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||Jai Sri Gurudev||

Sri Adichunchanagiri Shikshana Trust (R.)

SJC INSTITUTE OF TECHNOLOGY

An Autonomous Institution under VTU from 2024-25

AICTE Approved, Accredited by NAAC with A+ Grade & NBA (CSE, ISE, ECE, ME & CV), NIRF(151-300) in 2023,Gold Rated by QS I-Gauge

P.B. No.20, B.B Road, Chikkaballapur - 562 101, Karnataka

Estd : 1986

V Semester

Scheme & Syllabus of B.E. Programme

Information Science & Engineering

(2024 Scheme)

Core Values

Spiritual, **J**udicious, **C**ommitment, **I**ntegrity, **T**rustworthy

AICTE | NIRF 151-300 NATIONAL INSTITUTIONAL RANKING FRAMEWORK | NBA ACCREDITED | NAAC A+ ACCREDITED WITH GRADE | QS I-GAUGE INDIAN UNIVERSITY RATING GOLD | INSTITUTION'S INNOVATION COUNCIL (Ministry of HRD Initiative) 4-Star Rating

SJC INSTITUTE OF TECHNOLOGY, CHIKKABALLAPURA

An Autonomous institution Under VTU from 2024 – 2025

AICTE Approved, Accredited by NBA(CSE, ISE, ECE, ME, CV) and NAAC with 'A+' grade, QS – I Gauge Gold Rated

SCHEME OF TEACHING AND EXAMINATION – B.E. –

Information Science and Engineering

(Applicable for students admitted from the Academic Year 2024-25 and onwards)

5th Semester

Information Science and Engineering

Sl. No.	Course Code	Course Title	Course Type	TD/ PSB	Teaching Hours / Week			Examination				
					L	T	P	SEE Duration (Hrs)	CIE Marks	SEE Marks	Total Marks	Credits
1	BCS501	Software Engineering and Project Management	PCC	TD:IS PSD:IS	3	0	0	**3**	**50**	**50**	**100**	**3**
2	BCS502	Computer Networks	IPCC	TD:IS PSD:IS	3	0	2	**3**	**50**	**50**	**100**	**4**
3	BCS503	Theory of Computation	PCC	TD:IS PSD:IS	3	2	0	**3**	**50**	**50**	**100**	**4**
4	BISL504	Mobile Application Development Lab	PCCL	TD:IS PSD:IS	0	0	2	**3**	**50**	**50**	**100**	**1**
5	BIS525x	Professional Elective Course – I	PEC	TD:IS PSD:IS	3	0	0	**3**	**50**	**50**	**100**	**3**
6	BIS536	Mini Project	PROJ	TD:IS PSD:IS	0	0	4	**3**	**50**	**50**	**100**	**2**
7	BRM507	Research Methodology and IPR	AEC	TD:IS PSD:IS	2	2	0	**3**	**50**	**50**	**100**	**3**
8	BCE508	Competency Enhancement Course-3	NCMC	CDCAC	0	2	0	-	**100**	-	**100**	**0**
9	BNS509	National Service Scheme (NSS)	NCMC	NSS Coordinator	0	0	2	-	**100**	-	**100**	**0**
	BPE509	Physical Education (PE) (Sports and Athletics)		Physical Education								

				Director								
	BYO509	Yoga		Yoga Teacher								
	BMU509	Music		Music Teacher								
									550	350	900	20

ASC: Applied Science Course, PCC: Professional Core Course, IPCC: Integrated Professional Core Course, PCCL: Professional Core Course laboratory, UHV: Universal Human Value Course, NCMC: Non Credit Mandatory Course, AEC: Ability Enhancement Course, SEC: Skill Enhancement Course, ESC: Engineering Science Course, ETC: Emerging Technology Course, PLC: Programming Language Course, L: Lecture, T: Tutorial, P: Practical, CIE: Continuous Internal Evaluation, SEE: Semester End Evaluation.

Professional Elective Course – I

Course Code	Course Name	Course Code	Course Name
BIS525A	Cryptography and Network Security	BIS525C	UI/UX
BIS525B	Foundations of AI	BIS525D	Embedded Systems and Sensor Technology

Professional Core Course (IPCC): Refers to Professional Core Course Theory Integrated with practical of the same course. Credit for IPCC can be 04 and its Teaching– Learning hours (L : T : P) can be considered as (3 : 0 : 2) or (2 : 2 : 2). The theory part of the IPCC shall be evaluated both by CIE and SEE. The practical part shall be evaluated by only CIE (no SEE). However, questions from the practical part of IPCC shall be included in the SEE question paper. For more details, the regulation governing the Degree of Bachelor of Engineering (B.E.) 2024-25 may please be referred.

National Service Scheme /Physical Education/Yoga/Music: All students have to register for any one of the courses namely National Service Scheme(NSS), Physical Education(PE)(Sports and Athletics), Yoga and Music with the concerned coordinator / teacher of the course during the first week of 3rd semester. Activities shall be carried out between 3rd semester to the 6th semester (for 4 semesters). Successful completion of the registered course and requisite CIE score is mandatory for the award of the degree. The events shall be appropriately scheduled by the colleges and the same shall be reflected in the calendar prepared for the NSS, PE, Yoga and Music activities. These courses shall not be considered for vertical progression as well as for the calculation of SGPA and CGPA, but completion of the course is mandatory for the award of degree.

Semester: V					
Software Engineering and Project Management					
Course Code	**:**	BCS501	**Credits**	**:**	3
Hours/Week(L:T:P)	**:**	3:0:0	**CIE**	**:**	50 Marks
Total Hours	**:**	40L	**SEE**	**:**	50 Marks
Course Type	**:**	PCC	**SEE Duration**	**:**	3 Hours

Prerequisites:	
Courses	Data Structures and Algorithms, Object-Oriented Programming
Knowledge on Fundamental Concepts	Analytical thinking, Critical thinking
Knowledge on Connected Tools (If any)	UML Tools Star UML, Debuggers

Course Learning Objectives: This course will enable the students to	
CLO1	Outline software engineering principles and activities involved in building large software programs.
CLO2	Illustrate the methods used for gathering, categorizing, documenting, and validating software requirements
CLO3	Understand the Unified Modeling Language (UML) and its application in software design.
CLO4	Analyze software requirements to design effective test cases.
CLO5	Identify software quality parameters and quantify software using measurements and metrics. List software quality standards and outline the practices involved.

Module – 1	**08Hrs**
Introduction: Professional software development, Software engineering ethics, Case studies. **Software Processes**: Software Process models: The Waterfall model – A Case study, Incremental development, Reuse-oriented software engineering, Process activities: Software specification, Software design and implementation, Software validation, Coping with Change: Prototyping, Incremental Delivery, Boehm's Spiral Model. **Textbook 1: Ch. 1:** 1.1 to 1.3, **Ch. 2:** 2.1 to 2.3	
Module – 2	**08Hrs**
Requirements Engineering: Functional and non-functional requirements: Functional requirements. Non-functional requirements, Introduction to Requirements specification. **Agile Software Development:** Agile methods- Plan driven and Agile Development, Introduction to Extreme Programming. **Textbook 1: Ch. 3:** 3.1 to 3.3, **Ch. 4:** 4.1 to 4.4	
Module – 3	**08Hrs**
Design and Implementation: Object-oriented design using UML: System Context and Interaction, Architectural design, Object Class identification, design Models, Interface Specification, Design Patterns, Implementation issues, Open Source development. **Textbook 1: Ch. 7:** 7.1 to 7.4	
Module – 4	**08Hrs**

Software Testing: Development Testing: Unit Testing, Choosing Unit Test Cases, Component Testing, System Testing, Test Driven Development, Release Testing: Requirements Based Testing, Scenario Testing, Performance Testing, User Testing. A Demo of Selenium.

Textbook 1: Ch. 8: 8.1 to 8.4

Module – 5	**08Hrs**

Introduction to Project Management:
Introduction Project and Importance of Project Management, Contract Management, Activities Covered by Software Project Management, Plans, Methods and Methodologies, Some ways of categorizing Software Projects, Stakeholders, Setting Objectives, Business Case, Project Success and Failure, Management and Management Control, Project Management life cycle.

Textbook 2: Ch. 1:1.1 to 1.17

Course Outcomes: After completing the course, the students will be able to	
CO1	Interpret the basic principles and practices of Software Engineering.
CO2	Apply Software Engineering Design Techniques and practices for developing Software.
CO3	Integrate requirement analysis, design strategies, and testing techniques to develop high-quality software systems
CO4	Design Models for different phases of software development to solve real world problems
CO5	Develop Projects by Estimating cost and time required for developing the Software Product.

Textbooks	
1	"Software Engineering", Ian Summerville, 9th Edition, Pearson Education, 2017 ISBN-13. 978-0137035151.
2	"Software Project Management", Bob Hughes, Mike Cotterell, Rajib Mall, 6th Edition, McGraw Hill Education, 2017. ISBN 0077122798.

Reference Books	
1	"Software Engineering an Engineering approach", James F. Peters, Witold Pedrycz, John Wiley. ISBN: 978-0-471-18964-0
2	"Software Engineering principles and practice", Waman S Jawadekar, The Mc Graw-Hill Companies. ISBN: 9780070583719
3	"Fundamentals of object-oriented design using UML Meiler page", Jones: Pearson Education. ISBN: 817808344

Web links and Video Lectures (e – Resources)	
1	https://onlinecourses.nptel.ac.in/noc20_cs68/preview
2	https://onlinecourses.nptel.ac.in/noc24_mg01/preview
3	https://nptel.ac.in/courses/106101061

CO – PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	2			1							
CO2	3		2		2					1	1
CO3		3	3	1						2	1
CO4				3	3					1	2
CO5			2					1	2	2	1

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Semester: V					
Computer Networks					
Course Code	**:**	BCS502	**Credits**	**:**	4
Hours/Week(L:T:P)	**:**	3:0:2	**CIE**	**:**	50 Marks
Total Hours	**:**	40L+20P	**SEE**	**:**	50 Marks
Course Type	**:**	IPCC	**SEE Duration**	**:**	3 Hours

Prerequisites:	
Courses	Digital fundamentals, Basics of communication System, Courses in Programming and IoT.
Knowledge on Fundamental Concepts	Data communication principles.
Knowledge on Connected Tools (If any)	Tools such as Eclipse and network simulation software (NS2). (Optional Check for CISCO Packet Tracker)

Course Learning Objectives: This course will enable the students to	
CLO1	Understand the architecture and protocols in the OSI and TCP/IP models.
CLO2	Learn error detection, framing, and flow control techniques at the data link layer.
CLO3	Explore IP addressing, routing protocols, and functions of the network layer.
CLO4	Comprehend transport layer operations including TCP and UDP.
CLO5	Examine on application layer protocols such as HTTP, FTP, and DNS.

