

<b>Course Code</b>	<b>22BSC101</b>	<b>Programme Code</b>	<b>BSC2022</b>
<b>Course Name</b>	<b>Basics of Computer &amp; C Programming</b>		
<b>Credits</b>	<b>4</b>	<b>Course Type : Core Course Theory</b>	
<b>Course Objectives</b>	<ul style="list-style-type: none"> <li>To expose the students about basic concept of computer.</li> <li>To build the basic skills of C Programming.</li> <li>To understand importance of C and its methodologies.</li> </ul>		
<b>Mapping of Programme Outcome(PO) &amp; Programme Specific Outcome(PSO)</b>	<b>PO1,PO4,PO6,PSO1,PSO2</b>		
<b>Prerequisites:</b>	<ul style="list-style-type: none"> <li>The student should have the basic knowledge of mathematics.</li> <li>The students should possess the logical thinking ability.</li> </ul>		
<b>Course Outcomes (CO)</b>	<p>The students will be able to learn</p> <p>CO1: The computer I/O, peripheral devices, concept of OS, draw flowchart, algorithm and simple program.</p> <p>CO2: Loops and decision making statements to solve problems and its implementation.</p> <p>CO3: Implementation of arrays and functions.</p> <p>CO4: Implementation of string functions, pointers, structure and unions.</p>		
<b>Unit No.</b>	<b>Contents</b>		<b>Total Hrs (60)</b>
I	<p><b>Introduction to Computer :</b> Definition of Computer, Characteristics, Block diagram of computer, Input Output Devices(), Applications of computer.</p> <p><b>Types of computers:</b> Micro, Mini, Main and Super.</p> <p><b>Software:</b> Types of software: system software, application software, utility software</p> <p><b>Memory :</b> Primary Memory : RAM , ROM , PROM , EPROM.</p> <p>Secondary Storage Devices: Hard disk, CD, DVD, Pen drives.</p> <p>Communication: modem.</p>		10
	<b>Mapping of CO:CO1</b>		
II	<p><b>Operating System :</b> Windows OS: Introduction, Features of windows, Customizing Desktop, creating Short-cuts, moving, deleting Icons.</p> <p><b>Number system:</b> Decimal, binary, octal, hexadecimal and their conversions, ASCII Code.</p> <p><b>Computer Languages:</b> Machine Language, Assembly Language, High Level Language</p> <p><b>Programming Concept:</b> Algorithm, flowcharting.</p> <p><b>Programming process:</b> Program design, Coding, Compilation &amp; Execution, Testing &amp; Debugging, Documentation.</p>		12
	<b>Mapping of CO:CO1</b>		
III	<p><b>Structured Programming :</b> History of C language, Structure of C program, Functions as building blocks, Application Areas, C Program development life cycle, Keywords, Identifiers, Variables, Constants – character, integer, float, string. Data types – built-in and user defined.</p> <p><b>Operators and Expressions:</b> Operator types (arithmetic, relational, logical, assignment, bitwise, Ternary operator).</p> <p>Formatted Input Output</p>		12
	<b>Mapping of CO:CO1</b>		
IV	<p><b>Control Structures:</b> Decision making structures If, if-else, switch</p> <p><b>Loop Control structures:</b> While, do-while, for, Nested structures break and continue</p> <p><b>Functions:</b> Introduction, Advantages of Functions, Standard library functions. User defined functions: Declaration, definition, function call, parameter passing (by value), return keyword.</p> <p><b>Arrays:</b> Declaration and initialization of one and two dimensional array.</p>		13
	<b>Mapping of CO:CO2,CO3</b>		

V	<p><b>Pointers</b> - Declaration, initialization, Dereferencing a Pointer, Dynamic Memory Allocation</p> <p><b>Structure</b> - Creating structures, Accessing structure members (dot Operator), Structure initialization</p> <p><b>Unions:</b> Declaration and initialization, Difference between structures and unions</p> <p><b>String functions</b> - String functions : strlen(), strcpy(), strcmp() &amp; strcat()</p>	13
	<b>Mapping of CO:CO4</b>	
	<p><b>Textbooks:</b></p> <ol style="list-style-type: none"> <li>1. E Balgurusamy, Programming in ANSI C, fourth edition, Tata Mc Graw- Hill , New Delhi, India, (2008).</li> <li>2. Yashwant Kanetkar, Let us C, 2nd edition, BPB publication, New Delhi, India, (1995).</li> </ol>	
	<p><b>References:</b></p> <ol style="list-style-type: none"> <li>1. K.R.Venugopal, S.R. Prasad, Mastering C, Tata Mc Graw- Hill, New Delhi, India, (2008).</li> <li>2. BYRON S Gottfried, Programming With C, Second Edition, , Tata Mc Graw Hill, New Delhi, India, (2007).</li> </ol>	

<b>Course Code</b>	<b>22BSC102</b>	<b>Programme Code</b>	<b>BSC2022</b>
<b>Course Name</b>	<b>Basics of Statistics</b>		
<b>Credits</b>	<b>4</b>	<b>Course Type : Core Course Theory</b>	
<b>Course Objectives</b>	<ul style="list-style-type: none"> <li>• To explain the purpose of descriptive statistics.</li> <li>• To read and interpret various types of graphs, charts and diagrams.</li> <li>• To calculate the various types of averages like mean, mode, median etc.</li> <li>• To use experimental &amp; theoretical probabilities as appropriate to formulate and solve problems involving uncertainty.</li> </ul>		
<b>Mapping of Programme Outcome(PO) &amp; Specific Programme Outcome (PSO)</b>	<b>PO1,PO4,PO6,PSO1,PSO2</b>		
<b>Prerequisites:</b>	<ul style="list-style-type: none"> <li>• The students should have basic knowledge of mathematics (set theory) and handling scientific calculator.</li> <li>• The students should able to compute simple mathematical examples like computation of simple averages.</li> </ul>		
<b>Course Outcomes (CO)</b>	<p>The students will</p> <p>CO1: able to collect and present data by diagram and graph.  CO2: able to calculate various averages with different methods.  CO3: able to find relation between variable &amp; probability.</p>		
<b>Unit No.</b>	<b>Contents</b>		<b>Total Hrs (60)</b>
I	<p><b>Introduction to Statistics:</b> History of statistics, Definition, meaning, functions and limitations of statistics. Statistical organizations MOSPI (NSSO, CSO, ISI) &amp; their functions. Types of data (quantitative, qualitative, frequency, non frequency, time series and geographical) Collection of data: Primary and secondary methods. Primary methods [Direct personal interview, Indirect personal interview, Questionnaire methods, Questionnaire, send through enumerator (schedule method)]</p> <p><b>Mapping of CO : CO1</b></p>		12
II	<p><b>Presentation of data: Classification:</b> concept, definition, rules of classification and its types. <b>Tabulation:</b> Concept, Definition and meaning of tabulation, its parts. Frequency, frequency distribution (Discrete, continuous and cumulative). <b>Diagrammatic representation of data-</b> Line diagram, Bar diagram (Simple, multiple, sub-divided) pie chart. Graphical representation of data: histogram, frequency polygon, frequency curve, Ogive curve.</p> <p><b>Mapping of CO : CO1</b></p>		12
III	<p><b>Measures of central tendency:</b> Concept of Measures of central tendency, Definition and meaning of averages, quality of ideal measures of measures of central tendency, Types of Averages, Mathematical Average (A.M,GM and H.M), Positional averages(Median, Mode), Weighted A.M. Merits, Demerits and properties of Measures of central tendency. Relation between mean, mode &amp; median, relation between A.M., G.M. &amp; H.M. (Simple problem on Arithmetic Mean, Mode and Median).</p> <p><b>Mapping of CO : CO1, CO2</b></p>		14

IV	<p><b>Basic of Probability:</b> Deterministic &amp; non- deterministic phenomenon with examples, Concept of probability with real life example, meaning of probability, properties of probability, importance of probability, trial and events, probability related event (mutually exclusive, independent, dependent, equally likely, simple, compound, exhaustive and impossible) Theorems of probability (Addition and multiplication) with simple example</p> <p><b>Mapping of CO : CO1, CO3</b></p>	12
V	<p><b>Probability :</b> Concept of permutations and combinations, fundamental rules of probability, calculation of probability (Mathematical, statistical, conditional). Discrete random variables: Concept of random variable &amp; it's types, definition of Discrete random variable, probability mass function with simple problem, expectation of Discrete random variable and its properties, Definition of continuous random variable.</p> <p><b>Mapping of CO : CO1, CO3</b></p>	10
	<p><b>Books:</b></p> <ol style="list-style-type: none"> <li>1. S.C .Gupta, V. K. Kapoor, Fundamentals of Mathematical statistics,11th edition, Sultan Chand &amp; Sons, New Delhi (2000).</li> <li>2. R. S. N. Pillai, V. Bagavathi, Statistics theory and practice, 7th edition, Sultan Chand &amp; Sons, New Delhi (2003).</li> <li>3. Goon A.M., Gupta M.K., Das Gupta B., An outline of statistical theory, 4th edition, The World press, Calcutta (2003).</li> <li>4. S.P.Gupta, Statistical methods 38th edition, Sultan Chand &amp; Sons, New Delhi (2009).</li> </ol>	
	<p><b>References:</b></p> <ol style="list-style-type: none"> <li>1. Goon A.M., Gupta M.K., Das Gupta B., Fundamentals of Statistics, Vol.-I &amp; II, The World press, Calcutta (1999).</li> <li>2. J. Medhi, Statistical methods, an introductory text, New Age International,(1992).</li> <li>3. Brase &amp; Brase, Understandable Statistics, 11th edition, Cengage Learning, (2014).</li> <li>4. Croxton F. E., Cowden D.J., and Kelin S., Applied general Statistics, 2nd edition, Prentice-Hall of India Pvt Ltd., New Delhi (1955).</li> </ol>	

<b>Course Code</b>	<b>22BSC103</b>	<b>Programme Code</b>	<b>BSC2022</b>
<b>Course Name</b>	<b>Basic Electronic Devices &amp; Power supply</b>		
<b>Credits</b>	<b>4</b>	<b>Course Type : Core Course Theory</b>	
<b>Course Objectives</b>	<ul style="list-style-type: none"> <li>To expose the students about basic concept of electronics.</li> <li>To understand basic electronic components.</li> <li>To expose the students about semiconductors devices</li> </ul>		
<b>Mapping of Programme Outcome(PO) &amp; Programme Specific Outcome(PSO)</b>	<b>PO1,PO4,PO6,PSO1,PSO2</b>		
<b>Prerequisites:</b>	<ul style="list-style-type: none"> <li>Basic knowledge of electricity</li> <li>Basics knowledge of OHMs law</li> </ul>		
<b>Course Outcomes (CO)</b>	<p>The students will</p> <p>CO1: able to identify and test electronic components.</p> <p>CO2: able to identify faulty electronic components</p> <p>CO3: gain knowledge and ability to bulid basic electronic circuits.</p>		
<b>Unit No.</b>	<b>Contents</b>		<b>Total Hrs (60)</b>
I	<b>Electronic components:</b> Introduction & types of Resistor,Capacitors, Inductors, Transformers, Switches and Relays,Concept of ideal,practical voltage and current source,KVL & KCL applied to DC circuits only.Simple numericals on KVL KCL		10
	<b>Mapping of CO: CO1</b>		
II	<b>Semiconductor diode and Rectifires:</b> Energy Bands, Intrinsic and Extrinsic semiconductors, P-type and N-type semiconductor, formation of P-N junction diode, forward and reverse biased operation and characteristics, breakdown mechanism: avalanche and Zener, Zener diode and characteristics.Introduction to LED photodiode,Schottky & varactor diode		14
	<b>Mapping of CO:CO1</b>		
III	<b>Power Supply:</b> Block diagram of power supply ,Construction working of half wave, full wave and bridge rectifiers, comparison between rectifiers <b>Filters:</b> Idea of filter, types of capacitive filter <b>Regulators:</b> line regulation, load regulation, Zener regulator, Regulated power supply design using series pass transistor, General features of IC regulators, 78xx,79xx , LM 317		14
	<b>Mapping of CO: CO1,CO2,CO3</b>		
IV	<b>BJT &amp; FET:</b> Concept of PNP and NPN transistor, construction and working Of BJT, CB, CE and CC configuration, input and output characteristics of CB and CE mode, relation between alpha and beta, load line and operating point concept. Amplification action of CB, CE amplifier. Construction, working, and characteristics of JFET, FET parameter and relation of FET parameters		12
	<b>Mapping of CO: CO1,CO2</b>		
V	<b>CRO:</b> Block diagram block diagram of CRO, CRT diagram, horizontal and vertical deflection systems, time base circuit using UJT, necessity and concept of delay circuit, application of CRO (voltage, frequency measurement only).		10
	<b>Mapping of CO: CO1,CO2,CO3</b>		
	<b>Text Books:</b> 1. B. L. Theraja -Basic Electronics : (S. Chand and Company) 2. Principles of Electronics :V.K. Mehta(S.Chand and Company)		
	<b>References:</b> 1. Allen Mottershed, Electronic Devices and circuits, prentice hall of India Pvt. Ltd. 2. R. G. Kale, U. K. Puranik, V. N. Pendse, Kitab Mahal, An Introduction to Electronics. 3. Grob, Basic Electronics ,Tata McGraw Hill 4. T. L. Floyd, Electronic Devices , Pearson Education Asia 5. Malvino, Electronic Principles ,Tata McGraw Hill		

<b>Course Code</b>	<b>22BSC104</b>	<b>Programme Code</b>	<b>BSC2022</b>
<b>Course Name</b>	<b>English-I</b>		
<b>Credits</b>	<b>3</b>	<b>Course Type : AECC</b>	
<b>Course Objectives</b>	<ul style="list-style-type: none"> <li>To train and prepare the students to seek and find employment in various fields.</li> <li>To develop communicative competence in students.</li> <li>To expose the students to the employment opportunities, challenges and job roles.</li> </ul>		
<b>Mapping of Programme Outcome (PO) &amp; Programme Specific Outcome (PSO)</b>	<b>PO1, PO3, PO6,PO7,PSO4, PSO5</b>		
<b>Prerequisites:</b>	<ul style="list-style-type: none"> <li>Basic knowledge of English.</li> <li>Basics knowledge of English speaking.</li> </ul>		
<b>Course Outcomes (CO)</b>	<p>The students will be</p> <p>CO1: able to understand the paragraph, prose, poetry and communication skills.</p> <p>CO2: able to apply the four skills of language in his daily routine.</p> <p>CO3: able to communicate properly their ideas and concepts in English.</p>		
<b>Unit No.</b>	<b>Contents</b>		<b>Total Hrs</b>
I	<b>Prose:</b> 1) Appro JRD –Sudha Murthy 2) All about a Dog – A. G. Gardiner 3) The Power of Prayer – APJ Abdul Kalam 4) Model Millionaire – Oscar Wilde		10
	<b>Mapping of CO:CO1</b>		
II	<b>Poetry:</b> 1) Daffodils- William Wordsworth 2) Leisure – W. H Davies 3) Stay Calm- Grenville Kleiser 4) The Mountain and the Squirrel – Ralph W. Emerson		08
	<b>Mapping of CO:CO1</b>		
III	<b>Communication Skills:</b> 1) Preparing a CV 2) Applying for a Job 3) Narrating an Experience 4) Creative Writing ( Expansion of idea)		12
	<b>Mapping of CO:CO1,CO2,CO3</b>		
IV	<b>Grammmar:</b> 1. Articles. 2. Prepositions. 3. Tenses. 4. Synonyms and Antonyms.		07
	<b>Mapping of CO:CO1,CO2</b>		
V	<b>Dialogue Conversation:</b> 1) Meeting People. 2) Exchanging Greetings and Taking Leave. 3) Introducing yourself. 4) Making requests and Responding to Request		08
	<b>Mapping of CO:CO1,CO2,CO3</b>		
	<b>Text Books :</b> <i>Magnificence</i> Edited by Board of Editors, Sant Gadge Baba Amrawati University, Amrawati		
	<b>References:</b> 1. <i>Business Communication</i> by Urmila Rai and S M Rai, Himalaya Publishing House. 2. <i>Technical Communication</i> by Meenakshi Raman and Sangeeta Sharma, Himalaya Publishing House.		

