE45.1	Elucidate the basic biological concepts via relevant industrial applications and case studies.
		21BE45.2	Evaluate the principles of design and development, for exploring novel bioengineering projects.
		21BE45.3	Corroborate the concepts of biomimetics for specific requirements.
		21BE45.4	Think critically towards exploring innovative biobased



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34	UNIVERSAL HUMAN VALUES	21UHV49.1	By the end of the course, students are expected to become more aware of themselves, and their surroundings (family, society, nature); they would become more responsible in life, and in handling problem.
		21UHV49.2	They would have better critical ability. They would also become sensitive to their commitment towards what they have understood (human values, human relationship and human society). It is hoped that they would be able to apply what they have learnt to their own self in different day-to-day settings in real life, at least a beginning would be made in this direction.
		21UHV49.3	Therefore, the course and further follow up is expected to positively impact common graduate attributes like: 1. Holistic vision of life 2. Socially responsible behaviour 3. Environmentally responsible work 4. Ethical human conduct 5. Having Competence and Capabilities for Maintaining Health and Hygiene 6. Appreciation and aspiration for excellence (merit) and gratitude for all
		V SEM	
35	AUTOMATA THEORY AND COMPILER DESIGN	21CS51.1	Acquire fundamental understanding of the core concepts in automata theory and Theory of Computation
		21CS51.2	Design and develop lexical analyzers, parsers and code generators
		21CS51.3	Design Grammars and Automata (recognizers) for different language classes and become knowledgeable about restricted models of Computation (Regular, Context Free) and their relative powers.
		21CS51.4	Acquire fundamental understanding of the structure of a Compiler and Apply concepts automata theory and Theory of Computation to design Compilers
		21CS51.5	Design computations models for problems in Automata theory and adaptation of such model in the field of compilers
36	COMPUTER NETWORKS	21CS52.1	. Identify, analyze and define database objects, enforce integrity constraints on a database using RDBMS
		21CS52.2	Use Structured Query Language (SQL) for database manipulation and also demonstrate the basic of query evaluation.
		21CS52.3	Design and build simple database systems and relate the concept of transaction, concurrency control and recovery in database
		21CS52.4	Develop application to interact with databases, relational algebra expression

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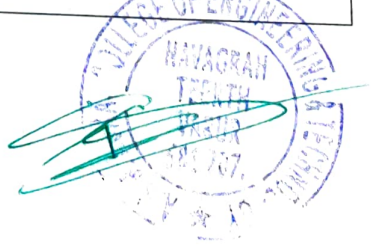
		21CS52.5	Develop applications using tuple and domain relation expression from queries.
37	ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING	21CS53.1	Apply the knowledge of searching and reasoning techniques for different applications.
		21CS53.2	Have a good understanding of machine leaning in relation to other fields and fundamental issues and challenges of machine learning
		21CS53.3	Apply the knowledge of classification algorithms on various dataset and compare results
		21CS53.4	Model the neuron and Neural Network, and to analyze ANN learning and its applications
		21CS53.5	Identifying the suitable clustering algorithm for different pattern
38	DATABASE MANAGEMENT SYSTEM LABORATORY WITH MINI PROJECT	21CSL55.1	Create, Update and query on the database.
		21CSL55.2	Demonstrate the working of different concepts of DBMS
		21CSL55.3	Implement, analyze and evaluate the project developed for an application.
39	ANGULAR JS	21CSL581. 1	Develop Angular JS programs using basic features
		21CSL581. 2	Develop dynamic Web applications using AngularJS modules
		21CSL581.3	Make use of form validations and controls for interactive applications
		21CSL581. 4	Appy the concepts of Expressions, data bindings and filters in developing Angular JS programs
		21CSL581. 5	Make use of modern tools to develop Web applications
40	ENVIRONMENTAL STUDIES	21CIV57.1	Understand the principles of ecology and environmental issues that apply to air, land, and water issues on a global scale,
		21CIV57.2	Develop critical thinking and/or observation skills, and apply them to the analysis of a problem or question related to the environment as legislation.
		21CIV57.3	Apply their ecological knowledge to illustrate and grasp the problem and describe the realities that managers face when dealing with complex issues.
41	RESEARCH METHODOLOGY & INTELLECTUAL PROPERTY RIGHTS	21RM56.1	To know the meaning of engineering research
		21RM56.1	To know the procedure of Literature Review and Technical Reading
		21RM56.1	To know the fundamentals of patent laws and drafting procedure.
		21RM56.1	. Understanding the copyright laws and subject matters of copyrights and designs
			. Understanding the basic principles of design rights.



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VI SEM			
42	SOFTWARE ENGINEERING & PROJECT MANAGEMENT	21CS61.1	Understand the activities involved in software engineering and analyze the role of various process models
		21CS61.2	Explain the basics of object-oriented concepts and build a suitable class model using modelling techniques
		21CS61.3	Describe various software testing methods and to understand the importance of agile methodology and DevOps
		21CS61.4	Illustrate the role of project planning and quality management in software development
		21CS61.5	Understand the importance of activity planning and different planning models
43	FULLSTACK DEVELOPMENT	21CS62.1	Understand the working of MVT based full stack web development with Django
		21CS62.2	Designing of Models and Forms for rapid development of web pages.
		21CS62.3	Analyze the role of Template Inheritance and Generic views for developing full stack web applications.
		21CS62.4	Apply the Django framework libraries to render nonHTML contents like CSV and PDF
		21CS62.5	. Perform jQuery based AJAX integration to Django Apps to build responsive full stack web applications,
44	COMPUTER GRAPHICS AND FUNDAMENTALS OF IMAGE PROCESSING	21CS63.1	Construct geometric objects using Computer Graphics principles and OpenGL APIs
		21CS63.2	Use OpenGL APIs and related mathematics for 2D and 3D geometric Operations on the objects
		21CS63.3	Design GUI with necessary techniques required to animate the created objects
		21CS63.4	Apply OpenCV for developing Image processing applications.
		21CS63.5	Apply Image segmentation techniques along with programming, using OpenCV, for developing simple applications.
45	AGILE TECHNOLOGIES	21CS641.1	Understand the fundamentals of agile technologies
		21CS641.2	Explain XP Lifecycle, XP Concepts and Adopting XP
		21CS641.3	Apply different techniques on Practicing XP, Collaborating and Releasing
		21CS641.4	Analyze the Values and Principles of Mastering Agility
		21CS641.5	Demonstrate the agility to deliver good values
46	ADVANCED JAVA PROGRAMMING	21CS642.1	Understanding the fundamental concepts of Enumerations and Annotations
		21CS642.2	Apply the concepts of Generic classes in Java programs
		21CS642.3	Demonstrate the concepts of String operations in Java
		21CS642.4	Develop web based applications using Java servlets and JSP
		21CS642.5	Illustrate database interaction and transaction processing in Java