Module – 1	**08Hrs**
Introduction: Data Communications, Networks, Network Types, Networks Models: Protocol Layering, TCP/IP Protocol suite, The OSI model, Introduction to **Physical Layer:** Transmission media, Guided Media, Unguided Media: Wireless. Switching and its types (circuit switching). **Textbook 1: Ch.1: 1.1 - 1.3, Ch.2: 2.1 - 2.3, Ch.7: 7.1 – 7.3, Ch.8: 8.3.**	
Module – 2	**08Hrs**
Data Link Layer: Error Detection and Correction: Introduction, Block Coding, Cyclic Codes. Data link control: DLC Services: Framing, Flow Control, Error Control, Connectionless and Connection Oriented, Data link layer protocols, High Level Data Link Control. Media Access Control: Random Access, Controlled Access. Check Sum and Point to Point Protocol. **Textbook 1: Ch.10: 10.1-10.4, Ch.11: 11.1 -11.4, Ch.12: 12.1 - 12.2**	
Module – 3	**08Hrs**
Network Layer: Network layer Services, Packet Switching, IPv4 Address, IPv4 Datagram, IPv6 Datagram, Introduction to Routing Algorithms, Unicast Routing Protocols: DVR, LSR, PVR, Unicast Routing protocols: RIP, OSPF, BGP, Multicasting Routing-MOSPF **Textbook 1: Ch.18: 18.1, 18.2, 18.4, Ch.20: 20.1-20.3, Ch.21: 21.3.2, Ch.22: 22.2**	
Module – 4	**08Hrs**

Introduction to Transport Layer: Introduction, Transport-Layer Protocols: Introduction, User Datagram Protocol, Transmission Control Protocol: services, features, segments, TCP connections, flow control, Error control, Congestion control. **Textbook 1: Ch.23: 23.1- 23.2, Ch.24: 24.1-24.3.4, 24.3.6-24.3.9**

Module – 5	**08Hrs**
Introduction to Application Layer: Introduction, Client-Server Programming, Standard Client Server Protocols: World Wide Web and HTTP, FTP, Electronic Mail, Domain Name System (DNS), TELNET, Secure Shell (SSH) **Textbook 1: Ch.25: 25.1-25.2, Ch.26: 26.1-26.6**	

Course Outcomes: After completing the course, the students will be able to	
CO1	Understand network models, transmission media, and switching techniques.
CO2	Apply data link layer concepts like error control, framing, flow control, and MAC protocols.
CO3	Implement network layer protocols, IP addressing, and routing algorithms.
CO4	Analyze transport layer protocols (TCP/UDP) and their control mechanisms.
CO5	Examine the application layer protocols and client-server architecture in network applications.

Textbook	
1	"Data Communications and Networking", Behrouz A. Forouzan, 5th Edition, Tata McGraw- Hill,2013. ISBN-10: 1259064751, ISBN-13: 978-1259064753.

Reference Books	
1	"Computer Networks – A Systems Approach", Larry L. Peterson and Bruce S. Davie, 4th Edition, Elsevier, 2019. ISBN-10:0-12-370548-7, ISBN-13: 978-0-12-370548-8.
2	"Computer and Communication Networks", 2nd Edition, Pearson Education, Nader F. Mir: 2015. ISBN-10: 0133814742, ISBN-13: 9780133814743.
3	"Data and Computer Communication", 10th Edition, William Stallings, Pearson Education, Inc., 2014. ISBN-13: 9780133506488 (Global).

Web links and Video Lectures (e – Resources)	
1	https://www.digimat.in/nptel/courses/video/106105183/L01.html
2	http://www.digimat.in/nptel/courses/video/106105081/L25.html
3	https://nptel.ac.in/courses/106105183

PRACTICAL COMPONENT OF IPCC

Sl.No	**Experiments**
1	Implement three nodes point – to – point network with duplex links between them. Set the queue size, vary the bandwidth, and find the number of packets dropped.
2	Implement transmission of ping messages/trace route over a network topology consisting of 6 nodes and find the number of packets dropped due to congestion.

3	Implement an Ethernet LAN using n nodes and set multiple traffic nodes and plot congestion window for different source / destination.
4	Develop a program for error detecting code using CRC-CCITT (16- bits).
5	Develop a program to implement a sliding window protocol in the data link layer.
6	Develop a program to find the shortest path between vertices using the Bellman- Ford and path vector routing algorithm.
7	Using TCP/IP sockets, write a client – server program to make the client send the file name and to make the server send back the contents of the requested file if present.
8	Develop a program on a datagram socket for client/server to display the messages on client side, typed at the server side.
9	Develop a program for a simple RSA algorithm to encrypt and decrypt the data.
10	Develop a program for congestion control using a leaky bucket algorithm.

Note: Experiments 1-3 (NS2/NS3) and Experiments 4-10 (Eclipse)

CO – PO MAPPING

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**
CO1	3	2	1								
CO2	3	3	2		2						
CO3	3	3	2	1	2						
CO4	3	3	2	1	2						
CO5	2	2			2				2	2	

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Semester: V					
Theory of Computation					
Course Code	**:**	BCS503	**Credits**	**:**	4
Hours/Week(L:T:P)	**:**	3:2:0	**CIE**	**:**	50 Marks
Total Hours	**:**	50L	**SEE**	**:**	50 Marks
Course Type	**:**	PCC	**SEE Duration**	**:**	3 Hours

Prerequisites:	
Courses	Discrete Mathematics, Data Structures, Programming Languages, Algorithms
Knowledge on Fundamental Concepts	Set Theory, Graph Theory, Logical Thinking, Problem-Solving
Knowledge on Connected Tools (If any)	JFLAP (Java Formal Languages and Automata Package)

Course Learning Objectives: This course will enable the students to	
CLO1	Introduce core concepts in Automata and Theory of Computation.
CLO2	Identify different Formal Language Classes and their Relationships.
CLO3	Learn concepts of Grammars and Recognizers for different formal languages.
CLO4	Prove or disprove theorems in automata theory using their properties.
CLO5	Determine the decidability and intractability of computational problems

Module – 1	**10 Hrs**
Introduction to Finite Automata, Structural Representations, Automata and Complexity. The Central Concepts of Automata Theory. Deterministic Finite Automata, Nondeterministic Finite Automata, An Application: Text Search, Finite Automata with Epsilon-Transitions. **Textbook 1: Ch. 1, Ch. 2.**	
Module – 2	**10 Hrs**
Regular Expressions, Finite Automata and Regular Expressions, Proving Languages not to be Regular. Closure Properties of Regular Languages, Equivalence and Minimization of Automata, Applications of Regular Expressions. **Textbook 1: Ch. 3, Ch. 4.**	
Module – 3	**10 Hrs**
Context-Free Grammars, Parse Trees, Ambiguity in Grammars and Languages, Ambiguity in Grammars and Languages, Definition of the Pushdown Automaton, The Languages of a PDA, Equivalence of PDA's and CFG's, Deterministic Pushdown Automata. **Textbook 1: Ch. 5, Ch. 6.**	
Module – 4	**10 Hrs**
Normal Forms for Context-Free Grammars, The Pumping Lemma for Context-Free Languages, Closure Properties of Context-Free Languages. **Textbook 1: Ch. 7.**	
Module – 5	**10 Hrs**

Introduction to Turing Machines: Problems That Computers Cannot Solve, The Turing Machine, Programming Techniques for Turing Machines, Extensions to the Basic Turing Machine, Undesirability: A Language That Is Not Recursively Enumerable. **Textbook 1: Ch. 8, Ch. 9**

Course Outcomes: After completing the course, the students will be able to	
CO1	Model and analyse various abstract computational devices (Finite Automata, Pushdown Automata, and Turing Machines) and their structural behaviours, limitations, and operational characteristics.
CO2	Design appropriate mathematical representations, grammars, and language recognizers to solve specific formal language problems.
CO3	Prove or disprove language properties using mathematical tools and closure properties.
CO4	Design pushdown automata and analyze the properties and normal forms of context-free grammars
CO5	Design Turing Machines to solve computational problems and analyze the limits of decidability

Textbook	
1	"Introduction to Automata Theory, Languages and Computation", John E. Hopcroft, Rajeev Motwani, Jeffrey D. Ullman, Third Edition, Pearson Education, 2006, ISBN: 978-0321455369.

Reference Books	
1	"Automata, Computability and complexity", Elain Rich, 1st Edition, Pearson Education,2018.
2	"Theory of Computer Science", K.L.P Mishra, N Chandrasekaran, 3rd Edition, PHI, 2012.
3	"An introduction to Formal Languages and Automata ", Peter Linz, 3rd Edition, Narosa Publishers,1998.
4	"Introduction to the Theory of Computation", Michael Sipser, 3rd edition, Cengage learning,2013.

Web links and Video Lectures (e – Resources)	
1	https://archive.nptel.ac.in/courses/106/105/106105196/
2	https://archive.nptel.ac.in/courses/106/106/106106049/
3	https://nptelvideos.com/course.php?id=717

CO – PO MAPPING

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**
CO1	3	2	2								1
CO2	2	3	2	1							1
CO3	2	2	2								1
CO4	2	2	2								1
CO5	2	2	2	1							1

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Semester: V					
Mobile Application Development Lab					
Course Code	**:**	BISL504	**Credits**	**:**	01
Hours/Week(L:T:P)	**:**	0:0:2	**CIE**	**:**	50 Marks
Total Hours	**:**	15P	**SEE**	**:**	50 Marks
Course Type	**:**	PCCL	**SEE Duration**	**:**	3 Hours

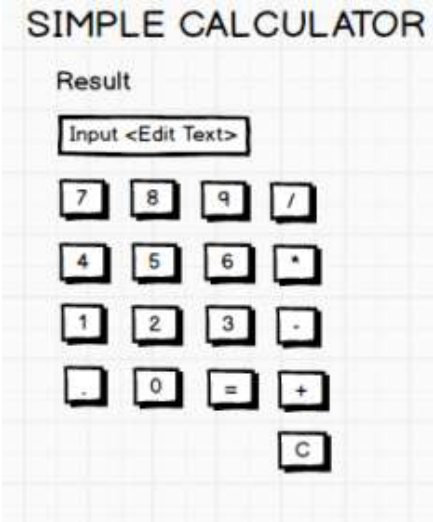
Prerequisites:	
Courses	Data Structures and Applications, Database Management system.
Knowledge on Fundamental Concepts	Data structures , Java programming concepts, SQL
Knowledge on Connected Tools (If any)	Android Studio, SQLite

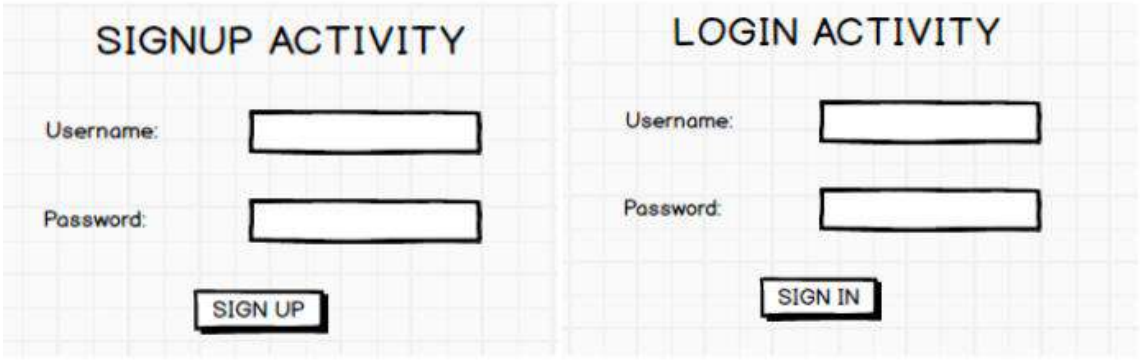
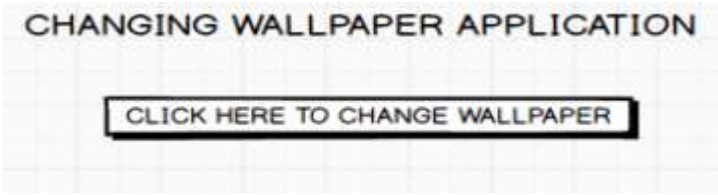
Course Level Objectives: Student able to	
CLO1	Learn and acquire the art of Android Programming.
CLO2	Configure Android studio to run the applications.
CLO3	Understand and implement Android's User interface functions.
CLO4	Create, modify and query on SQlite database
CLO5	Inspect different methods of sharing data using services.