Course code	22BSC105	Programme code	BSC2022
Course Name		ELECTIVE-I: Hindi	
Credit	3	Course type : Generic Interdisciplinary Theory	
<b>Course objectives</b>		1. विद्यार्थियों को विभिन्न क्षेत्रों में रोजगार प्राप्त हो, इस हेतु विद्यार्थियों में भाषा कौशल निर्माण करना। 2. विद्यार्थियों की क्षमता बढ़ाना। 3. विद्यार्थियों में भाषा के संबंध में रूचि पैदा कर उन्हें भाषा के विभिन्न माध्यमों से अवगत करना।	
<b>Mapping of Programme Outcome (PO) &amp; Programme Specific Outcome (PSO)</b>		<b>PO1,PO2,PO3,PSO4</b>	
<b>Prerequisites</b>		1 हिंदी भाषा का मूलभूत ज्ञान 2. बोलचाल की हिंदी भाषा का मूलभूत ज्ञान	
<b>Course outcome (CO)</b>		CO1. पाठ, कविता,सारांश आदि भाषा के विभिन्न रूपों को समझ पायेंगे CO2. भाषा के सभी कौशल कला का विकास कर अपनी संकल्पनाएं तथा विचारों को सुव्यवस्थित रूप रख सकेंगे। CO3. विद्यार्थी अपने ज्ञान को हिन्दी भाषा के माध्यम बेहतर ढंग से संप्रेषित कर सकेंगे।	
Unit no.	Contents	Total hrs (45)	
I	( गद्यविभाग ) 1) बड़े घर की बेटी- ( कहानी ) प्रेमचंद (2) अभाव -( कहानी) विष्णु प्रभाकर (3) निलकंठ -(संस्मरण) महादेवी वर्मा (4) महिला एवं पर्यावरण संरक्षण -डॉ विनोद सिंह, डॉ विरेंद्र बहादुर सिंह (5) बातचीत में शिष्टाचार -(निबंध) कामताप्रसाद गुप्त	15	
	<b>Mapping of CO : CO1,CO2,CO3</b>		
II	<b>संतवाणी</b> (1) संत जांभोजी के पद (2) संत तुकोडोजी के पद	05	
	<b>Mapping of CO : CO1,CO2</b>		
III	<b>पद्य विभाग</b> (1) पुष्प की अभिलाषा - माखनलाल चतुर्वेदी (2) मिट्टी की महिमा - शिवमंगल सुमन (3) भिक्षुक – सूर्यकांत त्रिपाठी ' निराला'	10	
	<b>Mapping of CO : CO1,CO2</b>		
IV	<b>हिंदी भाषा एवं व्याकरण</b> मुहावरे, विज्ञापन लेखन	05	
	<b>Mapping of CO : CO2,CO3</b>		
V	<b>संपूर्ण पाठ्यक्रम पर वस्तुनिष्ठ प्रश्न</b>	10	
	<b>Mapping of CO : CO2,CO3</b>		
नियोजित पाठ्य पुस्तक "ऋतुपर्ण " राघव पब्लिकेशन नागपुर संत गाडगे बाबा अमरावती विश्वविद्यालय, अमरावती द्वारा संचालित संदर्भ पुस्तक अभिनव हिंदी पाठ्यपुस्तक प्रकाशक – ओरियंट ब्लैकस्वान प्राइवेट लिमिटेड			

<b>Course Code</b>	<b>22BSC105</b>	<b>Programme Code</b>	<b>BSC2022</b>
<b>Course Name</b>	<b>ELECTIVE-I: Marathi</b>		
<b>Credits</b>	<b>3</b>	<b>Course Type: Generic Interdisciplinary Theory</b>	
<b>Course Objectives</b>	<ul style="list-style-type: none"> <li>विद्यार्थ्यांमध्ये मराठी साहित्याची गोडी निर्माण व्हावी सोबतच मराठी विषयाचा अभ्यास आकलनासाठी सोपा व आनंददायी असावा.</li> <li>मराठी साहित्य परंपरा तसेच लेखक, कवी, विचारवंत यांच्या लेखनातून आलेल्या दृष्टिकोनाची, मानवी मूल्यांची विद्यार्थ्यांना ओळख होईल.</li> <li>या अभ्यासक्रमातून विद्यार्थ्यांमध्ये सकारात्मकता निर्माण व्हावी हा उद्देश आहे</li> </ul>		
<b>Mapping of Programme Outcome (PO) &amp; Programme Specific Outcome (PSO)</b>	<b>PO1,PO2,PO3,PSO4</b>		
<b>Prerequisites:</b>	<ul style="list-style-type: none"> <li>भाषा ही माहिती संपादनाचे महत्त्वाचे साधन या दृष्टीने विद्यार्थ्यांनी मराठी विषयाकडे बघावे.</li> <li>मातृभाषेच्या अभ्यासातून व्यक्तीच्या अस्तित्वाला अर्थ येतो. तिच्या अधिष्ठानाशिवाय व्यक्तीचा अभ्यास व विकास अपूर्ण आहे म्हणून महाविद्यालयीन स्तरावर मराठीवर प्रभुत्व असणे अपेक्षित आहे.</li> </ul>		
<b>Course Outcomes (CO)</b>	<p>CO1: विद्यार्थ्यांची मातृभाषा आणि वाङ्मयविषयक अभिरुची वाढीस लागेल.</p> <p>CO2: नेमलेल्या साहित्यातून जीवनदर्शन, समकालीन व्यवहार जाणीवा याची माहिती होईल.</p> <p>CO3: भाषेच्या आकलनाबरोबरच विद्यार्थ्यांमध्ये मानवी मूल्ये वृद्धींगत होतील.</p> <p>CO4: विद्यार्थ्यांमध्ये मराठी भाषा, साहित्य, कला, कवी, विचारवंत यांचा परिचय होईल व विद्यार्थ्यांमध्ये याविषयी आवड निर्माण होईल.</p> <p>CO5: उपयोजित घटकाच्या माध्यमातून विविध प्रकारची कौशल्य त्यांच्यात निर्माण होतील.</p>		
<b>Unit No.</b>	<b>(Contents) घटक</b>	<b>Total Hrs (45)</b>	
I	<b>गद्य विभाग</b> पाखाला बाळास पांगुरवाणे - म्हाईभट गाडगेबाबांनी शाळा दिली - सीमा साखरे ...आणि गहुली झाली माऊली - प्रकाश राणे	10	
	<b>Mapping of CO: CO2, CO3</b>		
II	<b>गद्य विभाग</b> रद्दी - विलास अंभोरे नियतीच्या विक्राळ जबड्यात - सिंधुताई सपकाळ अन्वरशा फकीर - मधुकर वाकोडे	10	
	<b>Mapping of CO: CO1, CO2</b>		
III	<b>पद्य विभाग</b> संतवाणी अ संत ज्ञानेश्वरांचे अभंग - घनु वाजे घुणघुणा ब संत तुकारामांचे अभंग - टिळा टोपी उंच दावी विद्यार्थ्यांप्रत - केशवसुत	08	
	<b>Mapping of CO: CO1, CO2, CO3</b>		
IV	<b>पद्य विभाग</b> सुख - बबन सराडकर विश्वशांती - दिनेशकाळे बाप - प्रमोद गारोडे	08	
	<b>Mapping of CO: CO1, CO2, CO4</b>		
V	<b>उपयोजित मराठी</b> 1 लेखनविषयक नियम 2 कार्यालयीन पत्रव्यवहार	09	
	<b>Mapping of CO: CO5</b>		
	अभ्यासक्रमासाठी पुस्तके 1) ऋतुरंग-राघव पब्लिशर्स अँड डिस्ट्रिब्युटर्स नागपूर / जबलपूर 2) उपयोजित मराठी, संपादक: डॉ. केतकी मोडक, संतोष शेणई, सुजाता शेणई, पद्मगंधा प्रकाशन, पुणे संदर्भ ग्रंथ:		

	१) उपयोजित मराठी : डॉ.प्रभाकर जोशी ,प्रशांत पब्लिकेशन जळगाव २) सुगम मराठी व्याकरण लेखन सुधारित आवृत्ती २०१२ नितीन प्रकाशन पुणे	
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<b>Course Code</b>	<b>22BSC105</b>	<b>Programme Code</b>	<b>BSC2022</b>
<b>Course Name</b>	<b>ELECTIVE-I: Supplementary English</b>		
<b>Credits</b>	<b>3</b>	<b>Course Type : Generic Interdisciplinary Theory</b>	
<b>Course Objectives</b>	<ul style="list-style-type: none"> <li>To train and prepare the students to seek and find employment in various fields.</li> <li>To develop communicative competence in students.</li> <li>To expose the students to the employment opportunities, challenges and job roles.</li> </ul>		
<b>Mapping of Programme Outcome (PO) &amp; Programme Specific Outcome (PSO)</b>	<b>PO1, PO3, PO6,PO7,PSO4, PSO5</b>		
<b>Prerequisites:</b>	<ul style="list-style-type: none"> <li>Basic knowledge of English.</li> <li>Basics knowledge of English speaking.</li> </ul>		
<b>Course Outcomes (CO)</b>	<p>The students will be</p> <p>CO1: able to understand the paragraph , prose, poetry and communication skills.</p> <p>CO2: able to apply the four skills of language in his daily routine.</p> <p>CO3: able to communicate properly their ideas and concepts in English.</p>		
<b>Unit No.</b>	<b>Contents</b>		<b>Total Hrs (45)</b>
I	<b>Prose:</b> 1) The Lottery Ticket – Arton Chekhov 2) The Three Questions – Lev Nikoloyevich Tolstoy 3) Water: The Elixir of Life – C. V Raman 4) With the Photographer – Stephen Leacock		10
	<b>Mapping of CO:CO1</b>		
II	<b>Personalities:</b> 1) Malika Srinivasan 2) G. D. Naidu 3) Akio Morita		12
	<b>Mapping of CO:CO1</b>		
III	<b>Poetry:</b> 1) Yussouf – James Russel Lowell 2) Lord Ullin’s Daughter –Thomas Campbell 3) To India – My Native Land- Henry Louis Vivian Derozio 4) When We Two Parted – Lord Byron		08
	<b>Mapping of CO:CO1</b>		
IV	<b>Grammar and Composition:</b> 1) Precis Writing 2) Voice 3) Expansion of an Idea or a Proverb		07
	<b>Mapping of CO:CO1,CO2</b>		
V	<b>Communication Skill:</b> 1) Spot Visit 2) Preparing its Report 3) Interview of a Dignitary 4) Presentation on a topic from prescribed prose/poetry		08
	<b>Mapping of CO:CO1,CO2,CO3</b>		
	<b>Text Books:</b> <i>Rhymes and Sketches</i> Edited by Board of Editors, Sant Gadge Baba Amrawati University, Amrawati		
	<b>References:</b> 1. <i>Business Communication</i> by Urmila Rai and S M Rai, Himalaya Publishing House. 2. <i>Technical Communication</i> by Meenakshi Raman and Sangeeta Sharma, Himalaya Publishing House.		

<b>Course Code</b>	<b>22BSC106</b>	<b>Programme Code</b>	<b>BSC2022</b>
<b>Course Name</b>	<b>LABORATORY OF BASICS OF COMPUTER &amp; C PROGRAMMING</b>		
<b>Credits</b>	<b>2</b>	<b>Course Type : Core Course Practical</b>	
<b>List of Programs.</b>			<b>Total Hours (30)</b>
	<ol style="list-style-type: none"> <li>1. Practical Based on different flowchart using Paint.</li> <li>2. Practical Based on formatting text using Word Processing Package.</li> <li>3. Practical Based on different formulae, Graph using Spreadsheet package.</li> <li>4. Practical Based on Power Point presentation.</li> <li>5. Program based on Structure of C programming</li> <li>6. Program based on use of Operators.</li> <li>7. Program based on decision making statement.</li> <li>8. Program based on different looping statement.</li> <li>9. Program based on nested looping statement.</li> <li>10. Program based using function.</li> <li>11. Program based on use of array.</li> <li>12. Program based on use of pointers.</li> <li>13. Program based on use of structures.</li> <li>14. Program based on use of union.</li> <li>15. Program based on string handling functions.</li> </ol>		

<b>Course Code</b>	<b>22BSC107</b>	<b>Programme Code</b>	<b>BSC2022</b>
<b>Course Name</b>	<b>LABORATORY OF BASICS OF STATISTICS</b>		
<b>Credits</b>	<b>2</b>	<b>Course Type : Core Course Practical</b>	
	<b>List of Practicals</b>		<b>Total Hours (30)</b>
	<ol style="list-style-type: none"> <li>1. Presentation of data by frequency table.</li> <li>2. Problems based on classification</li> <li>3. Problems based on diagrammatic representation of data by bar diagram</li> <li>4. Problems based on diagrammatic representation of data by pie diagram</li> <li>5. Problems based on graphical representation of data by histogram, Frequency polygon.</li> <li>6. Problems based on graphical representation of data by frequency curve, Ogive curve.</li> <li>7. Problems based on arithmetic mean (grouped &amp; ungrouped data)</li> <li>8. Problems based on G.M. &amp; H.M.</li> <li>9. Problems based on weighted arithmetic mean.</li> <li>10. Problems based on median.</li> <li>11. Problems based on mode.</li> <li>12. Problems based on permutation &amp; combination.</li> <li>13. Problems based on evaluation of addition theorem.</li> <li>14. Problems based on multiplication theorem.</li> <li>15. Problems based on approximate approach of probability.</li> </ol>		

<b>Course Code</b>	<b>22BSC108</b>	<b>Programme Code</b>	<b>BSC2022</b>
<b>Course Name</b>	<b>LABORATORY OF BASIC ELECTRONIC DEVICES &amp; POWER SUPPLY</b>		
<b>Credits</b>	<b>2</b>	<b>Course Type : Core Course Practical</b>	
<b>List of Experiments</b>			<b>Total Hours (30)</b>
	<ol style="list-style-type: none"> <li>1. To verify resistance by color code method</li> <li>2. Study of forward characteristics of silicon diode</li> <li>3. Study of reverse characteristics of silicon diode</li> <li>4. Study of forward characteristics of zener diode</li> <li>5. Study of reverse characteristics of zener diode</li> <li>6. Study of half wave rectifier</li> <li>7. Study of full wave rectifier</li> <li>8. Study of bridge rectifier</li> <li>9. Study of input characteristics of NPN transistor in CB mode</li> <li>10. Study of output characteristics of NPN transistor in CB mode</li> <li>11. Study of input characteristics of NPN transistor in CE mode</li> <li>12. Study of output characteristics of NPN transistor in CE mode</li> <li>13. Study of forward characteristics of LED</li> <li>14. Study of reverse characteristics of LED</li> <li>15. Study of CRO to measure voltage &amp; frequency</li> </ol>		

<b>Course Code</b>	<b>22BSC201</b>	<b>Programme Code</b>	<b>BSC2022</b>
<b>Course Name</b>	<b>Data Structures</b>		
<b>Credits</b>	<b>4</b>	<b>Course Type : Core Course</b>	
<b>Course Objectives</b>	<ul style="list-style-type: none"> <li>To build the basic skills of programming.</li> <li>Analyze algorithms to determine time and space complexity.</li> <li>Build and manipulate linear and non-linear data structure, including stack, Array, Linked list, Queues, Tree and Graphs.</li> <li>To acquire the ability to choose the appropriate data structure to use in solving typical computer science problem</li> </ul>		
<b>Mapping of Programme Outcome(PO) &amp; Programme Specific Outcome(PSO)</b>	<b>PO1,PO4,PO6,PSO1,PSO2</b>		
<b>Prerequisites:</b>	<ul style="list-style-type: none"> <li>The student should have the basic knowledge of mathematics.</li> <li>The student should be able to do computations.</li> <li>The student should possess the logical thinking ability.</li> <li>The Student should have prior programming knowledge.</li> </ul>		
<b>Course Outcomes (CO)</b>	Students will able to learn: CO 1.Arrays, records, linked structures, stacks, queues, trees, and graphs are represented in memory and used by algorithms. CO 2.The concept of recursion, and it's Implementation using stack CO 3.Computational efficiency of algorithms for sorting & searching.		
<b>Unit No.</b>	<b>Contents</b>		<b>Total Hrs (60)</b>
I	<b>Data structure:</b> Introduction to data structure, Types of data structure, Data structure Operations, Algorithms & Algorithms Notation, Time-space Complexity. <b>Array:</b> Definition and concepts, Memory Representations, Operations: Traversing, Insertion, Deletion. <b>Mapping of CO:CO1</b>		<b>12</b>
II	<b>Linked List:</b> Linked lists & their representation in memory, types of linked list, Primitive Operation on Linked list, traversing a linked list, searching a linked list, Introduction to circular & doubly linked list . Memory allocation & garbage collection. Operations on linked list: Insertion, deletion. <b>Mapping of CO:CO1</b>		<b>12</b>
III	<b>Stack:</b> Definition, sequential and Linked representation in Memory. Primitive Operation on Stack, Arithmetic expressions: Polish notation: Infix, Postfix & Prefix operations using stack. <b>Recursion:</b> Recursion definitions & their types, recursion for Tower of Hanoi <b>Queues:</b> Definition, Primitive Operation on Queues, Array Representation of Queues, linked lists representation of a queue. Dequeue. Circular Queue, priority queue. <b>Mapping of CO:CO1,CO2</b>		<b>14</b>
IV	<b>Trees:</b> Definition, Tree terminology , Binary Trees, Linked representation, sequential representation, Tree traversal: Inorder, Preorder, Postorder. <b>Graph:</b> Definition, Graph Theory terminology, sequential and Linked representation of Graph. <b>Mapping of CO:CO1</b>		
V	<b>Searching Sorting &amp; Merging</b> <b>Searching:</b> Linear search, binary search <b>Sorting:</b> Bubble sort, selection sort, Insertion sorts, Radix sorts, Quick Sort. <b>Merging:</b> Merging & Merge sort. <b>Mapping of CO:CO1,CO3</b>		<b>10</b>
	<b>Text Books :</b> 1. Seymour Lipschutz: Data Structures, TMH Education Private Limited, New Delhi (2006) 2. S.B. Kishor: Data Structures, Third Edition, Dasganu Publications, Nagpur (2008) 3. G.S. Baluja: Data Structures Through C (A Practical Approach), GAGAN KAPUR FOR Dhanpat Rai & Co. (P) LTD. New Delhi. (1995).		
	<b>References:</b> 1. K.R. Venugopal, S.R. Prasad, Mastering C, Tata Mc Graw- Hill, New Delhi, India, (2008). 2. BYRON S Gottfried, Programming With C, Second Edition, , Tata Mc Graw Hill, New Delhi, India, (2007).		