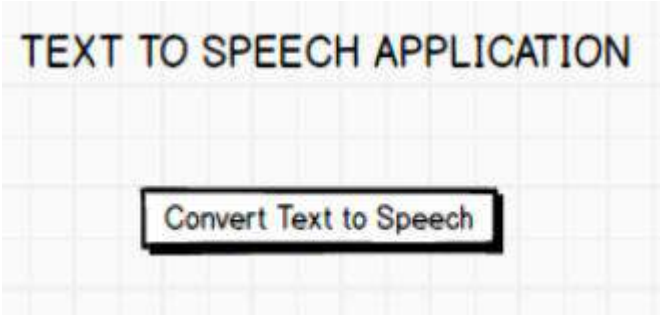
Description	
1	The installation procedure of the Android Studio/Java software must be demonstrated and carried out in groups.
2	Students should use the latest version of Android Studio/Java/ Kotlin to execute these programs. Diagrams given are for representational purposes only, students are expected to improvise on them.
3	Part B programs should be developed as an application and are to be demonstrated as a mini project in a group by adding extra features or the students can also develop their application and demonstrate it as a mini-project. (Projects/programs are not limited to the list given in Part B).

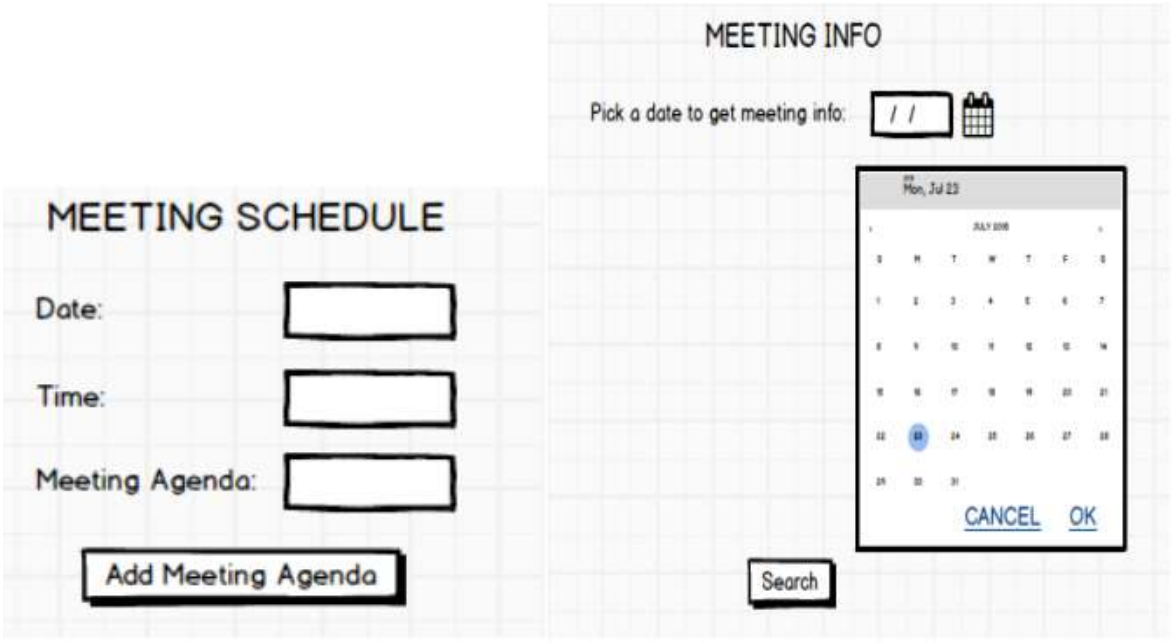
Practical Component:

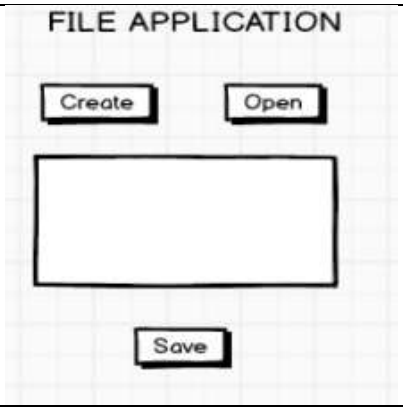
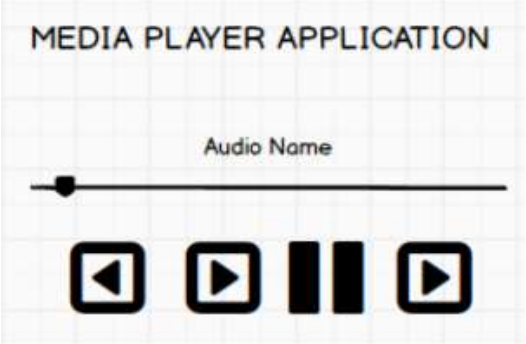
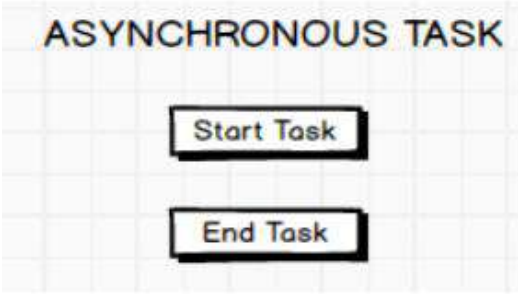
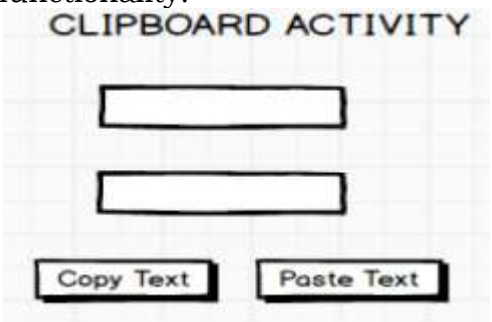
Sl.No	**PART-A**
1	Create an application to design a Visiting Card. The Visiting card should have a company logo at the top right corner. The company name should be displayed in Capital letters, aligned to the center. Information like the name of the employee, job title, phone number, address, email, fax and the website address is to be displayed. Insert a horizontal line between the job title and the phone number.

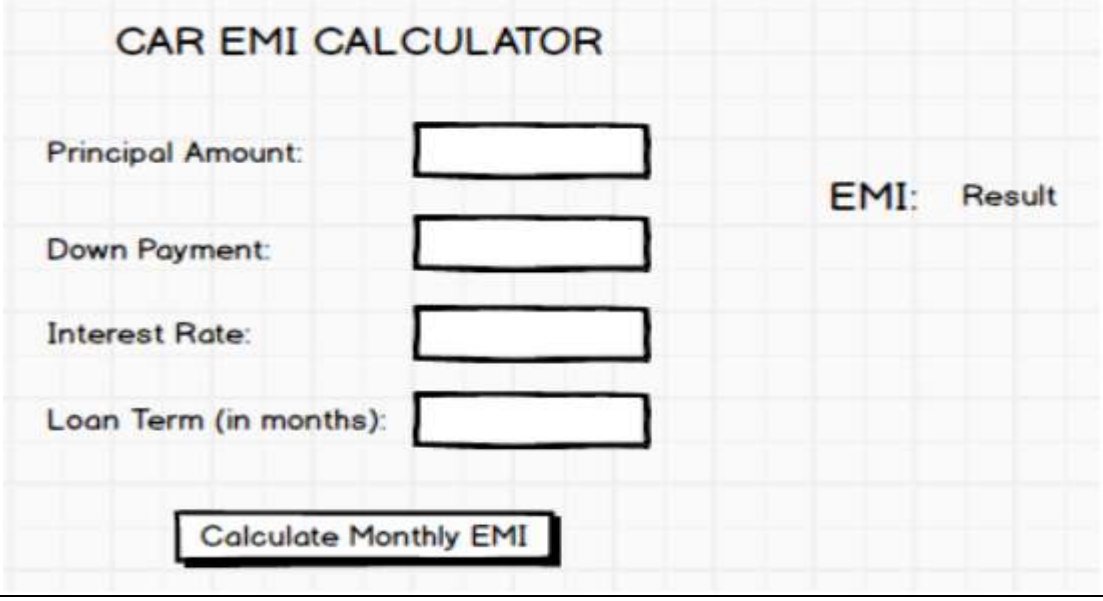
2	Develop an Android application using controls like Button, TextView, EditText for designing a calculator having basic functionality like Addition, Subtraction, Multiplication and Division. 
3	Create a SIGN Up activity with Username and Password. Validation of password should happen based on the following rules: • Password should contain uppercase and lowercase letters. • Password should contain letters and numbers. • Password should contain special characters. • Minimum length of the password (the default value is 8). On successful SIGN UP proceed to the next Login activity. Here the user should SIGN IN using the Username and Password created during signup activity. If the Username and Password are matched then navigate to the next activity which displays a message saying "Successful Login" or else display a toast message saying "Login Failed ".The user is given only two attempts and after that display a toast message saying "Failed Login Attempts" and disable the SIGN IN button. Use Bundle to transfer information from one activity to another.

	
4	Develop an application to set an image as wallpaper. On click of a button, the wallpaper image should start to change randomly every 30 seconds. 
5	Write a program to create an activity with two buttons START and STOP. On pressing of the START button, the activity must start the counter by displaying the numbers from One and the counter must keep on counting until the STOP button is pressed. Display the counter value in a TextView control.
6	Create two files of XML and JSON type with values for City_Name, Latitude, Longitude, Temperature, and Humidity. Develop an application to create an activity with two buttons to parse the XML and JSON files which when clicked should display the data in their respective layouts side by side.

7	Develop a simple application with one EditText so that the user can write some text in it. Create a button called "Convert Text to Speech" that converts the user input text into voice. 
8	Create an activity like a phone dialer with CALL and SAVE buttons. On pressing the CALL button, it must call the phone number and on pressing the SAVE button it must save the number to the phone contacts.
PART - B	
1	Write a program to enter Medicine Name, Date and Time of the Day as input from the user and store it in the SQLite database. Input for Time of the Day should be either Morning or Afternoon or Evening or Night. Trigger an alarm based on the Date and Time of the Day and display the Medicine Name.

2	Develop a content provider application with an activity called “Meeting Schedule” which takes Date, Time and Meeting Agenda as input from the user and store this information into the SQLite database. Create another application with an activity called “Meeting Info” having DatePicker control, which on the selection of a date should display the Meeting Agenda information for that particular date, else it should display a toast message saying “No Meeting on this Date”. 
3	Create an application to receive an incoming SMS which is notified to the user. On clicking this SMS notification, the message content and the number should be displayed on the screen. Use appropriate emulator control to send the SMS message to your application.
4	Write a program to create an activity having a Text box, and also Save, Open and Create buttons. The user has to write some text in the Text box. On pressing the Create button the text should be saved as a text file in MkSDcard. On subsequent changes to the text, the Save button should be pressed to store the latest content to the same file. On pressing the Open button, it should display the contents from the previously stored files in the Text box. If the user tries to save the contents in the Textbox to a file without creating it, then a toast message has to be displayed saying “First Create a File”.

	
5	Create an application to demonstrate a basic media playerthat allows the user to Forward, Backward, Play and Pause an audio. Also, make use of the indicator in the seek bar to move the audio forward or backward as required. 
6	Develop an application to demonstrate the use of Asynchronous tasks in android. The asynchronous task should implement the functionality of a simple moving banner. On pressing the Start Task button, the banner message should scrollfrom right to left. On pressing the Stop Task button, the banner message should stop. Let the banner message be “Demonstration of Asynchronous Task”. 
7	Develop an application that makes use of the clipboard framework for copying and pasting of the text. The activity consists of two EditText controls and two Buttons to trigger the copy and paste functionality. 

8	Create an AIDL service that calculates Car Loan EMI. The formula to calculate EMI is E = P * (r(1+r)n)/((1+r)n -1) where E = The EMI payable on the car loan amount P = The Car loan Principal Amount r = The interest rate value computed on a monthly basis n = The loan tenure in the form of months The down payment amount has to be deducted from the principal amount paid towards buying the Car. Develop an application that makes use of this AIDL service to calculate the EMI. This application should have four EditText to read the Principal Amount, Down Payment, Interest Rate, Loan Term (in months) and a button named as "Calculate Monthly EMI". On click of this button, the result should be shown in a TextView. Also, calculate the EMI by varying the Loan Term and Interest Rate values. 

Course Outcomes: After completing the course, the students will be able to	
CO1	Create and debug Android application by setting up Android development environment.
CO2	Apply the concept of views to design user interface components and event handling.
CO3	Implement adaptive, responsive user interface that work across a wide range of devices.
CO4	Develop an Android application to create SQLite database and sharing data in Android applications.
CO5	Develop responsive and user-friendly mobile application interfaces using Flutter/Kotlin UI concepts.

Text Books	
1	Google Developer Training, "Android Developer Fundamentals Course – Concept Reference", Google Developer Training Team, 2017.
2	"Android Programming – Pushing the Limits", Erik Hellman, 1 st Edition, , 2014, Wiley India Pvt Ltd. ISBN-13: 978-8126547197.

Reference Books	
1	"Head First Android Development", Dawn Griffiths and David Griffiths, 1 st Edition, 2015, O"Reilly SPD Publishers. ISBN-13: 978-9352131341

2	"Android Programming: The Big Nerd Ranch Guide", Bill Phillips, Chris Stewart and Kristin Marsicano, 3rd Edition, 2017. ISBN-13: 978-0134706054

Web links and Video Lectures (e – Resources)	
1	https://www.gitbook.com/book/google-developer-training/android-developer-fundamentalscourse-concepts/details (Download pdf file from the above link)
2	https://www.youtube.com/@VTUeShikshanaProgramme
3	Lecture 1 -- Introduction to Mobile Application Development

CO – PO MAPPING

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**
CO1	3	2	2	2	3						1
CO2	2	3	2	2	3			1	1	1	1
CO3	2	3	2	3	3			1	1	1	1
CO4	3	3	3	3	3			1	2	1	1
CO5	3	3	3	3	3	1	1	1	2	1	1

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Semester: V					
Cryptography And Network Security					
Course Code	**:**	BIS525A	**Credits**	**:**	3
Hours/Week(L:T:P)	**:**	3:0:0	**CIE**	**:**	50 Marks
Total Hours	**:**	40L	**SEE**	**:**	50 Marks
Course Type	**:**	PEC	**SEE Duration**	**:**	3 Hours

Prerequisites	
Courses	Computer Networks, Discrete Mathematical Structures & Graph Theory, Problem Solving through Programming, Operating Systems
Knowledge on Fundamental Concepts	Symmetric and asymmetric encryption principles, Networking basics (IP, protocols, ports) , Authentication and security threats
Knowledge on Connected Tools (If any)	Programming knowledge (C/Python/Java for implementing ciphers) - OpenSSL basics

Course Learning Objectives: This course will enable the students to	
CLO1	Understand Cryptography, Network Security theories, algorithms and systems.
CLO2	Apply different Cryptography and Network Security operations on different applications.
CLO3	Analyse different methods for authentication and access control.
CLO4	Evaluate Public and Private key, Key management, distribution and certification.
CLO5	Design necessary techniques to build protection mechanisms to secure computer networks.

Module – 1	**08 Hrs**
Classical Encryption Techniques: Symmetric Cipher Model, Cryptography, Cryptanalysis and Brute-Force Attack, Substitution Techniques, Caesar Cipher, Monoalphabetic Cipher, Playfair Cipher, Hill Cipher,Polyalphabetic Cipher, One Time Pad. **Block Ciphers and the Data Encryption Standard:** Traditional block Cipher structure, Stream Ciphers and Block Ciphers, Motivation for the Feistel Cipher structure, the Feistel Cipher, The data encryption standard, DES encryption, DES decryption, A DES example, results, the avalanche effect, the strength of DES, the use of 56-Bit Keys, the nature of the DES algorithm, timing attacks, Block cipher design principles, number of rounds, design of function F, key schedule algorithm. **Textbook 1: Ch 2, 3**	
Module – 2	**08 Hrs**
Public-Key Cryptography and RSA: Principles of public-key cryptosystems. Public-key cryptosystems. Applications for public-key cryptosystems, requirements for public-key cryptosystems. public-key cryptanalysis. The RSA algorithm, description of the algorithm, computational aspects, the security of RSA. **Other Public-Key Cryptosystems:** Diffie-Hellman key exchange, The algorithm, key	

exchange protocols, man in the middle attack, Elgamal Cryptographic systems.

Textbook 1: Ch 9, 10

Module – 3	**08 Hrs**

Key Management and Distribution: Symmetric key distribution using Symmetric encryption, A key distribution scenario, Hierarchical key control, session key lifetime, a transparent key control scheme, Decentralized key control, controlling key usage, Symmetric key distribution using asymmetric encryption, simple secret key distribution, secret key distribution with confidentiality and authentication, A hybrid scheme, distribution of public keys, public announcement of public keys, publicly available directory, public key authority, public keys certificates.

Textbook 1: Ch 14.1 – 14.3

Module – 4	**08 Hrs**

X-509 certificates. Certificates, X-509 version 3 Public key infrastructure.
User Authentication: Remote user Authentication principles, Mutual Authentication, one-way authentication, remote user Authentication using Symmetric encryption, Mutual Authentication, one-way Authentication, **Kerberos**, Motivation, Kerberos version 4, Kerberos version 5, Remote user Authentication using Asymmetric encryption, Mutual Authentication, one-way Authentication.

Textbook 1: Ch 14.4 – 15.4

Module – 5	**08 Hrs**

Electronic Mail Security: Pretty good privacy, S/MIME,
IP Security: IP Security overview, IP Security policy, Encapsulating Security payload, Combining security associations, Internet key exchange.

Textbook 1: Ch 19.1, 19.2, 20.1 – 20.5

Course Outcomes: After completing the course, the students will be able to	
CO1	Apply cryptographic techniques, network security theories, algorithms, and security systems to secure computing environments.
CO2	Apply different Cryptography and Network Security operations on different applications
CO3	Analyse different methods for authentication and access control
CO4	Evaluate Public and Private key, Key management, distribution and certification
CO5	Design necessary techniques to build protection mechanisms to secure computer networks

Text Books	
1	Cryptography and Network Security, William Stallings, 6th edition,2013, Pearson, ISBN-10 9332518777.
2	Network Security: Private Communication in a Public World,Kaufman, Perlman, and Speciner –3rd Edition, 2022, Pearson Education,ISBN-10 0136643604.

Reference Books	
1	Cryptography and Information Security, V. K Pachghare: 2nd Edition,2015, PHI, ISBN-10 9788120350823
2	Cryptography and Network Security, BehrouzA.Foruzan, 2007,Tata McGraw Hil, ISBN-10 0073327530
3	Cryptography and Network Security, Atul Kahate –3rd Edition, 2018, McGraw Hill

	Education, ISBN-10 9781259029882

Web links and Video Lectures (e – Resources)	
1	https://nptel.ac.in/courses/106105031
2	https://onlinecourses.nptel.ac.in/noc21_cs16
3	https://www.digimat.in/nptel/courses/video/106105031

CO – PO MAPPING

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**
CO1	3	3		2	2						2
CO2	3	3	2	2	3						2
CO3	3	3	2	2	3						2
CO4	3	3	2	2	3						2
CO5	3	3	3	3	3	2	2	2	2	1	2

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Semester: V					
Foundations of AI					
Course Code	**:**	BIS525B	**Credits**	**:**	3
Hours/Week(L:T:P)	**:**	3:0:0	**CIE**	**:**	50 Marks
Total Hours	**:**	40L	**SEE**	**:**	50 Marks
Course Type	**:**	PEC	**SEE Duration**	**:**	3 Hours

Prerequisites:	
Courses	Discrete Mathematical structure, Problem solving through Programming, Introduction to python Programming, Data Structures.
Knowledge on Fundamental Concepts	Mathematical Foundations, Programming Concepts, Problem-solving using algorithms**.**
Knowledge on Connected Tools (If any)	Python, Jupyter Notebook, VS Code.

Course Learning Objectives: This course will enable the students to	
CLO1	Learn the basic principles and theories of artificial intelligence.
CLO2	Study key AI areas such as machine learning, neural networks, natural language processing, and robotics.
CLO3	Apply AI techniques like search algorithms, optimization, and decision-making to real-world problems.
CLO4	Understand the ethical and legal issues related to AI, including bias, fairness, and accountability.
CLO5	Explore the societal impact of AI on the workforce and privacy.