<b>Course Code</b>	<b>22BSC202</b>	<b>Programme Code</b>	<b>BSC2022</b>
<b>Course Name</b>	<b>Advanced Statistics</b>		
<b>Credits</b>	<b>4</b>	<b>Course Type : Core Course Theory</b>	
<b>Course Objectives</b>	<ul style="list-style-type: none"> <li>• Able to identify skewness of distribution.</li> <li>• Able to find the mean, variance and correlation between variable.</li> <li>• To be able to apply probability to solve day to day life problems.</li> <li>• To study how to develop probability model and important concept in probability.</li> </ul>		
<b>Mapping of Programme Outcome(PO) &amp; Programme Specific Outcome(PSO)</b>	<b>PO1,PO4,PO6,PSO1,PSO2</b>		
<b>Prerequisites:</b>	<ul style="list-style-type: none"> <li>• The students should have basic knowledge of statistics and handling scientific calculator.</li> <li>• The students should have basic knowledge of probability, also able to solve simple problems on probability.</li> </ul>		
<b>Course Outcomes (CO)</b>	<p>The students will be:</p> <p>CO1. Able to calculate dispersion and correlation of different data.</p> <p>CO2. Able to find relation between discrete and continuous random variable and its mathematical expectation.</p> <p>CO3. Able to gain knowledge about probability distribution and understand how probabilities are distributed.</p> <p>CO4. Learn the difference between theoretical and experimental probabilities</p>		
<b>Unit No.</b>	<b>Contents</b>		<b>Total Hrs (60)</b>
I	<p><b>Measures of Dispersion:</b> Definition, Meaning, Purpose of dispersion, basic concept of quartile, deciles and percentile, Quality of ideal measure of dispersion, types of dispersion (range, Q.D, M.D and S.D) with its merits &amp; demerits, coefficient of measures of dispersion, Coefficient of variation, concept of variance. Concept of skewness, kurtosis with Karl Pearson's coefficient.</p>		10
	<b>Mapping of CO : CO1</b>		
II	<p><b>Correlation:</b> Meaning, definition. Types of correlation (Positive, negative, simple, partial, multiple, linear, non linear, spurious), coefficient of correlation with interpretation, Measurement of correlation: scatter diagram, correlation graph method. Karl Pearson's coefficient of correlation, spearman's correlation coefficient, coefficient of concurrent deviation (Merits &amp; demerits), Probable and standard error of coefficient of correlation, coefficient of determination and correlation ratio.</p>		12
	<b>Mapping of CO : CO1</b>		
III	<p><b>Random variable and mathematical expectation:</b>  Concept of discrete random variable with its definition and probability mass function, Concept and definition of continuous random variable, probability density function, mathematical expectation of discrete and continuous random variable. Moments &amp; covariance.</p>		10
	<b>Mapping of CO : CO2</b>		
IV	<p><b>Discrete probability distribution:</b>  Concept of discrete probability distribution and it's types, Discrete uniform distribution with mean and variance, Bernoulli distribution with mean and variance &amp; it's properties, Binomial distribution with mean and variance &amp; it's properties Poisson distribution with mean and variance &amp; its properties, usefulness of Poisson distribution.</p>		14
	<b>Mapping of CO : CO3, CO4</b>		

V	<p><b>Continuous probability distribution:</b>  Concept of Continuous probability distribution, with its types, continuous uniform distribution, it's mean and variance, Cauchy distribution (definition), concept of Exponential distribution with mean and variance. concept of gamma distribution, concept of normal distribution with mean and variance, usefulness of normal distribution, properties of normal distribution, importance of normal distribution.</p> <p><b>Mapping of CO : CO3, CO4</b></p>	14
	<p><b>Books:</b></p> <ol style="list-style-type: none"> <li>1. S.C .Gupta, V. K. Kapoor, Fundamentals of Mathematical statistics,11th edition, Sultan Chand &amp; Sons, New Delhi (2000).</li> <li>2. R. S. N. Pillai, V. Bagavathi, Statistics theory and practice, 7th edition, Sultan Chand &amp; Sons, New Delhi (2003).</li> <li>3. Goon A.M., Gupta M.K., Das Gupta B., An outline of statistical theory, 4th edition, The World press, Calcutta (2003).</li> <li>4. S.P.Gupta, Statistical methods 38th edition, Sultan Chand &amp; Sons, New Delhi (2009).</li> </ol>	
	<p><b>References:</b></p> <ol style="list-style-type: none"> <li>1. Goon A.M., Gupta M.K., Das Gupta B., Fundamentals of Statistics, Vol.-I &amp; II, The World press, Calcutta (1999).</li> <li>2. J. Medhi, Statistical methods, an introductory text, New Age International,(1992).</li> <li>3. Brase &amp; Brase, Understandable Statistics, 11th edition, Cengage Learning, (2014).</li> <li>4. Croxton F. E., Cowden D.J., and Kelin S., Applied general Statistics, 2nd edition, Prentice-Hall of India Pvt Ltd., New Delhi (1955).</li> </ol>	

<b>Course Code</b>	<b>22BSC203</b>	<b>Programme Code</b>	<b>BSC2022</b>
<b>Course Name</b>	<b>Digital Electronics</b>		
<b>Credits</b>	<b>4</b>	<b>Course Type : Core Course Theory</b>	
<b>Course Objectives</b>	<ul style="list-style-type: none"> <li>To expose the students about basic concept of digital electronics.</li> <li>To understand basic digital circuits.</li> <li>To expose the students about digital electronics</li> </ul>		
<b>Mapping of Programme Outcome (PO) &amp; Programme Specific Outcome (PSO)</b>	<b>PO1,PO4,PO6,PSO1,PSO2</b>		
<b>Prerequisites:</b>	<ul style="list-style-type: none"> <li>Basic knowledge of electronics</li> </ul>		
<b>Course Outcomes (CO)</b>	The students will be CO1: able to identify various logic circuits and verify truth table. CO2: able to learn Boolean algebra and K map CO3: able to gain knowledge and build basic digital circuits.		
<b>Unit No.</b>	<b>Contents</b>		<b>Total Hrs (60)</b>
I	<b>Number System and Logic Gates:</b> Number systems: Decimal, Binary, Octal and Hexadecimal and their inter-conversion, 1's complement and 2's complement of binary number, Binary arithmetic (addition, subtraction using one's and two's complement), Logic gates: NOT, AND, OR, NAND, NOR gates, EX-OR (truth table, logic symbol) NAND and NOR gate as a universal logic gate		12
	<b>Mapping of CO: CO1</b>		
II	<b>Boolean Algebra:</b> Boolean laws, Boolean identities, De-Morgan's theorem. Simplification of Boolean equations using Boolean algebra, fundamental products and K-map (K-map up to 4 variables), representation of SOP and POS form on K-map.		12
	<b>Mapping of CO: CO2</b>		
III	<b>Arithmetic Logic unit and Combinational Logic circuit:</b> <b>Arithmetic logic unit:</b> Half adder, Full adder, Four bit parallel adder, Four bit parallel adder/subtractor. <b>Combinational Logic circuit:</b> Definition, Construction and Operation of Multiplexer: 4:1, 8:1, De-multiplexer: 1:4, 1:8, Encoder: Decimal to BCD, Decoder: 2:4, 3:8		12
	<b>Mapping of CO: CO1, CO3</b>		
IV	<b>Flip-flops &amp; Registers:</b> RS, CLK RS, D, JK, T (logic diagram, truth table, construction and working). <b>Shift registers:</b> Types of shift registers, Left shift, and Right shift registers., Ring counter		12
	<b>Mapping of CO: CO1, CO3</b>		
V	<b>Counters, A/D and D/A converters: Counters:</b> Comparison between Asynchronous and synchronous counter, 3 bit and 4 bit ripple counter, 3 bit & 4 bit up-down counter, Decade counter. <b>A/D and D/A converters:</b> D/A converters: Weighted resistor, R-2R ladder. <b>A/D converters:</b> Flash type, Counter type		12
	<b>Mapping of CO: CO1, CO3</b>		
	<b>Text Books:</b> 1. R. P. Jain, Modern Digital Electronics, Tata Mc-Graw Hill 2. A. Anand Kumar, Fundamental of Digital Circuits, PHI		
	<b>References:</b> 1. A. P. Malvino, D. P. Leach, Digital principles and applications, McGraw Hill 2. V. S. Kale, Principles of digital Electronics M. B. Matsagar, Vision publication 3. Jain, Digital fundamentals Floyd, Pearson Publication 4. C. V. Dhuley and V. M. Ghodki, Fundamentals of Digital Electronics		

<b>Course Code</b>	<b>22BSC204</b>	<b>Programme Code</b>	<b>BSC2022</b>
<b>Course Name</b>	<b>English II</b>		
<b>Credits</b>	<b>3</b>	<b>Course Type : AECC</b>	
<b>Course Objectives</b>	<ul style="list-style-type: none"> <li>To train and prepare the students to seek and find employment in various fields.</li> <li>To develop communicative competence in students.</li> <li>To expose the students to the employment opportunities, challenges and job roles.</li> </ul>		
<b>Mapping of Programme Outcome (PO) &amp; Programme Specific Outcome (PSO)</b>	<b>PO1, PO3, PO6,PO7,PSO4, PSO5</b>		
<b>Prerequisites:</b>	<ul style="list-style-type: none"> <li>Basic knowledge of English.</li> <li>Basics knowledge of English speaking.</li> </ul>		
<b>Course Outcomes (CO)</b>	<p>The students will be :</p> <p>CO1: Able to understand the paragraph , prose, poetry and communication skills.</p> <p>CO2: Able to apply the four skills of language in his daily routine.</p> <p>CO3: Able to communicate properly their ideas and concepts in English.</p>		
<b>Unit No.</b>	<b>Contents</b>		<b>Total Hrs</b>
I	<b>Prose:</b> 1) The Last Leaf – O’Henry. 2) Of Studies – Francis Bacon. 3) Why is the Sea Blue? – G. Venkataraman 4) The Mute Companion – R. K . Narayan.		10
	<b>Mapping of CO:CO1</b>		
II	<b>Poetry:</b> 1) Once Upon a Time – Gabriel Okara 2) Ode on A Grecian Urn – John Keats 3) Leave this Chanting and Singing – Ravindranath Tagore 4) How do I Love thee? – Elizabeth Barrett Browning.		08
	<b>Mapping of CO:CO1</b>		
III	<b>Communication Skills:</b> 1) Non- Verbal Communication 2) Body Language		12
	<b>Mapping of CO:CO1,CO2,CO3</b>		
IV	<b>Grammmar:</b> 1) Question Tag. 2) Types of Sentences. 3) Voice. 4) Other forms of Verbs.		07
	<b>Mapping of CO:CO1,CO2</b>		
V	<b>Speaking Skills:</b> 1) Introducing People to Others. 2) Describing Daily Routine.		08
	<b>Mapping of CO:CO1,CO2,CO3</b>		
	<b>Text Books:</b> <i>Magnificence</i> Edited by Board of Editors, Sant Gadge Baba Amrawati University, Amrawati		
	<b>References:</b> 1. <i>Business Communication</i> by Urmila Rai and S M Rai, Himalaya Publishing House. 2. <i>Technical Communication</i> by Meenakshi Raman and Sangeeta Sharma, Himalaya Publishing House.		

Course code	22BSC205	Programme code	BSC2022
Course Name		Hindi	
Credit	3	Course type : Generic Interdisciplinary Theory	
<b>Course objectives</b>		1. विद्यार्थियों को विभिन्न क्षेत्रों में रोजगार प्राप्त हो, इस हेतु विद्यार्थियों में भाषा कौशल निर्माण करना। 2. विद्यार्थियों की क्षमता बढ़ाना। 3. विद्यार्थियों में भाषा के संबंध में रूचि पैदा कर उन्हें भाषा के विभिन्न माध्यमों से अवगत करना।	
<b>Mapping of Programme Outcome (PO) &amp; Programme Specific Outcome (PSO)</b>		<b>PO1,PO2,PO3,PSO4</b>	
<b>Prerequisites</b>		1 हिंदी भाषा का मूलभूत ज्ञान 2. बोलचाल की हिंदी भाषा का मूलभूत ज्ञान	
<b>Course outcome (co)</b>		CO1. पाठ, कविता,सारांश आदि भाषा के विभिन्न रूपों को समझ पायेंगे CO2. भाषा के सभी कौशल कला का विकास कर अपनी संकल्पनाएं तथा विचारों को सुव्यवस्थित रूप रख सकेंगे। CO3. विद्यार्थी अपने ज्ञान को हिन्दी भाषा के माध्यम बेहतर ढंग से संप्रेषित कर सकेंगे।	
Unit no.	Contents	Total hrs (45)	
I	<b>गद्यविभाग</b> 1) बहु की विदाई ( एकांकी) – विनोद रस्तोगी (2) बुधिया वापस कब आयेगा (निबंध) – ज्ञानचंद मर्मज्ञ (3) भोजन पोषण विज्ञान व स्वास्थ्य – डॉ. श्रीमती सुरजीत मल्हान	15	
	<b>Mapping of CO : CO1,CO2,CO3</b>		
II	<b>गद्यविभाग</b> (1) जीवन की किताब – गोपाल अनंत शेवडे (2) आज हिरोशिमा कहाँ है – इंदु जैन (3) उधार मांगना भी एक कला है(व्यंग्य) – बरसानेलाल चतुर्वेदी	05	
	<b>Mapping of CO : CO1,CO2</b>		
III	<b>पद्य विभाग</b> (1) रोटी और संसद – सुदामा पाण्डेय'धूमिल' (2) दोनों और प्रेम पलता है – मैथिलीशरण गुप्त (3) रोज विचारों से जिनकी टक्कर होती है – जहिर कुरैशी (4) कोशिश करने वालों की हार नहीं होती – सोहनलाल द्विवेदी (5) नया तूर्य - भवानीप्रसाद मिश्र	10	
	<b>Mapping of CO : CO1,CO2</b>		
IV	<b>व्यावहारिक कौशल</b> <b>अनुवाद :</b> (1) परिभाषा प्रकार महत्व और विशेषताएं (2) प्रूफ पठन और व्यवहारिक प्रूफ संशोधन	05	
	<b>Mapping of CO : CO2,CO3</b>		
V	<b>हिंदी भाषा एवं व्याकरण</b> लोकोक्तियाँ, अनेक शब्दों के लिए एक शब्द <b>पत्र लेखन :</b> महत्व और उसके विविध रूप( निजीपत्र,अखबारी पत्र,व्यावसायिक पत्र,अर्थ शासकीय पत्र)	10	
	<b>Mapping of CO : CO2,CO3</b>		
<b>नियोजित पाठ्य पुस्तक</b> "ऋतुपर्ण" राघव पब्लिकेशन नागपुर संत गाडगे बाबा अमरावती विश्वविद्यालय, अमरावती द्वारा संचालित <b>संदर्भ पुस्तक</b> प्रयोजनमूलक हिंदी दूरस्थ शिक्षा निदेशालय महर्षि दयानंद विश्वविद्यालय ,रोहतक हिंदी भाषा संरचना मध्य प्रदेश हिंदी ग्रंथ अकादमी अभिनव हिंदी पाठ्यपुस्तक प्रकाशक – ओरियंट ब्लैकस्वान प्राइवेट लिमिटेड			

<b>Course Code</b>	<b>22BSC205</b>	<b>Programme Code</b>	<b>BSC2022</b>
<b>Course Name</b>	<b>Marathi</b>		
<b>Credits</b>	<b>3</b>	<b>Course Type: Generic Interdisciplinary Theory</b>	
<b>Course Objectives</b>	<ul style="list-style-type: none"> <li>विद्यार्थ्यांमध्ये मराठी साहित्याची गोडी निर्माण व्हावी सोबतच मराठी विषयाचा अभ्यास आकलनासाठी सोपा व आनंददायी असावा.</li> <li>मराठी साहित्य परंपरा तसेच लेखक, कवी, विचारवंत यांच्या लेखनातून आलेल्या दृष्टिकोनाची, मानवी मूल्यांची विद्यार्थ्यांना ओळख होईल.</li> <li>या अभ्यासक्रमातून विद्यार्थ्यांमध्ये सकारात्मकता निर्माण व्हावी हा उद्देश आहे</li> </ul>		
<b>Mapping of Programme Outcome (PO) &amp; Programme Specific Outcome (PSO)</b>	<b>PO1,PO2,PO3,PSO4</b>		
<b>Prerequisites:</b>	<ul style="list-style-type: none"> <li>भाषा ही माहिती संपादनाचे महत्त्वाचे साधन या दृष्टीने विद्यार्थ्यांनी मराठी विषयाकडे बघावे.</li> <li>मातृभाषेच्या अभ्यासातून व्यक्तीच्या अस्तित्वाला अर्थ येतो. तिच्या अधिष्ठानाशिवाय व्यक्तीचा अभ्यास व विकास अपूर्ण आहे म्हणून महाविद्यालयीन स्तरावर मराठीवर प्रभुत्व असणे अपेक्षित आहे.</li> </ul>		
<b>Course Outcomes (CO)</b>	<p>CO1: विद्यार्थ्यांची मातृभाषा आणि वाङ्मयविषयक अभिरुची वाढीस लागेल.</p> <p>CO2: नेमलेल्या साहित्यातून जीवनदर्शन, समकालीन व्यवहार जाणीवा याची माहिती होईल.</p> <p>CO3: भाषेच्या आकलनाबरोबरच विद्यार्थ्यांमध्ये मानवी मूल्ये वृद्धीगत होतील.</p> <p>CO4: विद्यार्थ्यांमध्ये मराठी भाषा, साहित्य, कला, कवी, विचारवंत यांचा परिचय होईल व विद्यार्थ्यांमध्ये याविषयी आवड निर्माण होईल.</p> <p>CO5: व्यावहारिक घटकाच्या माध्यमातून विविध प्रकारची कौशल्ये त्यांच्यात निर्माण होतील.</p>		
<b>Unit No.</b>	<b>(Contents) घटक</b>	<b>Total Hrs (45)</b>	
I	<b>गद्य विभाग</b> 1 शिक्षण- जोतिराव फुले 2 डॉ.पंजाबराव देशमुख- वि.भि.कोलते 3 भारतीय संविधानाची विज्ञान निष्ठा- यशवंत मनोहर	10	
	<b>Mapping of CO: CO2, CO3</b>		
II	<b>गद्य विभाग</b> 1 कृष्णविवर- जयंत नारळीकर 2 लापड- गणेश चव्हाण 3 ग्रामगीतेतील अस्पृश्यता निर्मूलन विचार- सिंधू मांडवकर	10	
	<b>Mapping of CO:CO1,CO2</b>		
III	<b>पद्य विभाग</b> 1 संतवाणी अ मुंगी उडाली आकाशी- संत ज्ञानेश्वर ब निश्चयाचा महामेरू- समर्थ रामदास 2 आजोबा- विनायक पवार 3 मलाला युसुफझाई- विष्णू सोळंके 4 हुंकार- अनिल काळबांडे 5 विज्ञानयुग- आ.य.पवार	10	
	<b>Mapping of CO:CO1,CO2,CO3, CO4</b>		
IV	<b>व्यावहारिक कौशल्ये</b> 1 स्वपरिचयपत्र 2 नोकरीसाठी अर्जलेखन	07	
	<b>Mapping of CO:CO5</b>		
V	<b>व्यावहारिक मराठी</b> 1 मराठी भाषा आणि प्रसार माध्यमे- डॉ.सर्जनादित्य मनोहर 2 जाहिरातींची लेखन कौशल्य- (मुद्रित व दृकश्राव्य) -प्रा. वैशाली कार्लेकर	08	
	<b>Mapping of CO:CO5</b>		
	<b>अभ्यासक्रमासाठी पुस्तके</b>		

<p>1) ऋतुरंग- राघव पल्लिचार्स अँड डिस्ट्रिब्युटर्स नागपूर / जबलपूर</p> <p>संदर्भ ग्रंथ -</p> <p>1) व्यावहारिक मराठी, ल.रा. नसिराबादकर, फडके प्रकाशन, कोल्हापूर, 2006</p> <p>2) उपयोजित मराठी, संपादक: डॉ.केतकी मोडक, संतोष शेणई, सुजाता शेणई, पद्मगंधा प्रकाशन, पुणे</p>	
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<b>Course Code</b>	<b>22BSC205</b>	<b>Programme Code</b>	<b>BSC2022</b>
<b>Course Name</b>	<b>Supplementary English</b>		
<b>Credits</b>	<b>3</b>	<b>Course Type : Generic Interdisciplinary Theory</b>	
<b>Course Objectives</b>	<ul style="list-style-type: none"> <li>To train and prepare the students to seek and find employment in various fields.</li> <li>To develop communicative competence in students.</li> <li>To expose the students to the employment opportunities, challenges and job roles.</li> </ul>		
<b>Mapping of Programme Outcome(PO) &amp; Programme Specific Outcome(PSO)</b>	<b>PO1, PO3, PO6,PO7,PSO4, PSO5</b>		
<b>Prerequisites:</b>	<ul style="list-style-type: none"> <li>Basic knowledge of English.</li> <li>Basics knowledge of English speaking.</li> </ul>		
<b>Course Outcomes (CO)</b>	<p>The students will be :</p> <p>CO1: Able to understand the paragraph, prose, poetry and communication skills.</p> <p>CO2: Able to apply the four skills of language in his daily routine.</p> <p>CO3: Able to communicate properly their ideas and concepts in English.</p>		
<b>Unit No.</b>	<b>Contents</b>		<b>Total Hrs (45)</b>
I	<b>Prose:</b> 1) The Last Salvation – R. P. Sisodiya. 2) Forgetting – Robert Lynd. 3) The Diamond Necklace- Guy de Maupassant 4) Lawley road – R. K. Narayan <b>Mapping of CO:CO1</b>		10
II	<b>Personalities:</b> 1) Vijay Bhatkar 2) Priya Paul 3) Steve Jobs <b>Mapping of CO:CO1</b>		12
III	<b>Poetry:</b> 1) Say Not the Struggle Naught Availeth – Arthur Hugh Clough 2) The Tiger and the Deer – Sri Aurobindo 3) Polonius to Laertes – William Shakespeare 4) Nature – Henry Wordsworth Longfellow <b>Mapping of CO:CO1</b>		08
IV	<b>Grammar and Composition:</b> 1) Story Writing 2) Narration 3) Writing E-mails <b>Mapping of CO:CO1,CO2</b>		07
V	<b>Communication Skill:</b> 1) Spot Visit and writing its report 2) Blog Writing 3) Presentation on a topic from prescribed prose/poetry <b>Mapping of CO:CO1,CO2,CO3</b>		08
	<b>Text Books:</b> <i>Rhymes and Sketches</i> Edited by Board of Editors, Sant Gadge Baba Amrawati University, Amrawati		
	<b>References:</b> 1. <i>Business Communication</i> by Urmila Rai and S M Rai, Himalaya Publishing House. 2. <i>Technical Communication</i> by Meenakshi Raman and Sangeeta Sharma, Himalaya Publishing House.		

<b>Course Code</b>	<b>22BSC206</b>	
<b>Course Name</b>	<b>LABORATORY OF DATA STRUCTURES</b>	
<b>Total Credits</b>	<b>2</b>	<b>Course Type : Core Course Practical</b>
<b>List of Practicals</b>		
	<ol style="list-style-type: none"> <li>1. Practical Based on traversing of Linear Array.</li> <li>2. Practical Based on insertion of an element in linear array.</li> <li>3. Practical Based on deletion of an element in linear array.</li> <li>4. Practical Based on insertion of an element in linked list.</li> <li>5. Practical Based on deletion of an element in linked list.</li> <li>6. Practical Based on Push and Pop operation on stack.</li> <li>7. Practical Based on Recursion.</li> <li>8. Practical Based on Recursion using iteration method.</li> <li>9. Practical Based on Recursion for Tower of Hanoi problem.</li> <li>10. Practical Based on insertion of an element in queue.</li> <li>11. Practical Based on deletion of an element in queue.</li> <li>12. Practical Based on binary search.</li> <li>13. Practical Based on linear search.</li> <li>14. Practical Based on insertion sort.</li> <li>15. Practical Based on bubble sort.</li> </ol>	<b>Total Hours (30)</b>

<b>Course Code</b>	<b>22BSC207</b>	
<b>Course Name</b>	<b>LABORATORY OF ADVANCED STATISTICS</b>	
<b>Total Credits</b>	<b>2</b>	<b>Course Type : Core Course Practical</b>
	<p style="text-align: center;"><b>List of Practicals</b></p> <ol style="list-style-type: none"> <li>1. Problems based on range and quartile deviation and its coefficients.</li> <li>2. Problems based on standard deviation and its coefficient.</li> <li>3. Problems based on mean deviation and its coefficient.</li> <li>4. Problems based on quartiles &amp; deciles.</li> <li>5. Problems based on skewness.</li> <li>6. Problems based on kurtosis.</li> <li>7. Problems based on Karl Pearson's coefficient of correlation.</li> <li>8. Problems based on spearman's correlation coefficient.</li> <li>9. Calculation of mean, variance of Binomial distribution.</li> <li>10. Calculation of mean, variance of Poisson distribution.</li> <li>11. Problems on discrete Uniform distribution.</li> <li>12. Problems on continuous Uniform distribution.</li> <li>13. Problems on Exponential distribution.</li> <li>14. Fitting of Normal distribution.</li> <li>15. Problems on Area property of Normal distribution.</li> </ol>	<p style="text-align: center;"><b>Total Hours (30)</b></p>

<b>Course Code</b>	<b>22BSC208</b>	
<b>Course Name</b>	<b>LABORATORY OF DIGITAL ELECTRONICS</b>	
<b>Total Credits</b>	<b>2</b>	<b>Course Type : Core Course Practical</b>
<b>List of Experiments</b>		
	<ol style="list-style-type: none"> <li>1. Study of half adder and 3 bit full adder</li> <li>2. study of 4 bit binary parallel adder</li> <li>3. study of 4 bit binary parallel adder /subtractor</li> <li>4. Study of Multiplexer</li> <li>5. Study of Demultiplexer</li> <li>6. Study of BCD to 7 segment decoder</li> <li>7. Study of SR and clocked SR flip flop</li> <li>8. Study of D flop flop</li> <li>9. Study of JK and T flip flop</li> <li>10. Study of shift register</li> <li>11. Study of ring counter</li> <li>12. Study of 4 bit ripple counter</li> <li>13. Study of decade counter</li> <li>14. Study of 4 bit synchronous counter</li> <li>15. Study of synchronous up/down counter</li> </ol>	<b>Total Hours (30)</b>

<b>Course Code</b>	<b>22BSC301</b>	<b>Programme Code</b>	<b>BSC2022</b>
<b>Course Name</b>	<b>Object Oriented Programming</b>		
<b>Credits</b>	<b>4</b>	<b>Course Type : Core Course Theory</b>	
<b>Course Objectives</b>	<ul style="list-style-type: none"> <li>To build the basic skills of programming.</li> <li>To learn and implement the OOPs features.</li> <li>To be able to configure text, color and page layout with CSS.</li> <li>To acquire the importance of C++ programming using various methodologies.</li> </ul>		
<b>Mapping of Programme Outcome(PO) &amp; Programme Specific Outcome(PSO)</b>	<b>PO1, PO3, PO4, PSO1, PSO2, PSO3, PSO5.</b>		
<b>Prerequisites:</b>	<ul style="list-style-type: none"> <li>The student should have the basic knowledge of C Programming.</li> <li>The student should be able to do computations.</li> <li>The student should possess the logical thinking ability.</li> </ul>		
<b>Course Outcomes (CO)</b>	<p>Students will be able to learn:</p> <p>CO 1: Basic Concepts of Object oriented programming language.</p> <p>CO 2: The programming structure of C++ language.</p> <p>CO 3: The concepts of Objects, Classes, Methods, Constructors and Destructors.</p> <p>CO 4: Single Inheritance, Multiple Inheritance, Multi-level Inheritance, Hierarchical Inheritance and Hybrid Inheritance.</p> <p>CO 5: The concepts of Arrays, Pointers and Virtual Functions.</p>		
<b>Unit No.</b>	<b>Contents</b>		<b>Total Hrs (60)</b>
I	<p><b>Introduction:</b> Basic Concepts of OOP, Comparison with POP, features and Applications of OOP, Introduction of C++, structure of C++ program, simple C++ program, tokens, keywords, identifiers and constants, <b>C++ Datatypes:</b> Built in data types, User defined data types, variables, declaration &amp; initialization of variables, Dynamic initialization of variable.</p> <p><b>Operators:</b> operators in C++, scope resolution operator, member dereferencing Operator, type cast operator.</p> <p><b>Mapping of CO: CO1,CO2</b></p>		<b>13</b>
II	<p><b>Control statements:</b> if statement, if...else, nested if...else, switch,break, continue, do...while, while, for statements.</p> <p><b>Functions:</b> Functions prototype, Function calling and returning and their types, call by reference, return by reference, inline functions, function overloading.</p> <p><b>Mapping of CO:CO1,CO2</b></p>		<b>10</b>
III	<p><b>Classes and objects:</b> Class specification, Creating objects, Accessing class member, Defining member functions, Arrays within class, Arrays of objects,friend functions,memory allocation for objects,static data members and member function.</p> <p><b>Constructors:</b> Defining constructor, parameterized constructor, multiple constructor in a class, (default constructor)/ constructor with default argument, destructor.</p> <p><b>Mapping of CO:CO1,CO3</b></p>		<b>13</b>
IV	<p><b>Operator overloading:</b> Defining operator overloading, rules for overloading operators. unary and Binary operator overloading,</p> <p><b>Inheritance:</b> Introduction to inheritance, abstract class, derived classes, Single inheritance, multiple inheritance, multilevel inheritance, hierarchical and hybrid inheritance, Visibility mode.</p> <p><b>Mapping of CO:CO1,CO4</b></p>		<b>12</b>
V	<p><b>Arrays and Pointers:</b> One-dimensional, two-dimensional arrays, Defining Pointers, Declaring and initializing pointers, Pointers to objects, this pointer.</p> <p><b>Virtual function and Polymorphism:</b> Introduction, pointers to derived class, concept of virtual function, pure virtual function, rules for virtual function.</p> <p><b>Mapping of CO:CO1,CO5</b></p>		<b>12</b>
	<p><b>Text Books :</b></p> <ol style="list-style-type: none"> <li>Object oriented Programming with C++ by E Balgurusamy, 5<sup>th</sup> edition, Tata Mc Graw- Hill, New Delhi, India, (2011).</li> <li>Let us C++ by Yashwant Kanetkar, 2<sup>nd</sup> edition, BPB publication, New Delhi, India, (1999).</li> <li>Mastering C++ by K.R.Venugopal, Rajkumar, T Ravishankar, Tata Mc Graw-Hill, New Delhi, India, (2009).</li> <li>Object-Oriented Programming in C++ by Robert Lafore, 4<sup>th</sup> edition, Pearson education.</li> </ol>		
	<p><b>References:</b></p> <ol style="list-style-type: none"> <li>The Complete reference C++ by Herbert Schildt.</li> <li>Teach yourself C++ by AL Stevens, 4<sup>th</sup> edition, BPB publications.</li> </ol>		

<b>Course Code</b>	<b>22BSC305</b>	<b>Programme Code</b>	<b>BSC2022</b>
<b>Course Name</b>	<b>LABORATORY OF OBJECT ORIENTED PROGRAMMING</b>		
<b>Total Credits</b>	<b>2</b>	<b>Course Type : Core Course Practical</b>	
<b>List of Practicals</b>			
	<ol style="list-style-type: none"> <li>1. Practical based on simple C++ program to print a message.</li> <li>2. Practical based on use of Operators.</li> <li>3. Practical based on the use of nested if...else statement.</li> <li>4. Practical based on the use of switch statement.</li> <li>5. Practical based on the use of looping statement.</li> <li>6. Practical based on Classes and Objects.</li> <li>7. Practical based on the use of functions.</li> <li>8. Practical based on the use of function overloading.</li> <li>9. Practical based on the use of array and objects.</li> <li>10. Practical based on Constructor.</li> <li>11. Practical based on the use of pointers.</li> <li>12. Practical based on Operator Overloading.</li> <li>13. Practical based on the use of single inheritance.</li> <li>14. Practical based on the use of multiple inheritance.</li> <li>15. Practical based on virtual function.</li> </ol>	<b>Total Hours (30)</b>	

<b>Course Code</b>	<b>22BSC302</b>	<b>Programme Code</b>	<b>BSC2022</b>
<b>Course Name</b>	<b>Inferential Statistics</b>		
<b>Credits</b>	<b>4</b>	<b>Course Type : Core Course Theory</b>	
<b>Course Objectives</b>	<ul style="list-style-type: none"> <li>• The students have basic theoretical knowledge about fundamental principles for statistical inference.</li> <li>• The student has knowledge about construction of point and interval estimators.</li> <li>• The students can perform point estimation, interval estimation, and testing of hypothesis under a large variety of discrete and continuous probability models.</li> </ul>		
<b>Mapping of Programme Outcome(PO)&amp; Programme Specific Outcome(PSO)</b>	<b>PO4 , PSO1, PSO2</b>		
<b>Prerequisites:</b>	<ul style="list-style-type: none"> <li>• The students should have basic knowledge of Probability distribution.</li> <li>• The students must have knowledge of theory of estimation and statistical estimator.</li> </ul>		
<b>Course Outcomes (CO)</b>	<p>The students will</p> <p>CO1: Understand the problem of statistical inference, problem of point estimation.</p> <p>CO2: Understand the problems of testing of hypothesis.</p> <p>CO3: Understand the Properties of good estimator such consistency, unbiasedness, sufficiency</p> <p>CO4: Understand the problems of small and large sample test.</p> <p>CO5: Understand the problems of parametric test.</p>		
<b>Unit No.</b>	<b>Contents</b>		<b>Total Hrs (60)</b>
I	<b>Concept of Statistical inference, types of tools under inferential statistics: ( Regression analysis, Hypothesis testing model )</b> <b>Regression analysis:</b> Introduction, Definition, uses of regression analysis, types of regression (linear, non-linear, simple and multiple, regression line , regression lines ,regression equation , regression coefficient , properties of regression coefficient , standard error of estimate.		10
	<b>Mapping of CO: CO1</b>		
II	<b>Testing of Hypothesis:</b> Introduction to testing of Hypothesis, Concepts of Hypothesis , Simple Hypothesis and Composite Hypothesis ,null and alternative Hypothesis, Hypothesis Testing Procedure, Types of errors, One tail test and two tail test, Types of error , P value , Level of Significance , power of a test , Standard error and utility of standard error .		12
	<b>Mapping of CO: CO2</b>		
III	<b>Estimation :</b> Definition and concept of estimation ,Types of Estimation, Definition of Estimate , Estimator, Concept and Definition of Confidence interval and Degree of freedom.		10
	<b>Properties of good estimator :</b> Unbiasedness consistency , Efficiency and Sufficiency , MVUE, test of significance of attributes ( Test for number of success , Test for proportion of success, Test for difference between proportion )		
IV	<b>Mapping of CO : CO3</b>		14
	<b>Large sample test:</b> large sample test with assumptions, large sample test for single proportion, test for significance for difference proportion, test for population single mean, test for significance for difference population mean. Concept of parametric and non-parametric test, Difference Between large sample and small sample test.		
	<b>Mapping of CO: CO4, CO5</b>		