Module – 1	**08 Hrs**
Introduction: What Is AI? , Foundations and History of AI, The State of The Art. **Intelligent Agents:** Agents and environment, Concept of Rationality, The nature of Environment, The structure of agents. **Text Book 1: Ch 1 : 1.1-1.4, Ch 2 : 2.1- 2.4**	
Module – 2	**08 Hrs**
Problem-solving: Problem-solving agents, Example problems, Searching for Solutions Uninformed Search Strategies, Informed Search Strategies, Heuristic functions. **Text Book 1: Ch 3 : 3.1-3.6**	
Module – 3	**08 Hrs**
Logical Agents: Knowledge–based agents, The Wumpus world, Logic, Propositional logic, Reasoning patterns in Propositional Logic. **Text Book 1: Ch 7 : 7.1-7.4**	
Module – 4	**08 Hrs**
First Order Logic: Representation Revisited, Syntax and Semantics of First Order logic, Using First Order logic, Knowledge Engineering In First-Order Logic. **Inference in First Order Logic:** Propositional Versus First Order Inference, Unification, Backward Chaining, Resolution Forward Chaining.	

Text Book 1: Ch 8: 8.1- 8.4 , Ch 9: 9.1-9.5	
Module – 5	**08 Hrs**
Uncertain Knowledge and Reasoning: Quantifying Uncertainty: Acting under Uncertainty, Basic Probability Notation, Inference using Full Joint Distributions, Independence, Baye's Rule and its use. Wumpus World Revisited. **Expert Systems:** Representing and using domain knowledge, ES shells, Explanation, knowledge acquisition. **Text Book 1: Ch 13: 13.1-13.6** **Text Book 2: Ch 20: 20.1-20.4**	

Course Outcomes: After completing the course, the students will be able to	
CO1	Apply the architecture and components of intelligent agents in their interaction with the AI environment.
CO2	Apply problem-solving agents and various search strategies to solve a given problem.
CO3	Utilize logical reasoning and knowledge representation using propositional and first-order logic.
CO4	Integrate first-order logic to represent knowledge and solve problems in artificial intelligence applications.
CO5	Analyze the use of probability and expert system techniques to build intelligent systems that handle uncertainty in specific domains.

Text Books	
1	Artificial Intelligence: A Modern Approach, Russell, S. J., and Norvig, P., 4th Edition, 2020, Pearson Education. ISBN-13: 978-0134610993.
2	Artificial Intelligence, Elaine Rich, Kevin Knight, 3rd edition, 2013, Tata McGraw Hill. ISBN-13: 978-0-07-008770-5, ISBN-10: 0-07-008770-9.

Reference Books	
1	Artificial Intelligence Structure and strategies for complex, George F Lugar, 5th Edition, 2011, Pearson Education. ISBN :0 321263189
2	Artificial Intelligence, Kaushik, S., 2nd Edition, Cengage Learning India, 2022, ISBN: 978-9355730428.
3	Principles of Artificial Intelligence, Nils J. Nilsson, 1st Edition, Elsevier, 1980. ISBN 0-934613-10-9

Web links and Video Lectures (e – Resources)	
1	https://www.kdnuggets.com/2019/11/10-free-must-read-books-ai.html
2	https://www.udacity.com/course/knowledge-based-ai-cognitive-systems--ud409
3	https://nptel.ac.in/courses/106106140
4	https://www.coursera.org/learn/introduction-to-ai

CO – PO MAPPING

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**
CO1	3	2	1								
CO2	3	3	3	2	2						1
CO3	3	2	2	2	2						
CO4	3	3	3	2	2						1
CO5	3	3	2	2	3						1

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Semester: V					
UI/UX					
Course Code	**:**	BIS525C	**Credits**	**:**	3
Hours/Week(L:T:P)	**:**	3:0:0	**CIE**	**:**	50 Marks
Total Hours	**:**	40L	**SEE**	**:**	50 Marks
Course Type	**:**	PEC	**SEE Duration**	**:**	3 Hours

Prerequisites:	
Courses	Web Application Development with HTML and PHP
Knowledge on Fundamental Concepts	Usability Principles ,Design Thinking, Interaction Design, Visual Design Basics
Knowledge on Connected Tools (If any)	Figma, Sketch, Google Analytics

Course Learning Objectives: This course will enable the students to	
CLO1	Understand the UX process lifecycle and the roles within a UX design team.
CLO2	Explore design thinking, ideation techniques, and user personas for user-centered design.
CLO3	Use prototypes and UX measures to make and test interactive designs.
CLO4	Learn how to check UX designs and use UX methods in agile projects.
CLO5	Utilize UX design skills and professional practices to address real-world challenges.

Module – 1	**08 Hrs**
The Wheel- A Lifecycle Template: Introduction, A UX process lifecycle template, choosing a process instance for your project, the system complexity space, Meet the user interface team, Scope of UX presence within the team, more about UX lifecycles. **Design Thinking, Ideation, and Sketching:** Introduction, Design paradigms, Design thinking, Design perspectives, User personas, Ideation, Sketching, more about phenomenology **Textbook 1 : Ch 2:2.1-2.7 , Ch 7: 7.1- 7.8**	
Module – 2	**08 Hrs**
UX Goals, Metrics, and Targets: Introduction, UX goals, UX target tables. **Prototyping:** Introduction, Depth and breadth of a prototype, Fidelity of prototypes, Interactivity of prototypes, Choosing the right breadth, depth, level of fidelity, and amount of interactivity, Paper prototypes, Advantages of and cautions about using prototypes, Prototypes in transition to the product, Software tools for prototyping **Textbook 1 : Ch 10:10.1-10.3,Ch 11: 11.1-11.9**	
Module – 3	**08 Hrs**
Rapid Evaluation Methods: Introduction, Design walkthroughs and reviews, UX Inspection, Heuristic evaluation, a UX inspection method, our practical approach to UX Inspection, Questionnaires. **UX Methods for Agile Development:** Introduction, Basics of agile SE methods, Drawbacks of agile SE methods from the UX perspective, what is needed on the UX side, Problems to anticipate, synthesized approach to integrating UX	

Textbook 1 : Ch 13:13.1-13.5,13.8, Ch 19:19.1-19.6	
Module – 4	**08 Hrs**
UX Design Guidelines: Introduction, Using and interpreting design guidelines, Human memory limitations, Selected UX design guidelines and examples, Planning, Translation, Physical actions, Outcomes, Assessment, Overall, Conclusions. **Connections with Software Engineering:** Introduction, Locus of influence in an organization, which scenario is right for you? **Textbook 1 : Ch 22: 22.1-22.11 , Ch 23:23.1,23.3**	
Module – 5	**08 Hrs**
Making It Work in the Real World: Putting it to work as a new practitioner, Be a smart UX practitioner, UX professionalism, Cost-justifying UX, UX within your organization, Parting words **Textbook 1 : Ch 24: 24.1-24.6**	

Course Outcomes: After completing the course, the students will be able to	
CO1	Apply UX lifecycle models, design thinking, and ideation techniques.
CO2	Develop and evaluate prototypes with appropriate UX goals, metrics, and tools.
CO3	Apply rapid UX evaluation methods and integrate UX in agile development.
CO4	Analyze the use of UX design guidelines considering human factors and software engineering practices.
CO5	Examine UX professionalism in real-world applications and cost justification.

Text Books	
1	The UX Book-Process and Guidelines for Ensuring a Quality User Experience ,REX HARTSON and PARDHA S. PYLA, Morgan Kaufmann,1st Edition,2012, Elsevier. ISBN: 978-0-12-385241-0

Reference Books	
1	"The Essential Guide to User Interface Design" ,Wilbert O. Galitz John Wiley & Sons, 2nd Edition, 2002. ISBN: 978-0-470-05342-3

Web links and Video Lectures (e – Resources)	
1	https://www.figma.com/
2	https://www.edureka.co/blog/ui-ux-design-tutorial/
3	https://www.udemy.com/course/introtoux/

CO – PO MAPPING

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**
CO1	3	2	3	2	2						
CO2	3	2	3	2	3						2
CO3	3	2		2	3						2
CO4	3		3		3	2	2	2			2
CO5	2	1	1	1	1	2		2	2	2	3

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Semester: V						
Embedded Systems and Sensor Technology						
Course Code	**:**	BIS525D		**Credits**	**:**	3
Hours/Week(L:T:P)	**:**	3:0:0		**CIE**	**:**	50Marks
Total Hours	**:**	40L		**SEE**	**:**	50Marks
Course Type	**:**	PEC		**SEE Duration**	**:**	3 Hours

Prerequisites:	
Courses	Digital Design and Computer Organization
Knowledge on Fundamental Concepts	Programming in C (Knowledge of variables and data types, control structures, functions, arrays, pointers, structures
Knowledge on Connected Tools (If any)	Arduino/STM32/PIC boards, Multisim /NI tools

Course Learning Objectives: This course will enable the students to	
CLO1	Analyze the architecture and operation of embedded systems.
CLO2	Gain knowledge of smart sensors and interfacing methods.
CLO3	Explore real-time operating systems (RTOS) and wireless sensing techniques.
CLO4	Learn to integrate sensors with microcontrollers for practical applications.
CLO5	Apply embedded and sensing technologies to real-world applications.

Module – 1	**08Hrs**
Introduction to Embedded Systems: Definition, Applications, Classification, Embedded hardware units, software components, **Smart Sensors Basics:** Sensor vs Transducer, Introduction, transitions, integration, output characteristics, sensing technologies, digital sensors, Output Characteristic, Sensing Technologies, Digital Output Sensors **Text Book 1: Ch 1: 1.1–1.6** **Text Book 2: Ch 1: 1.1, 1.6, Ch 3: 3.2–3.4**	
Module – 2	**08Hrs**
Application-specific sensors: Ultrasonic Sensors, Microwave Motion Detectors, Capacitive Sensors, Optical Sensors – Photodiode, Photoresistor, CCD/CMOS, Temperature Sensors – Thermoelectric, Motion & Ultrasonic Sensing. **Embedded Firmware Development / Control Techniques:** Firmware Architecture, Languages, Hardware–Software Co-design, State Machines, Fuzzy Logic, Neural Networks, Adaptive Control, Impact of Artificial Intelligence. **Text Book 1: Ch 7: 7.1–7.2; Ch 15, Ch 17.** **Text Book 2: Ch 3.2.2–3.2.7, Ch 7.1.1, 7.3–7.5, 7.7**	
Module – 3	**08 Hrs**
Basics of RTOS, Task Scheduling, Interrupts, Preemption, Sensor Interfacing with	

Microcontrollers, Signal Conditioning, Digital Conversion, Context Switching, Device Driver Programming **Text Book 1: Ch 10: 10.1–10.3, 10.5.2, Ch 12:12.1–12.2** **Text Book 2: Ch 4: 4.1–4.7, Ch 5: 5.2–5.7**
Module – 4 **08 Hrs**
Wireless Data Communication: RF Sensing, RF MEMS, Telemetry, Wireless Sensor Networks, Industrial Wireless Sensing, **Communication Protocols:** Serial, I2C, SPI, Wireless Standards (e.g., IEEE 802.15.4) **Text Book 2: Ch 8: 8.1–8.9** **Text Book 1: Ch 2: 2.3**
Module – 5 **08 Hrs**
Real-time Applications: Automotive, Industrial, Smart Homes, Future sensor and semiconductor capabilities, Embedded System Tools, Development Environments, Trusted Sensing. **Text Book 2: Ch 14: 14.3–14.5, Ch 16:16.2–16.6,** **Text Book 1: Ch 9: 9.1–9.2**

Course Outcomes: After completing the course, the students will be able to	
CO1	Interpret the architecture and components of embedded systems.
CO2	Analyze the behavior and interfacing mechanisms of smart sensors.
CO3	Develop embedded firmware and integrate it with sensors.
CO4	Implement real-time task scheduling and synchronization using RTOS.
CO5	Analyze and apply wireless and smart sensing in real-world embedded applications.