V	<p>Introduction to small sample tests, difference between large sample test and small sample test, assumption and limitation of large sample test.</p> <p>I) Small sample tests based on chi square distribution ,</p> <ol style="list-style-type: none"> <li>1) Test for goodness of fit.</li> <li>2) Test for independence of two attributes.</li> </ol> <p>I) For 2x2 contingency table.</p> <p>II) For rxs contingency table.</p> <p>II) Small sample tests based on students-t distribution,</p> <ol style="list-style-type: none"> <li>I) test for single mean.</li> <li>II) Test for significance of two population mean.</li> <li>III) Paired t test.</li> </ol>	14
<b>Mapping of CO: CO4,CO5</b>		
<p><b>Books:</b></p> <ol style="list-style-type: none"> <li>1. S.C .Gupta, V. K. Kapoor, Fundamentals of Mathematical statistics,11th edition, Sultan Chand &amp; Sons, New Delhi (2000).</li> <li>2. R. S. N. Pillai, V. Bagavathi, Statistics theory and practice, 7th edition, Sultan Chand &amp; Sons, New Delhi (2003).</li> <li>3. Goon A.M., Gupta M.K., Das Gupta B., An outline of statistical theory, 4th edition, The World press, Calcutta (2003).</li> <li>4. Gupta and Mukhopadhyay P.P., Applied Statistics ,Central Book Agency, S.Chand Publication.</li> </ol>		
<p><b>References:</b></p> <ol style="list-style-type: none"> <li>1. Goon A.M., Gupta M.K., Das Gupta B., Fundamentals of Statistics, Vol.-I &amp; II, The World press, Calcutta (1999).</li> <li>2. J. Medhi, Statistical methods, an introductory text, New Age International,(1992).</li> <li>3. Brase &amp; Brase, Understandable Statistics, 11th edition, Cengage Learning, (2014).</li> <li>4. Croxton F. E., Cowden D.J., and Kelin S., Applied general Statistics, 2nd edition, Prentice-Hall of India Pvt Ltd., New Delhi (1955).</li> </ol>		

<b>Course Code</b>	<b>22BSC306</b>	<b>Programme Code</b>	<b>BSC2022</b>
<b>Course Name</b>	<b>LABORATORY OF INFERENCEAL STATISTICS</b>		
<b>Credits</b>	<b>2</b>	<b>Course Type : Core Course Practical</b>	
	<b>List of Practical's</b>		<b>Total Hours (30)</b>
	<ol style="list-style-type: none"> <li>1. Practical based on regression equations.</li> <li>2. Practical based on standard error of estimate.</li> <li>3. Computation of mean and variance of estimator.</li> <li>4. Large sample test for single mean.</li> <li>5. Large sample test for two population means.</li> <li>6. Large sample test for single proportions.</li> <li>7. Large sample test for two population proportions.</li> <li>8. Chi-square test for goodness of fit.</li> <li>9. Computation of 2x2 contingency table.</li> <li>10. Computation of rxs contingency table.</li> <li>11. Chi-square test for population variance.</li> <li>12. t- test for significance of single mean.</li> <li>13. t- test for significance of two population mean.</li> <li>14. Computation of paired -t test.</li> <li>15. F test for significance of two population variance.</li> </ol>		

<b>Course Code</b>	<b>22BSC303</b>	<b>Programme Code</b>	<b>BSC2022</b>
<b>Course Name</b>	<b>Electronic Instrumentation &amp; Multivibrators</b>		
<b>Credits</b>	<b>4</b>	<b>Course Type : Core Course Theory</b>	
<b>Course Objectives</b>	<ul style="list-style-type: none"> <li>To expose the students about basics of Instrumentation.</li> <li>To expose the students about basics of multivibrators.</li> <li>To introduce the students about various types of transducer.</li> </ul>		
<b>Mapping of Programme Outcome(PO) &amp; Programme Specific Outcome(PSO)</b>	<b>PO1,PO4,PO6,PSO1,PSO2</b>		
<b>Prerequisites:</b>	<ul style="list-style-type: none"> <li>Basic knowledge of physical quantities like force, torque, displacement etc.</li> </ul>		
<b>Course Outcomes (CO)</b>	<p>The students will</p> <p>CO1: gain knowledge about instruments.</p> <p>CO2: gain knowledge about transducers.</p> <p>CO3: able to design basic instruments for measuring some physical quantities.</p> <p>CO4: gain knowledge about multivibrators.</p>		
<b>Unit No.</b>	<b>Contents</b>		<b>Total Hrs (60)</b>
I	<p><b>Unit I :</b> Basics of instrumentation: Block diagram of generalized instrumentation system, definitions of accuracy, precision, resolution, error, sensitivity. Concept of transducers(primary and secondary, active and passive, analog and digital), Electrical transducers, advantages, selection criteria of transducer.</p> <p><b>Mapping of CO: CO1</b></p>		10
II	<p><b>Unit II: Types of Transducers:</b> Resistive transducers (potentiometer), inductive transducer (LVDT), capacitive transducer(by changing distance), measurement of displacement using capacitive transducer (by changing dielectric)</p> <p><b>Mapping of CO:CO2</b></p>		12
III	<p><b>Unit III: Temperature, Flow and Humidity Measurements:</b> Resistive Thermometer, Thermister, Thermo couple: their types, Construction, use in measurement of temperature, advantages. Flow Measurement: Using Ultrasonic, Electromagnetic and Hot wire anemometer. Humidity measurement: Resistive transducer.</p> <p><b>Mapping of CO: CO1, CO2, CO3</b></p>		14
IV	<p><b>Unit IV: Pressure and Level Measurement:</b> Types of pressure measurement devices, Inductive, Capacitive transducer, piezoelectric transducer: construction, working. Measurement of low pressure: concept and working of thermocouple Vacuum gauge, pirani gauge, Ionization type vacuum gauge. Level measurement: Resistive, using gamma rays, Ultrasonic method.</p> <p><b>Mapping of CO: CO1, CO2, CO3</b></p>		14
V	<p><b>Unit V: Multivibrators</b> Multivibrators: Basic concept of multivibrator, Construction working, frequency of oscillation, merits and demerits of Astable, monostable and bi-stable multivibrator, comparison between multivibrators, Construction and working of schmitt trigger.</p> <p><b>Mapping of CO: CO4</b></p>		10

	<p><b>Text Books:</b></p> <ol style="list-style-type: none"> <li>1. A.K. Sawhney, Electrical and Electronic Measurements and Instrumentation, (Dhanpat Rai and sons)</li> <li>2. H.S. Kalsi, Electronic Instrumentation</li> <li>3. Sanjeev Gupta, Electronic Devices And Circuits, Dhanpat Rai publications</li> </ol>	
	<p><b>References:</b></p> <ol style="list-style-type: none"> <li>1. W. D. Cooper and A. D. Helfrick, Electronic instrumentation and Measurement Techniques, (Prentice Hall)</li> <li>2. C. S. Rangan, G. R. Sharma, V. S. V. Mani, Instrumentation Deices and Circuits, (McGraw Hill)</li> <li>3. R. S. Khandpur, Handbook of Biomedical Instrumentation, (Tata McGraw Hill Ltd.2003)</li> <li>4. Design G. Haridasan, Biomedical Instrumentation- Principles, Measurements and (Vipul Prakashan, Mumbai)</li> <li>5. Bhargava, Kulshreshtha, Basic electronics and linear circuits, Gupta Technical education.</li> <li>6. G. Pimpale, Sushama Pimpale, Functional circuits in Electronics, Mcmillan India Ltd.</li> </ol>	

<b>Course Code</b>	<b>22BSC307</b>	<b>Programme Code</b>	<b>BSC2022</b>
<b>Course Name</b>	<b>LABORATORY OF ELECTRONIC INSTRUMENTATION &amp; MULTIVIBRATORS</b>		
<b>Credits</b>	<b>2</b>	<b>Course Type : Core Course Practical</b>	
<b>List of Experiments</b>			
<ol style="list-style-type: none"> <li>1. To study the characteristics of Photo-voltaic cell.</li> <li>2. To study the characteristics of Photo-conductive cell.</li> <li>3. Measurement of displacement using LVDT.</li> <li>4. Measurement of temperature by thermister.</li> <li>5. Measurement of temperature by thermocouple.</li> <li>6. Measurement of Pressure using pressure gauge transducer.</li> <li>7. Study of resistive transducer (Potentiometer).</li> <li>8. Study of capacitive transducer.</li> <li>9. Study of astable multivibrator.</li> <li>10. Study of monostable multivibrator.</li> <li>11. Study of bistable multivibrator.</li> </ol>			

<b>Course Code</b>	<b>22BSC304</b>	<b>Program Code</b>	<b>BSC2022</b>
<b>Course Name</b>		<b>Environment Science and Disaster Management</b>	
<b>Credits</b>	<b>2</b>	<b>Course Type: Life Skill Course</b>	
Course Objectives		<ul style="list-style-type: none"> <li>To Create Awareness about the Environment among the Students.</li> <li>To impart basic knowledge about the Environment and its applied problem.</li> <li>To develop an attitude of concern for the Environment.</li> <li>To Provide students an exposure to disasters, their types and causes.</li> <li>To ensure that students begin to understand the relationship between vulnerability, disasters, disaster prevention and Risk Reduction.</li> <li>To enhance awareness and to develop rudimentary ability to respond to their surroundings with potential disaster response in areas where they live, with due sensitivity.</li> </ul>	
Mapping of Programme Outcome(PO) and Programme Specific Outcome (PSO)		PO1, PSO1	
Prerequisites		Basic awareness about Environment Protection and conservation.	
Course outcomes (CO)		<b>The Student Will</b> CO 1: Be able to understand Environmental issues and their causes. CO2: Gain knowledge of Ecosystem, Biodiversity, Environmental Pollution and control. CO3: Achieve awareness about Environment Protection and conservation. CO4: Gain Knowledge about disasters, their types, causes, and impacts. CO5: Be able to understand the relationship between vulnerability, disasters, disaster prevention and Risk Reduction. CO6: Be achieve awareness and to develop rudimentary ability to respond to their surroundings with potential disaster response in areas where they live, with due sensitivity.	

<b>Units</b>	<b>Contents</b>	<b>Total Hrs:30</b>
I	<b>The Multidisciplinary Nature of Environmental Studies:</b> Definition, Scope and importance, Need for Public Awareness. <b>Social Issues and the Environment:</b> Population Explosion, Sustainable Development, Water Conservation, Global warming, Acid-rain, Environment Protection Act. <b>Mapping of CO : CO1,CO2</b>	6
II	<b>Ecosystem, Biodiversity and its Conservation: Ecosystem-</b> Concept of Ecosystem, Structure and function of Ecosystem, Forest ecosystem, Desert ecosystem. <b>Biodiversity:</b> Introduction- Definition, Genetic, Species and Ecosystem diversity, Values of diversity, Hotspots of biodiversity, Threats to biodiversity, Conservation of biodiversity, In-situ and Ex-situ conservation. <b>Mapping of CO: CO2</b>	6
III	<b>Environmental Pollution and Control:</b> Definition, Causes, effects and control measures of Air Pollution, Soil Pollution, Water Pollution, Noise Pollution, Thermal Pollution, Solid Waste Management. <b>Mapping of CO: CO3</b>	6
IV	<b>Introduction to Disasters:</b> Definitions and Concepts of Disaster, Hazard, Vulnerability, Capacity, Risks. Classification of Disaster, Causes, Impacts (including social, economic, environmental, health, psychosocial, etc.) Differential impacts – in terms of caste, class, gender, age, location, disability, Pandemics, Climate change. <b>Mapping of CO: CO4</b>	6
V	<b>Approaches to Disaster Risk Reduction:</b> Disaster Management Cycle- Its analysis, Phases. Prevention, Mitigation and Preparedness. Factors affecting Vulnerabilities. Structural and Non-structural measures, Roles and responsibilities of- community, States, Centre and other Stake-holders. Disaster Management Act. <b>Mapping of CO: CO2,CO5</b>	6

	<p><b>Text Books :</b></p> <ol style="list-style-type: none"> <li>1. Prof. K. J. Gawai, Environmental Studies, Sanskar publications.</li> <li>2. Environmental Studies, Mr. D.L. Bhade, Mr. S.B. Sonone, Pioneer publications.</li> <li>3. Gupta Anil K. Seerja S. Nair, 2011 Environmental knowledge for Disaster Risk Management, NIDM, New Delhi.</li> <li>4. KapurAnu 2010:Vulnerable India: A Geographic Study of Disasters, IIAS and Sage Publishers, New Delhi.</li> </ol>	
	<p><b>References :</b></p> <ol style="list-style-type: none"> <li>1. Agarwal, K.C. Environmental Biology, Nidi Publ.Ltd. Bikaner.</li> <li>2. Brunner R.C. ,1989, Hazardous Waste Incineration, McGraw Hill Inc. 480p Clark R.S., Marine Pollution, Clarendon Press Oxford (TB)</li> <li>3. De A.K. Environmental Chemistry, Wiley Eastern Ltd.</li> <li>4. Alexander David, Introduction in 'Confronting Catastrophe', Oxford University Press 2000.</li> <li>5. Andharia J., Vulnearability in Disaster Discourse , JTCDM, Tata Institute of Social Sciences Working Paper No.8, 2008.</li> <li>6. Govt.of India: Disaster Management Act, 2005, Government of India, New Delhi.</li> </ol>	

<b>Course Code</b>	<b>22BSC401</b>	<b>Programme Code</b>	<b>BSC2022</b>
<b>Course Name</b>	<b>Vital &amp; Economic Statistics</b>		
<b>Credits</b>	<b>4</b>	<b>Course Type : Core Course Theory</b>	
<b>Course Objectives</b>	<ul style="list-style-type: none"> <li>• To provide relevant difference amongst rates, ratio's and proportion, and also amongst measures of morbidity, mortality and fertility</li> <li>• To be able to apply concept of Index No and Demand analysis</li> <li>• To be able to calculate and understand the meaning of various vital measures</li> <li>• To study the theory of consumer behavior and its application.</li> </ul>		
<b>Mapping of Programme Outcome(PO)&amp; Programme Specific Outcome(PSO)</b>	<b>PO4 , PS01, PS02</b>		
<b>Prerequisites:</b>	<ul style="list-style-type: none"> <li>• The student should have knowledge about collection of data and the student should have knowledge about different vital events.</li> <li>• The student should have knowledge about demand, supply, profit and loss.</li> </ul>		
<b>Course Outcomes (CO)</b>	<p>The students will be:</p> <p>CO1: Able to understand how vital statistics are obtained from different method.</p> <p>CO2: Able to know the importance of index number and time series in Economy in nation.</p> <p>CO3:Able to know how economist use economic model and time series model.</p> <p>CO4:Able to explains and graphically illustrate market equilibrium surplus and shortages</p>		
<b>Unit No.</b>	<b>Contents</b>		<b>Total Hrs (60)</b>
I	<p><b>Census:</b> Definition of population, population census, need of census, method of census (De-facto and De-jure), general idea of census in India, density of population, census survey method.</p> <p><b>Sample survey:</b> Definition of sample, parameter, statistic and sample survey, error in sample survey, various principal steps in sample survey, advantages and limitations of sample survey over complete census.</p> <p><b>Mapping of CO: CO1</b></p>		12
II	<p><b>Vital statistics:</b> vital events, definition of vital statistics, uses of vital statistics methods of obtaining vital statistics (Registration method, census enumeration method, analytical method), measurement of population, Rates and ratio of vital events.</p> <p><b>Calculation of vital statistics:</b> Measures of fertility with merits and demerits (CBR, GFR, SFR, TFR, GRR and NRR), Measures of Mortality with merits and demerits (CDR, Specific death rate, Age-SFR, Standardized Death rates, IMR) Vital Index .</p> <p><b>Mapping of CO: CO1</b></p>		12
III	<p><b>Index number:</b> Definition of I.N., Uses, classification of Index Number, steps involved in construction of I.N., problems involved in construction of I.N., methods of constructing price index and quantity index number (unweighted and weighted aggregates method) Theoretical test for consistency of index number ( factor reversal test, time reversal test) ,concept of cost of living index number, construction and uses of cost of living index number</p> <p><b>Mapping of CO : CO2</b></p>		12
IV	<p><b>Time series analysis:</b> concept of time series, definition, uses of time series, component of time series (trend, seasonal variation, cyclic variation, irregular variation) Mathematical model of time series, measurement of Trend ( Graphic method, Method by semi-averages, method of moving averages) measurement of seasonal variations (simple average method ,link relative method )</p> <p><b>Mapping of CO: CO3, CO4</b></p>		12