Text Books	
1	Introduction to Embedded Systems**,** Shibu K.V., 2nd Edition, 2017, McGraw-Hill Education, ISBN: 978-93-5260-401-2.
2	Understanding Smart Sensors, Randy Frank, 3rd Edition, 2013, Artech House, ISBN: 978-1608075072.

Reference Books	
1	Handbook of Modern Sensors**,** Jacob Fraden, 5th Edition, 2021, Springer, ISBN: 978-3-030-61108-0.
2	Embedded Systems: Architecture, Programming and Design**,** Raj Kamal, 3rd Edition, 2017, Tata McGraw-Hill Education, ISBN: 978-93-5260-311-4.
3	Internet of Things: Technologies and Applications**,** Vlasios Tsiatsis, Stamatis Karnouskos, Jean-Paul Vasseur, Marcus Bauer, and Serafim Nikoletseas, 1st Edition, 2014, Academic Press (Elsevier), ISBN: 978-0-12-416043-2.
Web links and Video Lectures (e – Resources)	
1	https://youtu.be/bvEDXDFbM_E

2	https://youtu.be/T9z0t_FWPRU
3	https://youtu.be/F321087yYy4
4	https://youtu.be/BBvG7uzmOV0

CO – PO MAPPING

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**
CO1	3	2	1		2						2
CO2	2	2	2	1	3						2
CO3	2	2	3	2	3			1	1	2	2
CO4	2	3	3	3	3			1	1	2	2
CO5	3	3	3	2	3	2	1	1	2	2	2

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Semester: V					
Mini Project					
Course Code	**:**	BIS536	**Credits**	**:**	2
Hours/Week(L:T:P)	**:**	0:0:4	**CIE**	**:**	50 Marks
Total Hours	**:**	10P	**SEE**	**:**	50 Marks
Course Type	**:**	PROJ	**SEE Duration**	**:**	3

Prerequisites:	
Courses	Fundamental of Concepts Programming
Knowledge on Fundamental Concepts	Programming concepts on C,DSA,JAVA,DBMS,PYTHON
Knowledge on Connected Tools (If any)	Eclipse, Edit plus, GCC, Codeblocks, Visual Studio

Course Learning Objectives: This course will enable the students to	
CLO1	Conceptualize, design and implement solutions for specific problems.
CLO2	Communicate the solutions through presentations and technical reports.
CLO3	Apply project and resource managements skills, professional ethics, societal concerns.
CLO4	Develop, test, and evaluate the solution using appropriate techniques.
CLO5	Synthesize self-learning, sustainable solutions and demonstrate life-long learning

PROJECT WORK (BIS536): The objective of the Project work is
(i) To encourage independent learning and the innovative attitude of the students.
(ii) To develop interactive attitude, communication skills, organization, time management, and presentation skills.
(iii) To impart flexibility and adaptability.
(iv) To inspire team working.
(v) To expand intellectual capacity, credibility, judgment and intuition.
(vi) To adhere to punctuality, setting and meeting deadlines.
(vii) To instil responsibilities to oneself and others.
(viii)To train students to present the topic of project work in a seminar without any fear, face the audience confidently, enhance communication skills, involve in group discussion to present and exchange ideas.

CIE procedure for Project Work:
(1) Single discipline: The CIE marks shall be awarded by a committee consisting of the Head of the concerned Department and two senior faculty members of the Department, one of whom shall be the Guide.The CIE marks awarded for the project work, shall be based on the evaluation of project work Report, project presentation skill, and question and answer session in the ratio 50:25:25. The marks awarded for the project report shall be the same for all the batch mates.
(2) Interdisciplinary: Continuous Internal Evaluation shall be group-wise at the college level with the participation of all guides of the college.
Participation of external guide/s, if any, is desirable. The CIE marks awarded for the project work, shall be based on the evaluation of project work Report, project presentation skill, and question and answer session in the ratio 50:25:25. The marks awarded for the project report shall be the same for all the batch mates.

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Semester: V					
Research Methodology and IPR					
Course Code	**:**	BRM507	**Credits**	**:**	3
Hours/Week (L: T :P)	**:**	2:2:0	**CIE**	**:**	50 Marks
Total Hours	**:**	40L	**SEE**	**:**	50 Marks
Course Type	**:**	AEC	**SEE Duration**	**:**	3 Hours

Prerequisites:	
Courses	Engineering / Technical Communication
Knowledge on Fundamental Concepts	Fundamentals of engineering problem solving, technical report writing, information retrieval, analytical thinking, and professional ethics
Knowledge on Connected Tools (If any)	Familiarity with web search engines, digital libraries, scholarly databases (e.g., Google Scholar), reference management tools, and basic office productivity software

Course Learning Objectives: This course will enable the students to	
CLO1	Familiarize students with research methodologies, problem formulation, and research ethics.
CLO2	Equip students with techniques for literature search, review, and analysis using scholarly databases.
CLO3	Strengthen technical reading and interpretation skills for research documents, algorithms, and datasets.
CLO4	Introduce Intellectual Property Rights and innovation protection procedures.
CLO5	Enhance awareness of IP management, commercialization, and significant IPR case studies.

Module – 1	**08Hrs**
Introduction: Meaning of Research, Objectives of Engineering Research, and Motivation in Engineering Research, Types of Engineering Research, Finding and Solving a Worthwhile Problem. Ethics in Engineering Research, Ethics in Engineering Research Practice, Types of Research Misconduct, Ethical Issues Related to Authorship. **Textbook 1**: **Ch. 1, Ch. 2**	
Module – 2	**08Hrs**
Literature Review and Technical Reading, New and Existing Knowledge, Analysis and Synthesis of Prior Art Bibliographic Databases, Web of Science, Google and Google Scholar, Effective Search: The Way Forward Introduction to Technical Reading Conceptualizing Research, Critical and Creative Reading, Taking Notes While Reading, Reading Mathematics and Algorithms, Reading a Datasheet. Attributions and Citations: Giving Credit Wherever Due, Citations: Functions and Attributes, Impact of Title and Keywords on Citations, Knowledge Flow through Citation, Citing Datasets, Styles for Citations, Acknowledgments and Attributions, What Should Be Acknowledged, Acknowledgments in, Books Dissertations, Dedication or Acknowledgments. **Textbook 1**: **Ch. 3, Ch. 4**	
Module – 3	**08Hrs**
Introduction To Intellectual Property: Role of IP in the Economic and Cultural, Development	

of the Society, IP Governance, IP as a Global Indicator of Innovation, Origin of IP History of IP in India. Major Amendments in IP Laws and Acts in India. Patents: Conditions for Obtaining a Patent Protection. Rights Associated with Patents. Enforcement of Patent Rights. Inventions Eligible for Patenting. Non-Patentable Matters. Patent Infringements. Avoid Public Disclosure of an Invention before Patenting. Process of Patenting. Process of Patenting. Prior Art Search. Choice of Application to be Filed. Patent Application Forms. Jurisdiction of Filing Patent Application. Publication. Pre-grant Opposition. Examination. Grant of a Patent. Validity of Patent Protection. Post-grant Opposition. Commercialization of a Patent. Need for a Patent Attorney/Agent. Patent Related Forms. Fee Structure. Types of Patent Applications. Commonly Used Terms in Patenting. National Bodies Dealing with Patent Affairs. Utility Models**.**

Textbook 2: Ch. 2

Module – 4	**08Hrs**

Copyrights and Related Rights: Classes of Copyrights. Criteria for Copyright. Ownership of Copyright. Copyrights of the Author. Copyright Infringements. Copyright Infringement is a Criminal Offence. Copyright Infringement is a Cognizable Offence. Fair Use Doctrine. Copyrights and Internet. Non-Copyright Work. Copyright Registration. Judicial Powers of the Registrar of Copyrights. Fee Structure. Copyright Symbol. @#@26092024 Validity of Copyright. Copyright Profile of India. Copyright and the word 'Publish'. Transfer of Copyrights to a Publisher. Copyrights and the Word 'Adaptation'. Copyrights and the Word 'Indian Work'. Joint Authorship. Copyright Society. Copyright Board. Copyright Enforcement Advisory Council (CEAC). International Copyright Agreements, Conventions and Treaties. Interesting Copyrights Cases. Trademarks: Eligibility Criteria. Acts and Laws. Classification of Trademarks. Validity of Trademark. Types of Trademark Registered in India. Trademark Registry. Process for Trademarks Registration. Prior Art Search. Famous Case Law: Coca-Cola Company vs. Bisleri International Pvt. Ltd.

Textbook 2: Ch. 3

Module – 5	**08Hrs**

Industrial Designs: Eligibility Criteria. Acts and Laws to Govern Industrial Designs. Design Rights. Enforcement of Design Rights. Non-Protectable Industrial Designs India. Protection Term. Procedure for Registration of Industrial Designs. Prior Art Search. Application for Registration. Duration of the Registration of a Design. Importance of Design Registration. Cancellation of the Registered Design. Application Forms. Classification of Industrial Designs. Designs Registration Trend in India. International Treaties. Famous Case Law: Apple Inc. vs. Samsung Electronics Co. Geographical Indications: Acts, Laws and Rules Pertaining to GI. Ownership of GI. Rights Granted to the Holders. Registered GI in India. Identification of Registered GI. Classes of GI. Non-Registerable GI. Protection of GI. Collective or Certification Marks. Enforcement of GI Rights. Procedure for GI Registration Documents Required for GI Registration. GI Ecosystem in India. Case Studies on Patents. Case study of Curcuma (Turmeric) Patent, Case study of Neem Patent, Case study of Basmati patent. IP Organizations in India. Schemes and Programmes.

Textbook 2: **Ch. 4, Ch. 7**

Course Outcomes: After completing the course, the students will be able to	
CO1	Apply research methodologies and ethical practices to address engineering research problems.
CO2	Analyze technical literature and synthesize research findings using appropriate citation practices.