V	<p><b>Demand Analysis &amp; consumer behaviors:</b>  <b>Demand Analysis:</b> Introduction, Necessities and Luxuries, Demand and Supply, Laws of demand and supply, equilibrium price, Price elasticity of Demand, Pareto's law of Income Distribution.  <b>Consumer behaviors:</b> concept of consumer behaviors, object, constraints, Decision variable, utility approach, utility function, marginal utility, total utility, average utility, Relation between AU, TU and MU.</p>	12
	<p><b>Mapping of CO: C03, C04</b></p>	
	<p><b>Books:</b>  1. S.C .Gupta, V. K. Kapoor, Fundamentals of Mathematical statistics,11th edition, Sultan Chand &amp; Sons, New Delhi (2000).  2. R. S. N. Pillai, V. Bagavathi, Statistics theory and practice, 7th edition, Sultan Chand &amp; Sons, New Delhi (2003).  3. Goon A.M., Gupta M.K., Das Gupta B., An outline of statistical theory, 4th edition, The World press, Calcutta (2003).  4. S.P.Gupta, Statistical methods 38th edition, Sultan Chand &amp; Sons, New Delhi (2009).</p>	
	<p><b>References:</b>  1. Goon A.M., Gupta M.K., Das Gupta B., Fundamentals of Statistics, Vol.-I &amp; II, The World press, Calcutta (1999).  2. J. Medhi, Statistical methods, an introductory text, New Age International,(1992).  3. Brase &amp; Brase, Understandable Statistics, 11th edition, Cengage Learning, (2014).  4. Croxton F. E., Cowden D.J., and Kelin S., Applied general Statistics, 2nd edition, Prentice-Hall of India Pvt Ltd., New Delhi (1955).</p>	

<b>Course Code</b>	<b>22BSC405</b>	<b>Programme Code</b>	<b>BSC2022</b>
<b>Course Name</b>	<b>LABORATORY OF VITAL &amp; ECONOMIC STATISTICS</b>		
<b>Credits</b>	<b>2</b>	<b>Course Type : Core Course Practical</b>	
	<b>List of Practicals</b>		<b>Total Hours (30)</b>
	<ol style="list-style-type: none"> <li>1. Computation of various measures of mortality.</li> <li>2. Computation of CBR.</li> <li>3. Computation of GFR.</li> <li>4. Computation of TFR.</li> <li>5. Computation of Age-SFR.</li> <li>6. Computation of GRR.</li> <li>7. Computation of NRR.</li> <li>8. Computation of crude rate of natural increase &amp; Pearle's Vital Index.</li> <li>9. Construction of price index numbers.</li> <li>10. Applications of time reversal test.</li> <li>11. Applications of factor reversal test.</li> <li>12. Measurement of linear trend by Graphical Method.</li> <li>13. Measurement of linear trend by Method of moving averages.</li> <li>14. Measurement of seasonal variations by Method of simple averages.</li> <li>15. Computation of Price Elasticity of Demand and Income Elasticity of Demand.</li> </ol>		

<b>Course Code</b>	<b>22BSC402</b>	<b>Programme Code</b>	<b>BSC2022</b>
<b>Course Name</b>	<b>Study Of OPAMP &amp; Oscillators</b>		
<b>Credits</b>	<b>4</b>	<b>Course Type : Core Course Theory</b>	
<b>Course Objectives</b>	<ul style="list-style-type: none"> <li>To expose the students about basic concept of amplifiers.</li> <li>To understand basic oscillator circuits.</li> <li>To expose the students about OPAMP &amp; its applications.</li> </ul>		
<b>Mapping of Programme Outcome (PO) &amp; Programme Specific Outcome (PSO)</b>	<b>PO1,PO4,PO5,PO6,PSO1,PSO2</b>		
<b>Prerequisites:</b>	<ul style="list-style-type: none"> <li>Basic knowledge of electronics components</li> </ul>		
<b>Course Outcomes (CO)</b>	<p>The students will be</p> <p>CO1: able to identify various amplifiers &amp; oscillators.</p> <p>CO2: able to learn uses of OPAMP</p> <p>CO3: able to gain knowledge and build basic amplifier &amp; oscillator circuits.</p>		
<b>Unit No.</b>	<b>Contents</b>		<b>Total Hrs (60)</b>
I	<p><b>Small Signal BJT Amplifiers:</b> Single stage amplifier: Basic idea of amplifier, Construction and working of CB ,CE and CC amplifier, comparison of CB ,CE and CC amplifier with respect to gains, phase and input output resistance</p> <p><b>Multi Stage Amplifier:</b> construction, working, frequency response, merits and demerits of RC coupled transistor amplifier, transformer coupled amplifier.</p> <p><b>Mapping of CO: CO1</b></p>		12
II	<p><b>Power Amplifier:</b> Comparison of voltage &amp; power amplifiers ,Characteristics of power amplifiers .</p> <p>Classification of power amplifiers : Class A, Class B, Class C ,Class AB amplifiers, Class A - transformer coupled amplifier, Class-A push-pull amplifier and Class-B push-pull amplifier (Construction, working, efficiency, merits and demerits).</p> <p><b>Mapping of CO:CO1</b></p>		12
III	<p><b>Differential amplifier:</b></p> <p>Introduction to DC amplifier, working of differential amplifier, Need of two power supplies, differential mode gain, common mode gain, C.M.R.R.</p> <p><b>Basics of Operational Amplifier:</b></p> <p>Circuit symbol of OP-AMP, Pin out and packaging of OP-AMP, block diagram of OPAMP, parameters of OP-AMP and characteristics of an ideal OP-AMP, open loop configuration, drawbacks of open loop configuration, closed loop OPAMP configuration</p> <p><b>Mapping of CO: CO1,CO2</b></p>		12
IV	<p><b>Applications of Operational Amplifier:</b></p> <p>OP AMP as an inverting amplifier, concept of virtual ground, non-inverting amplifier, unity gain amplifier, adder, subtractor, integrator, differentiator, comparator,Schmitt trigger.</p> <p><b>Mapping of CO: CO2,CO3</b></p>		12
V	<p><b>Sinusoidal oscillator:</b> Concept of oscillator,essential components of oscillators ,concept of tank circuit, barkhausen criteria of oscillation, construction, working, merits and demerits of Colpitts, Hartley , RC phase shift, Wien bridge and Crystal oscillators.</p> <p><b>Mapping of CO: CO1,CO3</b></p>		12
	<p><b>Text Books:</b></p> <ol style="list-style-type: none"> <li>Ramakant Gayakwad,Op-amps and Linear Integrated Circuits, Prentice Hall publications</li> <li>U.A.Bakshi, A.P.Godse,Basic Electronics Engineering,technical publication pune</li> <li>Sanjeev Gupta, Electronic Devices And Circuits, Dhanpat Rai publications</li> <li>V. K. Mehta, Rohit Mehta, Principles of Electronics</li> <li>B. L. Theraja, Basic Electronics, S. Chand and Company</li> </ol>		
	<p><b>References:</b></p> <ol style="list-style-type: none"> <li>Bhargava, Kulshreshtha, Basic electronics and linear circuits, Gupta Technical education.</li> <li>G. Pimpale, Sushama Pimpale, Functional circuits in Electronics, Mcmillan India ltd.</li> </ol>		

	<ol style="list-style-type: none"><li>3. Ryder, Electronics Fundamental and applications, PHI</li><li>4. M. K. Bagde, S. P. Singh, Kamal Singh, Elements of electronics, S.Chand and Co.</li><li>5. N. C. Goyal, R. K. Khetan, Monograph on electronic design principles,</li><li>6. A. P. Godse, U. P. Bakshi, EDC I EDC II, Technical Publishers Pune</li><li>7. R. G. Kale, U. K. Puranik, V. N. Pendse, Kitab Mahal, An Introduction to Electronics.</li><li>8. R. G. Kale, U. K. Puranik, V. N. Pendse, Kitab Mahal, An Introduction to Electronics.</li></ol>	
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<b>Course Code</b>	<b>22BSC406</b>	
<b>Course Name</b>	<b>LABORATORY OF STUDY OF OPAMP &amp; OSCILLATORS</b>	
<b>Total Credits</b>	<b>2</b>	<b>Course Type : Core Course Practical</b>
	<b>List of Experiments</b>	
	<ol style="list-style-type: none"> <li>1. Study of OPAMP as Inverting amplifier</li> <li>2. Study of OPAMP as Non-inverting amplifier.</li> <li>3. Study of OPAMP as unity gain amplifier.</li> <li>4. Study of OPAMP as an adder.</li> <li>5. Study of OPAMP as a subtractor.</li> <li>6. Study of OPAMP as a comparator.</li> <li>7. Study of phase shift oscillator and calculation of frequency.</li> <li>8. Study of Colpitts oscillator and calculation of frequency.</li> <li>9. Study of Hartley oscillator and calculation of frequency.</li> <li>10. Study of Wien Bridge oscillator and calculation of frequency.</li> <li>11. Study of class A power amplifier</li> <li>12. Study of class B Push pull power amplifier</li> <li>13. Study of CB amplifier</li> <li>14. Study of CE amplifier</li> <li>15. Study of multistage amplifier</li> </ol>	<b>Total Hours (30)</b>

<b>Course Code</b>	<b>22BSC403</b>	<b>Programme Code</b>	<b>BSC2022</b>
<b>Course Name</b>	<b>Computer Networking (Elective-III)</b>		
<b>Credits</b>	<b>4</b>	<b>Course Type : Discipline Specific Theory</b>	
<b>Course Objectives</b>	<ul style="list-style-type: none"> <li>To acquire the basic knowledge about computer Networks, network devices and various media.</li> <li>To acquire the knowledge about various modulation types and switching techniques.</li> <li>To understand the various levels of OSI model and about Internet history and application.</li> </ul>		
<b>Mapping of Programme Outcome(PO) &amp; Programme Specific Outcome(PSO)</b>	<b>PO1,PO4, PO5,PO6,PSO1, PSO2, PSO3, PSO4</b>		
<b>Prerequisites:</b>	<ul style="list-style-type: none"> <li>The student should have the basic knowledge of computer hardware and software.</li> </ul>		
<b>Course Outcomes (CO)</b>	<p>Students will be able to:</p> <p>CO 1: Use different networking topologies.</p> <p>CO 2: Identify networking models and use appropriate transmission modes.</p> <p>CO 3: Identify the types of networking devices or switches and their functions.</p> <p>CO 4: Learn Modulation techniques for communication.</p> <p>CO 5: Use various internet applications and protocols</p>		
<b>Unit No.</b>	<b>Contents</b>		<b>Total Hrs (60)</b>
I	<b>Introduction to Computer Network</b> , Advantages of computer network, Types of computer networks: LAN, MAN, WAN. <b>Network Topology:</b> Bus, Ring, Star, Mesh, Tree <b>Transmission Media:</b> Bounded media: Twisted pair cable, Coaxial cable, Fibre optic cable. <b>Unbounded Media:</b> Microwave, Satellite, Infrared <b>Mapping of CO:CO1, CO2</b>		<b>12</b>
II	<b>Communication:</b> Communication System, <b>Mode of Transmission:</b> Simplex, Half duplex, full duplex. Asynchronous and Synchronous transmission of data, Digital signal, Analog Signal, Voice Communication network, Private Branch Exchange (PBX). <b>Mapping of CO: CO2</b>		<b>12</b>
III	<b>Modulation:</b> Amplitude modulation, Frequency Modulation, Phase Modulation. <b>Multiplexing:</b> Multiplexers, Frequency Division Multiplexing, Time Division Multiplexing. <b>Switching Techniques:</b> Switching Concept, Circuit switching, packet switching, Message switching <b>Mapping of CO:CO3, CO4</b>		<b>12</b>
IV	<b>Network Devices:</b> NIC, Hub, Bridges, Router, Switches, Repeaters, Gateways, modem and modem types. Integrated Services Digital Network, WiFi( Wireless Fidelity): Uses, Advantages and disadvantages. <b>Internet:</b> History, applications of Internet- WWW, E-mail, Telnet, Voice chat, Video conferencing. <b>Mapping of CO: CO3, CO5</b>		<b>12</b>
V	<b>OSI model and Communication Protocols:</b> OSI Model, Transmission Control Protocol/Internet Protocol (TCP/IP), Internetwork Packet Exchange/Sequenced Packet Exchange (IPX/SPX), SMTP, FTP, X.25 protocol, Ethernet, Token Ring. <b>Mapping of CO:CO5</b>		<b>12</b>
	<b>Text Books :</b> 1. Jerry FitzGerald, Alan Dennis, Fundamentals of Business Data Communications, Tenth Edition, Wisley India Pvt Ltd. New Delhi, India(2009) 2. Michael A. Miller, Introduction to digital and data Communications, JAICO Publishing House, Mumbai, India(2006)		
	<b>References:</b> 1. Andrew S. Tanenbaum, David J. Wetherall, Computer Networks, Fifth Edition, Pearson Publications, New Delhi, India(2011) 2. Pradeep K Sinha, Priti Sinha, Computer Fundamentals, Sixth Edition, BPB Publications, New Delhi, India, (2011) 3. Behrouz A. Forouzan, Data Communications and Networking, Fifth Edition, Tata Mc Graw- Hill, New Delhi, India, (2008). 4. Uyles D. Black, data Communications and Distributed Networks, Third Edition, PHI Learning private Limited, New Delhi, India, (2009)		

<b>Course Code</b>	<b>22BSC407</b>	<b>Programme Code</b>	<b>BSC2022</b>
<b>Course Name</b>	<b>PRACTICAL BASED ON ELECTIVE THEORY-III (COMPUTER NETWORKING)</b>		
<b>Credits</b>	<b>2</b>	<b>Course Type : Discipline Specific Practical</b>	
<b>List of Practicals</b>			<b>Total Hours (30)</b>
	<ol style="list-style-type: none"> <li>1. Case Study Based on different components of network</li> <li>2. Case Study Based on different types of Networks</li> <li>3. Case Study Based on different modes of transmission.</li> <li>4. Case Study Based on Bounded transmission media</li> <li>6. Case Study Based on Unbounded transmission media</li> <li>7. Case Study Based on Network Topology.</li> <li>8. Case Study Based on Modulation.</li> <li>9. Case Study Based on TDM technique</li> <li>10. Case Study Based on FDM Techniques</li> <li>11. Case Study Based on switching techniques.</li> <li>12. Case Study Based on network devices.</li> <li>13. Case Study Based on OSI Model.</li> <li>14. Case Study Based on TCP/IP protocols</li> <li>15. Case Study Based on SMTP &amp; FTP protocols</li> </ol>		

<b>Course Code</b>	<b>22BSC403</b>	<b>Programme Code</b>	<b>BSC2022</b>
<b>Course Name</b>	<b>Operating System (Elective-III)</b>		
<b>Credits</b>	<b>4</b>	<b>Course Type : Disciplines Specific Theory</b>	
<b>Course Objectives</b>	<ul style="list-style-type: none"> <li>• Understands the different services provided by Operating System at different level.</li> <li>• They Understand real life applications of Operating System in every field.</li> <li>• Understands the use of different process scheduling algorithm and synchronization techniques to avoid deadlock.</li> <li>• They will learn different memory management techniques like paging, segmentation and demand paging etc.</li> </ul>		
<b>Mapping of Programme Outcome(PO) &amp; Programme Specific Outcome(PSO)</b>	<b>PO1,PO4, PO6,PSO1,PSO2,PSO3</b>		
<b>Prerequisites:</b>	•Basic knowledge of Data Structures and Computer Organization.		
<b>Course Outcomes (CO)</b>	CO1: Ability to understand, How operating system is important for computer System. CO2: Ability to understand differentdifferent process scheduling algorithms. CO3: Ability to understand differentsynchroniziontechniques to achieve better performance of a computer system. CO4: Ability to understand different I/O devices. CO5: Ability to understand virtual and secondary memory management.		
<b>Unit No.</b>	<b>Contents</b>		<b>Total Hrs (60)</b>
I	<b>Operating System Introduction:</b> Characteristics, User View, System View, Computer System Organization, Operating system Services, Types of O.S. Batch operating system, Time-sharing operating systems, Distributed operating System, Network operating System Real Time operating System, Online O.S. <b>Mapping of CO:CO1</b>		10
II	<b>Process:</b> Concept, Process State, Process State Transition, Process Control block, Threads, Operation on Process: Creation, Termination, Inter Process Communication :Signal, Message <b>Multithreading:</b> Motivation, Benefits, Multicore Programming Multithreading Models, Threads Issues, Process Scheduling: Concept, Scheduling Criterion, and Scheduling Algorithms: FCFS, Shortest Job First, Round -Robin Scheduling. <b>Mapping of CO:CO2</b>		12
III	<b>Process Coordination:</b> Process Synchronization concept, Critical section problem, Semaphore:Binary, Monitor Deadlocks: Concept, Characterization of Deadlocks, Strategies, Prevention, Avoidance, Detection and recovery from Deadlocks <b>Mapping of CO:CO3</b>		12
IV	<b>I/O Systems :</b> Principles of I/O Hardware , I/O devices , Device controllers , Direct memory access . Principles of I/O Software : Goals , Interrupt handlers , Device drivers , Device independent I/O software . Secondary-Storage Structure : Disk structure o Disk scheduling o Disk management. <b>Mapping of CO:Co4</b>		13
V	<b>Memory Management:</b> Introduction, Hardware, Logical Versus Physical Address space ,Dynamic Loading, Linking, Shared Library, Swapping, Contiguous Memory Allocation Schemes, Paging, Segmentation Virtual Memory Management: Background, Demand Paging scheme, Process Creation, Page Replacement Policies:FIFO,Optimal,LRU <b>Mapping of CO:CO5</b>		13

	<p><b>Text Books :</b></p> <ol style="list-style-type: none"> <li>1. V. Rajaraman, Fundamental of computer, Prentice Hall India Pvt., Limited PrenticeHall Of India Pvt. Limited, 01-Oct-2003.</li> <li>2. B. Ram, Computer Fundamental, Nas. Age Pub. 2014</li> <li>3. Pradeep K. Sinha, PritiSinha, Computer Fundamental, BPB Publications, 01-Nov2004</li> <li>4. D. M. Dhamdhere, System Software and operating system, TMH</li> <li>5. Silberschatz, Galvin, Gagne, Operating System Concepts, 7th Edition ,Addision Education</li> <li>6. Achyut S. Godbole, Operating system, Tata McGraw-Hill Education, 2005.</li> </ol>	
	<p><b>References :</b></p> <ol style="list-style-type: none"> <li>1. Roger Hunt &amp; John Shelly, Computers and Commonsense, Prentice-Hall of India Pvt. Ltd. New Delhi</li> <li>2. William Stalling, Operating Systems: Internals and Design Principles, 8th Edition.</li> <li>3. Crowley, Operating System, Tata McGraw-Hill Education, 2001.</li> <li>4. Peterson, Operating System concepts (2nd edition) Addison-Wesley Longman Publishing Co.1985</li> </ol>	

<b>Course Code</b>	<b>22BSC407</b>	<b>Programme Code</b>	<b>BSC2022</b>
<b>Course Name</b>	<b>PRACTICAL BASED ON ELECTIVE THEORY-III (OPERATING SYSTEM)</b>		
<b>Credits</b>	<b>2</b>	<b>Course Type : Disciplines Specific Practical</b>	
	<b>List of Programs.</b>		<b>Total Hours (30)</b>
	<ol style="list-style-type: none"> <li>1. Write a case study on types of operating systems.</li> <li>2. Write C programs to demonstrate various process related concept</li> <li>3. Write C programs to demonstrate various thread related concepts.</li> <li>4. Write C programs to simulate CPU scheduling algorithms: FCFS, SJF, and Round Robin.</li> <li>5. Write and Execute a Unix system calls for Process Management.</li> <li>6. Write and Execute a Unix system calls for File Management.</li> <li>7. Write a case study on Demand Paging.</li> <li>8. Write a case study on Producer-consumer Problem.</li> <li>9. Write a case study on Linux operating system.</li> <li>10. Write a c program for binary semaphore.</li> <li>11. Write a c program for FIFO page replacement policy.</li> <li>12. Write a case study on Race condition.</li> <li>13. Write a case study on concept of deadlock and methods for its avoidance.</li> <li>14. Write a case study on Device drivers.</li> <li>15. Write a case study on Interrupt handlers</li> </ol>		

<b>Course Code</b>	<b>22BSC403</b>	<b>Programme Code</b>	<b>BSC2022</b>
<b>Course Name</b>	<b>Web Technologies (Elective-III)</b>		
<b>Credits</b>	<b>4</b>	<b>Course Type : Discipline Specific Theory</b>	
<b>Course Objectives</b>	<ul style="list-style-type: none"> <li>To develop the skill and knowledge of web page design using HTML5.</li> <li>To have an understanding of the introductory internet and World Wide Web concepts.</li> <li>To be able to configure text, color and page layout with CSS.</li> <li>To have an understanding of configuring images and multimedia on web pages.</li> <li>To have an understanding of some advanced technology of web.</li> </ul>		
<b>Mapping of Programme Outcome(PO) &amp; Programme Specific Outcome(PSO)</b>	<b>PO1,PO3,PO4, PO6,PSO1,PSO2, PSO3,PSO5</b>		
<b>Prerequisites:</b>	<ul style="list-style-type: none"> <li>The student should have the basic knowledge of computer hardware and software.</li> <li>The student should be able to do computations.</li> <li>The student should possess the logical thinking ability.</li> <li>The student should have prior programming knowledge.</li> </ul>		
<b>Course Outcomes (CO)</b>	Students will be able to learn: CO1: Ability to develop a dynamic website by the use of JavaScript, HTML5 and Cascading Style Sheet. CO2: Write a well formed / valid XML document and Schema. CO3: Scripting languages and web services to transfer data and add interactive components to web pages.		
<b>Unit No.</b>	<b>Contents</b>		<b>Total Hrs (60)</b>
I	Web basics, Multitier Application Architecture, Client-Side Scripting versus Server-Side Scripting, World Wide Web Consortium (W3C) <b>HTML5:</b> Features, Editing, First HTML5 Example, Headings, Linking, Images, Special Characters and Horizontal Rules, Lists, Tables, Forms, meta Elements.		<b>10</b>
	<b>Mapping of CO: CO1,CO3</b>		
II	<b>HTML5 Elements:</b> Form input type element: Colors, date, time, e-mail addresses, numbers, range, search, telephone numbers, URLs, Datalist Elements. <b>Page-Structure Elements:</b> header, nav, figure, figcaption, article, summary, details, section, aside, meter, footer. Audio and Video elements. <b>Canvas element:</b> rectangle.		<b>14</b>
	<b>Mapping of CO:CO1,CO3</b>		
III	<b>jQuery:</b> Introduction , importance, jQuery Installation, jQuery Syntax, jQuery Selectors, jQuery Event Methods, jQuery Effects <b>AngularJS:</b> OVERVIEW, Features, advantages, disadvantages, simple application, Directives, <b>Expressions:</b> numbers, String, Object, and Array.		<b>12</b>
	<b>Mapping of CO:CO3</b>		
IV	<b>Introduction to scripting:</b> Java Script basics, operators, data types, popup boxes. Control structures: if, If-else, Switch. <b>Looping structures:</b> for, do-while, while. <b>Java Script functions:</b> built in functions, Defining and invoking parameter functions. <b>JavaScript objects:</b> Math, String, Date, Number, Boolean.		<b>12</b>
	<b>Mapping of CO:CO1,CO3</b>		
V	<b>XML:</b> Introduction, Features, Syntax, Tags, Elements, Attributes, Tree Structure and namespaces. <b>DTD:</b> Internal, External. <b>XML Schemas:</b> Definition types. <b>CSS:</b> Introduction, basic properties, Inline Styles Embedded Style Sheets, External Style Sheets. Element Positioning and Dimensions, <b>Selectors:</b> universal, type, id, class.		<b>12</b>
	<b>Mapping of CO: CO1, CO2</b>		
	<b>Text Books :</b> 1. Paul Deitel, Harvey Deitel and Abbey Deitel, –Internet & World Wide Web: How to program  , Fifth Edition Pearson ISBN 978-0-13-215100-9 2. Thomas A. Powell, –HTML & CSS: The Complete Reference  , Fifth Edition, McGraw-Hill, ISBN: 978-0-07-174170-5 3. Kogent Learning Solutions Inc, HTML5 Black Book: Covers CSS3, Javascript, XML, XHTML, Ajax, PHP and jQuery, Dreamtech Press, New Delhi, 2011 4. Jeffery C. Jackson, –Web Technologies  , A Computer Science Perspective, Pearson Education		
	<b>References:</b> 1. Kogent Learning Solutions Inc, Web Technologies Black Book, Dreamtech Press, New Delhi, 2009 2. Bankim Patel, Lal Bihari Barik, Introduction to Web Technology & Internet, Acme Learning Private Limited, New Delhi, 2009 3. Jonathan Chaffer, Karl Swedberg, ILearning jQuery  4. Phil Ballard, Michael Moncur, Sams Teach Yourself Ajax, JavaScript and PHP, Pearson Education, New Delhi, 2009		

<b>Course Code</b>	<b>22BSC407</b>	<b>Programme Code</b>	<b>BSC2022</b>
<b>Course Name</b>	<b>PRACTICAL BASED ON ELECTIVE THEORY-III(WEB TECHNOLOGIES)</b>		
<b>Credits</b>	<b>2</b>	<b>Course Type : Discipline Specific Practical</b>	
	<b>List of Practicals</b>		<b>Total Hours (30)</b>
	<ol style="list-style-type: none"> <li>1. Create a webpage in HTML5 using &lt;img&gt; tag with its attributes.</li> <li>2. Create a webpage in HTML5 for strength of BSc using &lt;table&gt; tag.</li> <li>3. Create a webpage in HTML5 using &lt;form&gt; tag with new input type.</li> <li>4. Create a webpage in HTML5 for strength of BSc using &lt;a&gt; tag.</li> <li>5. Create a webpage in HTML5 with audio and video Elements.</li> <li>6. Write a program for inline CSS.</li> <li>7. Write a program for internal style sheet.</li> <li>8. Write a program for external style sheet.</li> <li>9. WAP for simple Javascript using if-else conditional statements.</li> <li>10. WAP for simple Javascript using for looping statements.</li> <li>11. WAP in Javascript to check whether the given number is even or odd.</li> <li>12. Write a program in XML for showing student information.</li> <li>13. Write a program in simple AJAX</li> <li>14. Write a program to use of jQuery</li> <li>15. Write a program to demonstrate AngularJS.</li> </ol>		

<b>Course Code</b>	<b>22BSC501</b>	<b>Programme Code</b>	<b>BSC2022</b>
<b>Course Name</b>	<b>Database Management System</b>		
<b>Credits</b>	<b>4</b>	<b>Course Type : Core Course Theory</b>	
<b>Course Objectives</b>	<ul style="list-style-type: none"> <li>To develop problem solving abilities using relational database management systems.</li> <li>To learn basic principles of database management systems and relational database systems.</li> <li>To develop skills for project management and framework activity using relational database management system.</li> </ul>		
<b>Mapping of Programme Outcome(PO) &amp; Programme Specific Outcome(PSO)</b>	<b>PO1,PO4, PO6,PSO1,PSO2, PSO3,PSO5</b>		
<b>Prerequisites:</b>	<ul style="list-style-type: none"> <li>The student should have the basic knowledge of computer hardware and software.</li> <li>The student should be able to do computations.</li> <li>The student should possess the logical thinking ability.</li> <li>The student should have prior programming knowledge.</li> </ul>		
<b>Course Outcomes (CO)</b>	<p>Students will be able to learn:</p> <p>CO 1: Ability to describe data models and schemas in DBMS.</p> <p>CO 2: Acquire knowledge about the features of database management systems.</p> <p>CO 3: Able to use SQL; the standard language of relational databases.</p> <p>CO 4: Ability to understand the functional dependencies and design of database.</p>		
<b>Unit No.</b>	<b>Contents</b>		<b>Total Hrs (60)</b>
I	<p><b>Basic Concept:</b> Traditional File based System, Database Management system, Roles in database environment, Architecture of DBMS, Components of DBMS, Advantages and Disadvantages, DBA and its role, Database Languages.<b>Database Models:</b> Relational, Hierarchical, Network with its Advantages and Disadvantages.</p> <p><b>Mapping of CO:CO1, CO2</b></p>		<b>12</b>
II	<p><b>Relational Model:</b> Relation, Domain &amp; Attributes, Keys, Relational Algebra and Calculus, Entity Relationship model, E-R diagram, Functional dependency Normalization: Introduction, 1NF, 2NF, 3NF, BCNF.</p> <p><b>Mapping of CO:CO1, CO4</b></p>		<b>12</b>
III	<p><b>SQL:</b> Introduction, Basic Structure of SQL Query, Components of SQL, Data types, Operators. <b>DDL Commands :</b> CREATE,ALTER,DROP, DESCRIBE,TRUNCATE</p> <p><b>DML Commands :</b>SELECT, INSERT, DELETE,UPDATE</p> <p>ORDER By Clause, Group By Clause, Having Clause.</p> <p><b>Mapping of CO:CO3</b></p>		<b>12</b>
IV	<p><b>Functions: Numeric Function:</b> ABS, MOD, FLOOR, CEIL, TRUNC, SQRT, SIGN, COS, LOG, EXP, LEAST, GREATEST.</p> <p><b>Group Function:</b> AVG, MAX, MIN, SUM, COUNT.</p> <p><b>Character Function:</b> LENGTH, LOWER, UPPER, INITCAP, INSTR, SUBSTR, LPAD, RPAD, LTRIM, RTRIM, DECODE, SOUNDEX.</p> <p><b>Joins:</b> EQUI JOIN, SELF JOIN, unions</p> <p><b>Mapping of CO:CO3</b></p>		<b>12</b>
V	<p><b>PL/SQL:</b> Introduction, Features, Block structure, Constants and Variables, data types, Control structure. <b>Programming Cursor:</b> Implicit Cursor, Explicit Cursor, their attributes, declaring, opening, fetching cursor.</p> <p><b>Mapping of CO:CO3</b></p>		<b>12</b>
	<p><b>Text Books :</b></p> <ol style="list-style-type: none"> <li>C.J. Date, an Introduction to Database Systems, Addison-Wesley Publishing Company, (8th Edition), 1981.</li> <li>Mujumdar &amp; Bhattacharya, Database Management Systems, Published by Tata McGraw-Hill Education Pvt. Ltd., 2004</li> <li>IVAN BAYROSS, Sql, PL/SQL the Programming Language Of Oracle, BPB Publications,2010</li> <li>Ivon Bayross, Database Concepts and Systems for Students. Published by Shroff Publishers &amp; amp. distributors Pvt. Ltd. 2009.</li> <li>Abraham Silberschatz, Henry F. Korth, S. Sudarshan, Database system concepts, Fifth Edition, McGrawHill Publication.</li> </ol>		
	<p><b>References :</b></p> <ol style="list-style-type: none"> <li>Ramakrishnan, Gehrke, Database management systems Third Edition, McGrawHill Publication.</li> <li>Ramez Elmasri, Shamkant B. Navathe, Fundamentals of Database systems Fifth edition, Pearson Education.</li> <li>Kevin Loney, George Koch, Oracle 9i.The complete Reference, Forth Edition, McGrawHill Publication. Fifth edition, Pearson Education.</li> </ol>		

<b>Course Code</b>	<b>22BSC505</b>	<b>Programme Code</b>	<b>BSC2022</b>
<b>Course Name</b>	<b>LABORATORY OF DATABASE MANAGEMENT SYSTEM</b>		
<b>Total Credits</b>	<b>2</b>	<b>Course Type : Core Course Practical</b>	
<b>List of Practicals</b>			
	<ol style="list-style-type: none"> <li>1. Create user ID and password in SQL.</li> <li>2. Practical based on DDL commands.</li> <li>3. Practical based on DML commands.</li> <li>4. Practical based on DCL commands.</li> <li>5. Practical based on Clauses [ORDER BY, GROUP BY, HAVING].</li> <li>6. Practical based on Operators.</li> <li>7. Practical based on Integrity Constraints.</li> <li>8. Practical based on Numeric functions.</li> <li>9. Practical based on Group functions.</li> <li>10. Practical based on Character functions.</li> <li>11. Write a program to display simple message in PL/SQL.</li> <li>12. Write a program to demonstrate the use of arithmetic operators in PL/SQL.</li> <li>13. Write a program to demonstrate the use of constant and variables in PL/SQL.</li> <li>14. Write a program to demonstrate the use of if...then...else in PL/SQL.</li> <li>15. Write a program to demonstrate the use of looping structure in PL/SQL.</li> </ol>	<b>Total Hours (30)</b>	

<b>Course Code</b>	<b>22BSC502</b>	<b>Programme Code</b>	<b>BSC2022</b>
<b>Course Name</b>	<b>Microprocessors 8085 &amp; 8086</b>		
<b>Credits</b>	<b>4</b>	<b>Course Type : Core Course Theory</b>	
<b>Course Objectives</b>	<ul style="list-style-type: none"> <li>To expose the students about basics of microprocessor.</li> <li>To introduce the students about programming of Microprocessor.</li> </ul>		
<b>Mapping of Programme Outcome(PO) &amp; Programme Specific Outcome(PSO)</b>	<b>PO1,PO4,PO6,PSO1,PSO2</b>		
<b>Prerequisites:</b>	<ul style="list-style-type: none"> <li>Basic knowledge of digital electronics.</li> <li>Basics knowledge of Computer system.</li> </ul>		
<b>Course Outcomes (CO)</b>	<p>The students will</p> <p>CO1: gain knowledge about Architecture of 8085.</p> <p>CO2: pre-requisite for basic programming of 8085 microprocessor.</p> <p>CO3: gain knowledge about Architecture of 8086.</p> <p>CO4: pre-requisite for basic programming of 8086 microprocessor.</p>		
<b>Unit No.</b>	<b>Contents</b>		<b>Total Hrs (60)</b>
I	<b>Unit I : Introduction and architecture of 8085 Microprocessor:</b> Introduction, Evolution of microprocessors, Features of 8085 microprocessor, Bus organization of 8085, Architecture of 8085[Block Diagram], Register organization, Pin diagram and pin details.		10
	<b>Mapping of CO: CO1</b>		
II	<b>Unit II : Addressing Modes and Instruction set:</b> Instruction format, opcode format. <b>Addressing modes of 8085:</b> Register Addressing Mode, Immediate Addressing Mode, Direct Addressing Mode, Indirect Addressing Mode, Implicit Addressing Mode. <b>Instructions Set:</b> Data transfer group, Arithmetic group, Logical group, Branching group, Stack & Machine Control Group.		14
	<b>Mapping of CO:CO2</b>		
III	<b>Unit III: Architecture and Addressing modes of 8086:</b> Block diagram of 8086 microprocessor, BIU & EU,Registers of 8086 - general purpose register, pointer and index registers, segment registers, instruction pointer, status flag. Various Data addressing modes with examples.		12
	<b>Mapping of CO: CO3</b>		
IV	<b>Unit IV: Instruction Set of 8086:</b> Data transfer Instructions: MOV, PUSH/POP, load effective address, IN, OUT. Arithmetic and Logical Instructions: Addition, subtraction, comparison, multiplication and division. Basic logic instructions, shift and rotate instructions, BCD and ASCII arithmetic.		12
	<b>Mapping of CO: CO3,CO4</b>		
V	<b>Unit V: Program control instructions and Hardware specification:</b> Conditional jump, Unconditional jump, CALL and RET instructions, Flag manipulation instruction and other control instructions. <b>Hardware Specification:</b> Minimum and maximum modes (concept only), Pin configuration, Function of each pin. <b>Interrupts:</b> hardware and software interrupts, interrupt vector table, interrupt processing.		12
	<b>Mapping of CO: CO3, CO4</b>		