CO3	Interpret research articles, algorithms, datasets, and technical documents in computing domains.
CO4	Implement intellectual property rights procedures for protecting technological innovations
CO5	Evaluate intellectual property case studies and determine suitable protection strategies for research outcomes

Textbooks	
1	"Research Methodology: Methods and Techniques", C.R. Kothari and Gaurav Garg, 5th Edition, New Age International Publishers, 2024. ISBN: 9389802555
2	"Intellectual property rights under WTO", T Ramappa, 2nd revised edition, Asia Law House Publisher, 2016, ISBN: 9385556819

Reference Books	
1	"Research Methodology: A Step-by-Step Guide for Beginners", Ranjit Kumar, SAGE Publications 2018, ISBN: 9781526457080
2	"Principles of Intellectual Property", Dr. N. S. Gopalakrishnan and T. G. Agitha, Eastern Book Company Publisher, 3rd edition, 2023. ISBN: 9788170121572

Web links and Video Lectures (e – Resources)	
1	https://online.vtu.ac.in/course/1-research-methodologies-and-ipr
2	https://onlinecourses.swayam2.ac.in/e-learning/preview/ntr24_ed08

CO – PO MAPPING

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**
CO1	2	3		3			3				2
CO2	2	3		3	1		2		2		3
CO3	2	3		2	2				2		3
CO4	1	1	2			2	3			2	2
CO5	1	3	2	2		2	3		1	2	2

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Semester: V					
Competency Enhancement Course-3					
Course Code	**:**	BCE508	**Credits**	**:**	0
Hours/Week(L:T:P)	**:**	0:2:0	**CIE**	**:**	100 Marks
Total Hours	**:**	40 L	**SEE**	**:**	-
Course Type	**:**	NCMC	**SEE Duration**	**:**	-

Prerequisites:	
Courses	Fundamentals of C Programing
Knowledge on Fundamental Concepts	Programming fundamentals, including variables, data types, control structures (if, loops) and syntax
Knowledge on Connected Tools (If any)	-

Course Learning Objectives: This course will enable the students to	
CLO1	Understand and apply fundamental programming concepts using C.
CLO2	Develop object-oriented programs in C++.
CLO3	Write and debug multi-file programs in C and C++.
CLO4	Design and manage databases using SQL in Oracle and MySQL.
CLO5	Compare and analyze different database models (RDBMS vs NoSQL).

Module – 1	**8 Hrs**

C programming (A)

Data Types, Operators and Expressions Input and output Operations Control Flow – Branching, Control Flow – Looping, Statements and Blocks, If Else, Switch, Nesting of If Else, GOTO statement, The while statement, The For statement, The Do statement, Jumps in loops

C programming (B)

Arrays, Strings, One-dimensional arrays, Initialization of one-dimensional arrays, Two-dimensional Arrays, Initializing Two-dimensional arrays, Multi-dimensional arrays, Dynamic arrays, Declaring and Initializing string variables, Reading Strings from Terminal, Writing Strings to screen, String handling functions, Operations on strings

C programming (C)

User-defined Functions, Structures, Basics of Functions, Functions Returning Non-integers, External Variables, Scope Rules, Header Files, Static Variables, Register Variables, Block Structure, Initialization, Recursion, Category of functions, Functions that return multiple values, Nesting functions, Multi-file programs, Structures and Functions, Arrays of Structures, Pointers to Structures, Self-referential structures.

Textbook 1: Ch1-11

Module – 2	**8 Hrs**

C Programming (D)

Unions, Pointers, Difference between Structures and Unions, Accessing the address of a variable, Declaring and Initializing pointer variables, Accessing a variable through its pointers,

Chain of pointers, Pointer Expressions, Pointer Increments and Scale Factors, Pointers and character strings, Array of pointers, Pointers as function arguments, Functions returning pointers, Pointers to functions, Drawback of Pointers

File Management in C

The Preprocessor, Defining and Opening a File, Closing a File, Input / Output Operations on Files, Random Access to Files, Command Line Arguments. Macro Substitution, File Inclusion, Compiler Control Directives, ANSI Additions.

Textbook 1: Ch 2-16

Module-3	**8 Hrs**

C++

Object oriented Programming, Class and Objects, Dynamic Memory Management POP,OOPs in C++, Console Input / Output in C++, Comment lines in C++, Importance of function prototyping in C++, Function overloading, Inline functions and default arguments.

Textbook 2 :Ch 1-6

Module-4	**8 Hrs**

C++

Scope Resolution Operator, Structures, Defining function outside the class , Friend functions, Friend class, Array of class objects, Passing class objects to and returning class objects from functions, Nested classes, Namespaces, Dynamic memory allocation using new and deallocation, new handler function.

Textbook 2: Ch 7-11

Module-5	**8 Hrs**

Database Management System : Types of DBMS – Merits and Demerits Oracle and MySQL, SDLC, Architecture (Oracle 10g) - Instance, User Accounts, Client Applications IP, Port Number, SQL Introduction Tables, DDL and DML, Pluggable Databases – Oracle 19c, Architecture Undo and Redo, Operators Constraints Sequences Triggers, Functions – Conversion, String, Math, Aggregate Clauses, Joins, Views, Synonyms, Indexes Stored Procedures, Normalization, Triggers and stored procedures, NoSQL Db, normalisation – tables

Textbook 3 : Ch 1-8

Course Outcomes: After completing the course, the students will be able to	
CO1	Demonstrate basic C programming skills in data types, control flow, arrays and strings to solve problems.
CO2	Apply advanced C features like functions, structures, pointers, unions and file handling for modular coding.
CO3	Apply C++ OOP concepts, including classes, function overloading, friend functions and dynamic memory management.
CO4	Design and manage databases with Oracle/MySQL, write SQL queries, normalize data and use stored procedures.
CO5	Combine C/C++ programming with database operations to build applications for data storage and retrieval.

Text Books	
1	Let Us C by Yashavant Kanetkar ,15th Edition, 2016, BPB Publications, ISBN- 978-8183331630.
2	Object-Oriented Programming with C++ by E. Balagurusamy, 8th Edition, 2020,Tata McGraw-Hill, ISBN- 978-9389949186.
3	Database System Concepts by Abraham Silberschatz, Henry Korth, S. Sudarshan,6th Edition, 2013,McGraw Hill Education, ISBN- 978-9332901384.

Reference Books	
1	Programming in ANSI C, by E. Balaguruswamy, 7th Edition, 2017,Tata McGraw-Hill, ISBN- 978-9339219666.
2	C PROGRAMMING LANGUAGE by Brian W. Kernighan / Dennis Ritchie,2nd Edition, 2015, Pearson Education India, (ISBN- 978-9332549449),

Web links and Video Lectures (e – Resources)	
1	https://www.softprayog.in/programming/c-programming-tutorial-data-types-and-expressions
2	https://www.geeksforgeeks.org/array-of-strings-in-c/
3	https://www.programiz.com/c-programming/c-structures-pointers
4	https://www.w3schools.com/cpp/cpp_oop.asp
5	https://www.geeksforgeeks.org/dbms/

CO – PO MAPPING

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**
CO1	3	3			2						2
CO2	3	3			2						2
CO3	3	2			2						2
CO4	3	2	3		2						2
CO5	3	2	3	2	2						2

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Semester: V					
National Service Scheme					
Course Code	**:**	BNS509	**Credits**	**:**	0
Hours/Week(L:T:P)	**:**	0:0:2	**CIE**	**:**	100 Marks
Total Hours	**:**	24P	**SEE**	**:**	-
Course Type	**:**	NCMC	**SEE Duration**	**:**	-

Course Learning Objectives: This course will enable the students to	
CLO1	Understand the community in general in which they work.
CLO2	Identify the needs and problems of the community and involve them in problem – solving.
CLO3	Develop among themselves a sense of social & civic responsibility & utilize their knowledge in finding practical solutions.
CLO4	Develop competence required for group-living and sharing of responsibilities & gain skills in mobilizing community participation to acquire leadership qualities and democratic attitudes.
CLO5	Appraise the importance of ethical issues and team working abilities pertaining to the social services.

Activity– 1	**06Hrs**
Developing Sustainable Water management system for rural areas and implementation approaches.	
Activity – 2	**06 Hrs**
Contribution to any national level initiative of Government of India. Foreg. Digital India, Skill India, Swachh Bharat, Atmanirbhar Bharath, Make in India, Mudra scheme, Skill development programs etc.	
Activity – 3	**06 Hrs**
Spreading public awareness under rural outreach programs.(Minimum 3 programs).	
Activity – 4	**06 Hrs**
Social connect and responsibilities.	

Pedagogy – Guidelines, it may differ depending on local resources available for the study as well as environment and climatic differences, location and time of execution

Sl.	**Topic**	**Group Size**	**Location**	**Activity Execution**	**Reporting**	**Evaluation of the Topic**
1.	Developing Sustainable Water management system for rural areas and	May be individual or team	Villages/ City Areas / Grama panchayat/ public associations/Government Schemes officers/ campus etc.	Site selection /proper consultation/ Continuous monitoring/ Information board	Report should be submitted by individual to the concerned	Evaluation as per the rubrics Of scheme and syllabus by NSS officer

	implementation approaches.				evaluation authority	
2.	Contribution to any national level initiative of Government of India. For eg. Digital India, Skill India, Swachh Bharat, Atmanirbhar Bharath, Make in India, Mudra scheme, Skill development programs etc.	May be individual or team	Villages/ City Areas / Grama panchayat/ public associations/Government Schemes officers/ campus etc.	Group selection /proper consultation/ Continuous monitoring/ Information board	Report should be submitted by individual to the concerned evaluation authority	Evaluation as per the rubrics Of scheme and syllabus by NSS officer
3.	Spreading public awareness under rural outreach programs. (minimum5 programs).	May be individual or team	Villages/ City Areas / Grama panchayat/ public associations/Government Schemes officers/ campus etc.	Group selection/proper consultation/ Continuous monitoring / Information board	Report should be submitted by individual to the concerned evaluation authority	Evaluation as per the rubrics Of scheme and syllabus by NSS officer
4.	Social connect and responsibilities.	May be individual or team	Villages/ City Areas / Grama panchayat/ public associations/Government Schemes officers/ campus etc.	Group selection/proper consultation/ Continuous monitoring / Information board	Report should be submitted by individual to the concerned evaluation authority	Evaluation as per the rubrics Of scheme and syllabus by NSS officer

Plan of Action (Execution of Activities for 5th Semester)

Sl. No.	Practice Session Description
1.	Lecture session by NSS Officer
2.	Selection of topic, Commencement of activity and its progress
3.	Execution of Activity
4.	Case study based Assessment, Individual performance
5.	Sector wise study and its consolidation
6.	Video based seminar for 10 minutes by each student At the end of semester with Report.
➢ In the 5th semester, each student should do activities according to the scheme and	

syllabus.

- At the end of the semester student performance has to be evaluated by the NSS Officer for the assigned activity progress and its completion.
- At the end of the 5th semester, consolidated report of all activities compiled report should be submitted as per the instructions.

Course Outcomes: After completing the course, the students will be able to	
CO1	Exploit the importance of his / her responsibilities towards society.
CO2	Analyze the environmental and societal problems/issues and will be able to design solutions for the same.
CO3	Evaluate the existing system and to propose practical solutions for the same for sustainable development.
CO4	Implement government or self-driven projects effectively in the field of societal problems.
CO5	Appraise the importance of ethical issues and team working abilities pertaining to the social services.

Assessment Details for CIE (100 Marks)

Weightage	**CIE- 100 Marks**
Selection of Topic, Commencement of activity and its progress	**40 Marks**
Case study based Assessment	**20 Marks**
Sector wise study and its consolidation	**20 Marks**
Video based seminar for 10 minutes by each student at the end of semester with Report	**20 Marks**
Total Marks for the course in the semester	**100 Marks**

Suggested Learning Resources:

Books:

1	NSS Course Manual, Published by NSS Cell, VTU Belagavi.
2	Government of Karnataka, NSS cell, activities reports and its manual.
3	Government of India, NSS cell, Activities reports and its manual.

CO – PO MAPPING

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**
CO1						3					3
CO2						3					3
CO3						3					3
CO4						3					3
CO5						2	3	3			3

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Semester: V					
Physical Education(PE)(Sports and Athletics)					
Course Code	**:**	BPE509	**Credits**	**:**	0
Hours/Week(L:T:P)	**:**	0:0:2	**CIE**	**:**	100 Marks
Total Hours	**:**	24P	**SEE**	**:**	-
Course Type	**:**	NCMC	**SEE Duration**	**:**	-

Course Learning Objectives: This course will enable the students to	
CLO1	Impart foundational knowledge on the importance of physical fitness, food, and nutrition for a healthy lifestyle and personal well-being.
CLO2	Develop awareness and proficiency in general fitness components such as agility, flexibility, and cardiovascular endurance through standardized physical fitness tests.
CLO3	Enhance motor skills and techniques in a selected sport (Badminton, Basketball, or Athletics) through structured practice and application of fundamental game-specific skills.

Module – 1	**4 Hrs**
Orientation A. Fitness B. Food & Nutrition	
Module – 2	**4 Hrs**
General Fitness & Components of Fitness A. Agility – Shuttle Run B. Flexibility – Sit and Reach C. Cardiovascular Endurance – Harvard step Test	
Module-3	**16 Hours**
Specific games (Any one to be selected by the student) A. Badminton (Fore hand low/high service, back hand service, smash, drop) B. Basketball (Dribbling, passing, shooting etc.) C. Athletics (Field events – Throws)	

Course Outcomes: After completing the course, the students will be able to	
CO1	Understand the fundamentals of fitness, food and nutrition and their role in a healthy lifestyle.
CO2	Demonstrate understanding of general fitness components such as agility, flexibility and cardiovascular endurance through standard fitness tests
CO3	Apply basic techniques, rules and strategies in the chosen sport (Badminton, Basketball, or Athletics)
CO4	Develop sport-specific skills to enhance performance in both practice and competitive situations
CO5	Exhibit teamwork, discipline and sportsmanship during training and game play

Scheme and Assessment for auditing the course and Grades:

Sl. No.	Activity	Marks
1.	Participation of student in all the modules	20
2.	Quizzes – 2, each of 15 marks	30
3.	Final presentation / exhibition / Participation in competitions/ practical on specific tasks assigned to the students	50
	Total	**100**

CO – PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	2				3					
CO2	3	3				3			2		
CO3	2	3				3	2	3	3		
CO4	2	3				3	2	3	3		
CO5	2	2					3	3	3		

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Semester: V					
Yoga					
Course Code	**:**	BYO509	**Credits**	**:**	0
Hours/Week(L:T:P:S)	**:**	0:0:2	**CIE**	**:**	100 Marks
Total Hours	**:**	15P	**SEE**	**:**	-
Course Type	**:**	NCMC	**SEE Duration**	**:**	-

Course Learning Objectives: This course will enable the students to	
CLO1	Adopt healthy lifestyle practices and maintain mental hygiene to promote physical and mental well-being
CLO2	Develop emotional intelligence and foster emotional stability through self-awareness and mindfulness practices.
CLO3	Impart moral values and enhance self-awareness to facilitate personal growth and attain higher levels of consciousness.

Module - 1	**03 Hrs**
Ashtanga Yoga Basics: Patanjali's Ashtanga Yoga – definition, need & importance, Introduction to 3 limbs: Asana, Pranayama, Pratyahara	
Module - 2	**03 Hrs**
Asana Overview: Meaning, need & benefits of Asanas, Classification: Sitting, Standing, Prone , Supine	
Module - 3	**03 Hrs**
Sitting & Standing Asanas: *Sitting Asanas*: Ardha Ushtrasana, Vakrasana, Yogamudra in Padmasana, *Standing Asanas*: Urdhva Hastothanasana, Hastapadasana, Parivritta Trikonasana Utkatasana, Technique, precautions & benefits	
Module - 4	**03 Hrs**
Prone & Supine Asanas: Prone Asanas: Padangushtha Dhanurasana, Poorna Bhujangasana / Rajakapotasana, Supine Asanas: Sarvangasana, Chakrasana, Navasana / Noukasana, Pavanamuktasana Technique, precautions & benefits	
Module - 5	**03 Hrs**
Pranayama Practice: Meaning, need & benefits of Pranayama, Breathing practice: 60 strokes/min, 3 rounds, Types of Pranayama:Ujjayi, Sheetali, Sheektari, Technique, precautions & benefits	

Course Outcomes: After completing the course, the students will be able to	
CO1	Describe the origin, history, objectives, and fundamental concepts of Yoga and its various schools.
CO2	Demonstrate Suryanamaskara and various types of Asanas with correct techniques, precautions, and benefits.
CO3	Differentiate between yogic and non-yogic practices
CO4	Apply yogic principles to promote physical and mental well-being.

Text Books	
1	Light on Yoga by BKS Iyengar, Thorsons Publishers, ISBN-10 : 8172235011
2	Teaching Methods for Yogic practices by Dr. M L Gharote & Dr. S K Ganguly, 4th

	Edition, Kaivalyadhama Publishers, ISBN-10 : 9788189485245.
3	Yoga Instructor Course hand book published by SVYASA University, Bengaluru

Reference Books	
1	"Yogapravesha", in Kannada by Ajitkumar
2	"Yoga for Children –step by step – ",by Yamini Muthanna

Web links and Video Lectures (e – Resources)	
1	https://www.youtube.com/watch?v=KB-TYlgd1wE
2	https://www.youtube.com/watch?v=aa-TG0Wg1Ls

CO – PO MAPPING

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**
CO1						2			2		
CO2						2			2		
CO3						2	2	3	2		2
CO4						2			2		
CO5						2	2	3	2		2

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Semester: V					
Music					
Course Code	**:**	BMU509	**Credits**	**:**	0
Hours/Week(L:T:P)	**:**	0:0:2	**CIE**	**:**	100 Marks
Total Hours	**:**	26P	**SEE**	**:**	-
Course Type	**:**	NCMC	**SEE Duration**	**:**	-

Course Objectives: This course will enable the students to	
CLO1	Understand the foundational concepts of Indian classical music, including the evolution and structure of Shruthi, Nada, Swara, Laya, Raga, Tala and Mela systems.
CLO2	Recognize and describe various types of Carnatic compositions such as Geethe, Jathi, Swara, Swarajathi, Varna, Krithi and Thillana, along with the basics of the notation system.
CLO3	Appreciate the contributions of key composers like Purandaradasa, Thyagaraja and Mysore Vasudevacharya to Indian music and understand their musical legacy.
CLO4	Identify and explain the classification and basic construction of traditional Indian musical instruments, including string, wind, percussion and idiophones, with appropriate examples.
CLO5	Demonstrate basic vocal proficiency through the practice of Sarale Varase exercises, notations for Suladi Sapta Tala in Mayamalavagowla raga and performance of selected compositions such as Geethe, Jathi Swara and Krithi.

Module -1	**03 Hrs**
Preamble Contents of the curriculum intended to promote music as language to develop an analytical, creative and intuitive understanding. For this the student must experience music through study and direct participation in improvisation and composition. Origin of the Indian Music: Evolution of the Indian music system, understanding of Shruthi, Nada, Swara, Laya, Raga, Tala, Mela **Textbook1, V-1 Ch. 1-4**	
Module – 2	**03 Hrs**
Compositions Introduction to the types of composition in Carnatic Music – Geethe, Jathi, Swara, Swarajathi, Varna, Krithi and Thillana, Notation System. **Textbook2 – Ch. 4-7**	
Module –3	**03 Hrs**
Composers Biography and contributions of Purandaradasa, Thyagaraja, Mysoro asudevacharya, Kanakadasa **Textbook3 – Ch. 2-5**	
Module –4	**03 Hrs**
Music Instruments Classification and construction of string instruments, wind instruments, percussion Instruments, Idiophones (Ghana Vaadya), Examples of each class of instruments.	

Textbook1,V-4 – Ch. 2-6	
Module –5	**14 Hrs**
Abhyasa Gana Singing the swara exercises (Sarale Varase Only), Botatio writing for sarale varase and sulafi sapta tala (Only in mayamalavagowla raga), singing 4 geethe in malahari and one jathi swara, oe krithi in a mela raga. **Textbook1, V-1&2**	

Course Outcomes: After completing the course, the students will be able to	
CO1	Outline the evolution of Indian music and key concepts like Shruthi, Swara, Raga and Tala.
CO2	Identify and interpret basic Carnatic compositions using standard notation.
CO3	Summarize the contributions of composers.
CO4	Classify Indian musical instruments and describe their construction and use.
CO5	Demonstrate basic Carnatic vocal skills through selected exercises and compositions.

Text Books	
1	"South Indian Music – Vol. I to VI", Prof. P. Sambamoorthy, The Indian Music Publishing House, Chennai.
2	"A Textbook of Carnatic Music", Dr. S. Bhagyalekshmy, CBH Publications
3	"Karnataka Sangeetha Charitre", Dr. V. S. Sampathkumaracharya, Kannada University, Hampi.

Reference Books	
1	"Music of India", B. Chaitanya Deva, Munshiram Manoharlal Publishers
2	"Essentials of Musicology in South Indian Music", Prof. S. R. Janakiraman, Asian Educational Services

CO – PO MAPPING

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**
CO1	3		1		1		1	1	1		1
CO2	3		3	1	2	1	2	1	1		1
CO3	1				1	1	1		1		
CO4	2		2		3	1	1	1	1		1
CO5	3			1	2	1	1	1	1		1

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Institute Vision

Preparing Competent Engineering and Management Professionals to Serve the Society

Institute Mission

- Providing Students with a Sound Knowledge in Fundamentals of their branch of Study.
- Promoting Excellence in Teaching, Training, Research and Consultancy.
- Exposing Students to Emerging Frontiers in various domains enabling Continuous Learning.
- Developing Entrepreneurial acumen to venture into Innovative areas.
- Imparting Value based Professional Education with a sense of Social Responsibility.

Department Vision

Educating Students to Engineer Information Science and Technology for Advancing the Knowledge as to Best Serve the Real World.

Department Mission

- Focusing on Fundamentals and Applied aspects in both InformationScience Theory and Programming practices.
- Training comprehensively and encouraging R&D culture in trending areas of Information Technology.
- Collaborating with premier Institutes and Industries to nurture Innovation and learning, in cutting edge Information Technology.
- Preparing the students who are much Sought-after, Productive and Well-respected for their work culture having Lifelong Learning practice.
- Promoting ethical and moral values among the students so as to enable them emerge as responsible professionals.

SJC INSTITUTE OF TECHNOLOGY

An Autonomous Institution under VTU from 2024-25

P.B. No.20, B.B Road,

Chikkaballapur - 562 101, Karnataka