	<p><b>Text Books:</b></p> <ol style="list-style-type: none"> <li>1 Barry B. Brey, The Intel Microprocessors, 6Th edition, Prentice hall, (2007).</li> <li>2. B. Ram, Fundamental of Microprocessor and Microcomputer, 6th edition, Dhanpatrai Publication, (2006).</li> <li>3. Ramesh S. Gaonkar, Microprocessor Architecture Programming and Applications with the 8085 , 5Th edition ,Prentice Hall, (2002)</li> </ol>	
	<p><b>References:</b></p> <ol style="list-style-type: none"> <li>1. James L. Antonakos, The Pentium Microprocessor, 1st edition, Prentice hall, (1997).</li> <li>2. Douglas V Hall, Microprocessor and Interfacing, 2nd edition, Glencoe, (1992).</li> <li>3. K. M. Bhurchundi, A. K. Ray, Advanced Microprocessors &amp; Peripherals, 3rd edition, Tata Mcgraw hill, (2013).</li> </ol>	

<b>Course Code</b>	<b>22BSC506</b>	<b>Programme Code</b>	<b>BSC2022</b>
<b>Course Name</b>	<b>LABORATORY OF MICROPROCESSORS 8085 &amp; 8086</b>		
<b>Credits</b>	<b>2</b>	<b>Course Type : Core Course Practical</b>	

**List of Experiments**

1. Write an 8085 ALP to copy content of one register to another.
2. Write an 8085 ALP for Addition of two 8 bit numbers.
3. Write an 8085 ALP for Subtraction of two 8 bit numbers.
4. Write an 8085 ALP for BCD Addition of two bytes.
5. Write an 8085 ALP for BCD subtraction of two bytes.
6. Write an 8085 ALP for Logical AND operation of two bytes.
7. Write an 8085 ALP for Logical OR operation of two bytes.
8. Write an 8086 ALP for Addition of two 16 bit numbers.
9. Write an 8086 ALP for Subtraction of two 16 bit numbers.
10. Write an 8086 ALP for Multiplication of two 8 bit numbers.
11. Write an 8086 ALP for Logical AND operation of two bytes.
12. Write an 8086 ALP for Logical OR operation of two bytes.
13. Write an 8086 ALP for Logical NOT operation and Logical XOR operation of two bytes.
14. Write an 8086 ALP for Rotate Right without carry.
15. Write an 8086 ALP for Rotate Left without carry.

<b>Course Code</b>	<b>22BSC503</b>	<b>Programme Code</b>	<b>BSC2022</b>
<b>Course Name</b>	<b>Research Methodology(RM).(Elective-V)</b>		
<b>Credits</b>	<b>4</b>	<b>Course Type : Discipline Specific Theory</b>	
<b>Course Objectives</b>	<ul style="list-style-type: none"> <li>• To introduce the basic concepts in research methodology in Social science.</li> <li>• To addresses the issues inherent in selecting a research problem and discuss the techniques and tools to be employed in completing a research project.</li> <li>• To enable the students to prepare report writing and framing Research proposals.</li> </ul>		
<b>Mapping of Programme Outcome(PO)&amp; Programme Specific Outcome(PSO)</b>	<b>PO4 , PSO1, PSO2</b>		
<b>Prerequisites:</b>	<ul style="list-style-type: none"> <li>• The student should have the Basic knowledge of data analysis and research.</li> <li>• Basic knowledge of correlation, regression, non-parametric test.</li> </ul>		
<b>Course Outcomes (CO)</b>	<p>The students will be:</p> <p>CO1: Able to understand and comprehend the basics in research methodology and applying them in research/ project work.</p> <p>CO2: Able to learn to select an appropriate research design &amp; report writing.</p> <p>CO3: Able to understand the sampling and sampling techniques and analyze it accordingly.</p> <p>CO4: Able to take up and implement a research project/ study.</p> <p>CO5: Able to develop skills in qualitative and quantitative data analysis and presentation, Parametric &amp; non-parametric test.</p>		
<b>Unit No.</b>	<b>Contents</b>		<b>Total Hrs (60)</b>
I	<p><b>Introduction to Research:</b> Need for research, Meaning, Definition, Objectives, Limitations. Types of Research: Basic or Pure Research, Applied vs fundamental research, Descriptive vs analytical Research, Quantitative vs Qualitative Research, Conceptual vs empirical research, Criteria of good research.</p> <p><b>Questionnaire:</b> Meaning, Definition, Types, Steps in questionnaire constructions.</p> <p><b>Case Study:</b> Meaning, Objectives, Types, Merits and Limitations.</p>		12
	<b>Mapping of CO: CO1,CO4</b>		
II	<p><b>Designing the methodology:</b> Formulation of research problem, Extensive literature survey, development of working hypothesis, preparing the research design ,determining sample design, collection of data, execution of the project, analysis of data, hypothesis testing, generalizations and interpretation, presentation of the report or the thesis.</p>		10
	<b>Mapping of CO: CO1,CO2</b>		
III	<p><b>Research design:</b> Meaning and Definition, important concept of research design: variable, dependent variable, independent variable. Different types of research design: Quantitative research design, Qualitative research design. Features of good design.</p> <p><b>Report writing :</b> Meaning, Significance of report writing, different steps in writing report, Precautions for writing research report.</p>		12
	<b>Mapping of CO : CO2</b>		
IV	<p><b>Analytical techniques-I: Sampling :</b> concept and definition of sampling. Different types of sampling techniques? a) Probability sampling b) Non-probability sampling. Definitions of SRS, concept of SRSWR &amp; SRSWOR. Notation and terminology of SRS, some important results: a) sample mean is an unbiased estimator of population means b) Variance of sample mean. Definitions and concept of Stratified random sampling. Construction of strata. Allocation of sample size- a) Proportional allocation b) Optimum allocation or Neyman allocation, Definitions and concept of systematic sampling &amp; cluster sampling.</p>		14
	<b>Mapping of CO: CO3</b>		

V	<p><b>Analytical techniques-II:</b>  Concept of parametric &amp; Non-parametric test, difference between parametric &amp; non parametric test, Concept and Definition of RUN, RUN test for univariate and Bivariate distribution, Sign test for uni-variate and Bi-variate distribution, Wilcoxon-mann-whitney test, Kolmogorov-smirnov test(one sample &amp; two samples).</p>	12
	<p><b>Mapping of CO: CO5</b></p>	
	<p><b>Books:</b></p> <ol style="list-style-type: none"> <li>1. Kothari C.R., Research Methodology, Methods and Techniques, Second edition, (2008), New Age International Publication.</li> <li>2. Ranjit Kumar : Research Methodology, A step by step guide for beginners, Pearson Education, Sixth Edition 2009.</li> <li>3. S.C .Gupta, V. K. Kapoor, Fundamentals of Mathematical statistics,11th edition, Sultan Chand &amp; Sons, New Delhi (2000).</li> <li>4. R. S. N. Pillai, V. Bagavathi, Statistics theory and practice, 7th edition, Sultan Chand &amp; Sons, New Delhi (2003).</li> </ol>	
	<p><b>References:</b></p> <ol style="list-style-type: none"> <li>1. Best, J. W. and Kahn J. V. (2005) Research Introduction, New Delhi, PHI.</li> <li>2. Bhattacharya, D. K. (2004) Research Methodology, New Delhi, Excel Books.</li> <li>3. Gupta, Santosh (2005) Research Methodology and Statistical Techniques, Deep and Deep Publications.</li> <li>4. Kothari, C. R. (2005) Quantitative Techniques, New Delhi, Vikash publishing house.</li> <li>5. Goon A.M., Gupta M.K., Das Gupta B., Fundamentals of Statistics, Vol.-I &amp; II, The World press, Calcutta (1999).</li> <li>6. Croxton F. E., Cowden D.J., and Kelin S., Applied general Statistics, 2nd edition, Prentice-Hall of India Pvt Ltd., New Delhi (1955).</li> </ol>	

<b>Course Code</b>	<b>22BSC507</b>	<b>Programme Code</b>	<b>BSC2022</b>
<b>Course Name</b>	<b>PRACTICAL BASED ON ELECTIVE THEORY-V (RESEARCH METHODOLOGY (RM))</b>		
<b>Credits</b>	<b>2</b>	<b>Course Type : Discipline Specific Practical</b>	

**List of Practical**

- 1) Problem based on Questionnaire.
- 2) Estimation of population mean using SRS.
- 3) Estimation of population variance using SRS.
- 4) Estimation of population mean using proportional allocation in stratified sampling.
- 5) Estimation of population mean using Neyman allocation in stratified sampling.
- 6) Sign test for uni-variate distribution.
- 7) Sign test for bi-variate distribution.
- 8) Run test for uni-variate distribution.
- 9) Run test for bi-variate distribution.
- 10) Wilcoxon-Mann-whitney test and kolmogorov-Smirnov test.

<b>Course Code</b>	<b>22BSC503</b>	<b>Programme Code</b>	<b>BSC2022</b>
<b>Course Name</b>	<b>Statistical Quality control And Operation Research (Elective-V)</b>		
<b>Credits</b>	<b>4</b>	<b>Course Type : Discipline Specific Theory</b>	
<b>Course Objectives</b>	<ul style="list-style-type: none"> <li>• To learn how to apply tools of statistical quality control in industrial research.</li> <li>• To learn application of LPP methods &amp; study how to apply industrial statistics.</li> <li>• To study the theory of control charts and sampling inspection plans with their applications.</li> <li>• To learn application of statistics for solving industrial problems.</li> <li>• To learn and practice the theory and problems on linear programming.</li> </ul>		
<b>Mapping of Programme Outcome(PO)&amp; Programme Specific Outcome(PSO)</b>	<b>PO4 , PSO1, PSO2</b>		
<b>Prerequisites:</b>	<ul style="list-style-type: none"> <li>• Basic knowledge of quality control.</li> <li>• Knowledge of various techniques such as Graphical - Control Charts and Sampling Plans, Rectifying Sampling Inspection Plans, etc.</li> </ul>		
<b>Course Outcomes (CO)</b>	<p>The students will be:</p> <p>CO1: Able to gain comprehensive theoretical knowledge as well as practical skills related to the SQC and sampling plans.</p> <p>CO2: Able to plot the control charts of data to analyzed and specify the requirements of the industry.</p> <p>CO3: Able to gain theoretical knowledge and practical skills related to SQC &amp; OR.</p> <p>CO4: Able to understand the various techniques of OR</p> <p>CO5: Able to apply the LPP, TP, AP and Sequencing tools practically.</p>		
<b>Unit No.</b>	<b>Contents</b>		<b>Total Hrs (60)</b>
I	<p><b>Introduction to SQC:</b> Concept and definition of SQC, elements of SQC, 4M's used in SQC, technique of SQC, 7 tools of SQC, importance SQC in industrial research and practice, Causes of variation in quality, Purpose of SQC (product control and process control), Control charts(Outline), 3-Control Limits. Uses of SQC, merits and demerits.</p> <p><b>Control Charts for Variables:</b> Tools for SQC (variables &amp; attributes), control charts for variables, construction of control chart for mean (<math>\bar{x}</math>), range(R) and standard deviation (<math>\sigma</math>), Criteria for detecting lack of control in <math>\bar{x}</math> and R charts, Natural tolerance limits and specification limits.</p> <p><b>Mapping of CO: CO1,CO2</b></p>		12
II	<p><b>Control Charts for Attributes:</b> Control charts for attributes (limitations over control charts for variables), Construction of control charts for fraction defective (p-chart), number of defectives (np-chart) and number defects per unit (c-chart), Applications of c-chart. Concept of Producer's risk and Consumer's risk.</p> <p><b>Acceptance Sampling Plans:</b> Rectifying sampling inspection plans- Single sampling plan and Double sampling plan, Operating characteristic curve, construction of OC curve, shape of an ideal OC curve.</p> <p><b>Mapping of CO: CO1,CO2</b></p>		12
III	<p><b>Linear Programming:</b> Elementary theory of convex sets, definition of LPP, Mathematical formulation of LPP, Examples of LPP, Terminology in LPP (objective function, constraints, solution, feasible and optimum solution, slack and surplus variables, non negative restrictions, etc.)</p> <p><b>Methods of LPP:</b> Graphical method to solve LPP. Computational procedure of simplex method (conditions of feasibility and optimality), Terminology in simplex method (associated cost vector, net evaluation, basic feasible solution, etc.), simplex algorithm.</p> <p><b>Mapping of CO : CO3,CO4,CO5</b></p>		12

IV	<p><b>Transportation Problem (T.P.):</b> Definition, assumption and example of transportation problem, Mathematical formulation of T.P., Balance and Unbalanced T.P., Various Methods to obtain initial basic feasible solution to T.P.(north-west corner rule, row minima method, column minima method, matrix minima method, Vogel`s approximation method). Application, merits &amp; demerits of TP.</p> <p><b>Mapping of CO: CO3,CO4,CO5</b></p>	12
V	<p><b>Assignment Problem:</b> Definition, assumption and example of assignment problem, Mathematical formulation of AP, Balance and Unbalanced AP, Assignment algorithm (Hungarian method). Merits &amp; demerits of AP.</p> <p><b>Sequencing Problem:</b> Sequencing problem: Definition of sequencing problem, Terminology and notations in S.P., sequencing problem of n-jobs with 2-machines (its mathematical formulation and algorithm).Application, merits &amp; demerits of SP.</p> <p><b>Mapping of CO: CO3,CO4,CO5</b></p>	12
	<p><b>Books:</b></p> <ol style="list-style-type: none"> <li>1. S.C .Gupta, V. K. Kapoor, Fundamentals of Mathematical statistics,11th edition, Sultan Chand &amp; Sons, New Delhi (2000).</li> <li>2. Goon A.M., Gupta M.K., Das Gupta B., An outline of statistical theory, 4th edition, The World press, Calcutta (2003).</li> <li>3. Kanti Swarup, P. K. Gupta, Man Mohan: Operations Research, 15th edition Sultan Chand &amp; Sons, New Delhi (2010).</li> <li>4. Hamdy A. Taha: Operations Research An Introduction, Pearson Education, Inc. and Dorling Kindersley Publishing Inc. (2007).</li> <li>5. K. R. Kothari: An Introduction to Operations Research, 3rd edition Vikas Publishing House Pvt. Limited, New Delhi (2005).</li> </ol>	
	<p><b>References:</b></p> <ol style="list-style-type: none"> <li>1. Goon A.M., Gupta M.K., Das Gupta B., Fundamentals of Statistics, Vol.-I &amp; II, The World press, Calcutta (1999).</li> <li>2. N. Ramnathan: Operations Research, Tech Max publications.</li> <li>3. Paul A. Jensen, Janathan F. Bard: Operations Research, John Willy and Sons (2003).</li> <li>4. E. Prem Kumar Gupta, Dr. D. S. Hira: S Chand Publication.</li> <li>5. A. M. Natarajan, P Balasubramani, A. Tamilarasi: Operations Research,</li> </ol>	

<b>Course Code</b>	<b>22BSC507</b>	<b>Programme Code</b>	<b>BSC2022</b>
<b>Course Name</b>	<b>PRACTICAL BASED ON ELECTIVE THEORY-V (SQC &amp; OR)</b>		
<b>Credits</b>	<b>2</b>	<b>Course Type : Discipline Specific Practical</b>	
<b>List of Experiments</b>			
<ol style="list-style-type: none"> <li>1) Construction of control chart for variables mean and range.</li> <li>2) Construction of control chart for attributes (np-chart).</li> <li>3) Construction of control chart for attributes (p-chart).</li> <li>4) Construction of control chart for attributes (c-chart).</li> <li>5) Problems on mathematical formulation of LPP.</li> <li>6) Solution of LPP by graphical method.</li> <li>7) Solution of LPP by simplex method.</li> <li>8) Computation of initial basic feasible solution to transportation problem by north west corner rule, row minima method, column minima method, matrix minima method and Vogel`s Approximation Method.</li> <li>9) Solution of assignment problem by Hungarian method.</li> <li>10) Solution of sequencing problem- n jobs with 2 machines.</li> </ol>			

<b>Course Code</b>	<b>22BSC503</b>	<b>Programme Code</b>	<b>BSC2022</b>
<b>Course Name</b>	<b>Sampling Theory (Elective-V)</b>		
<b>Credits</b>	<b>4</b>	<b>Course Type : Discipline Specific Theory</b>	
<b>Course Objectives</b>	<ul style="list-style-type: none"> <li>• To learn how to apply sampling techniques to solve day to day life problems.</li> <li>• To study how to select proper sampling &amp; develop sampling distribution.</li> <li>• To study probability &amp; non- probability sampling.</li> </ul>		
<b>Mapping of Programme Outcome(PO)&amp; Programme Specific Outcome(PSO)</b>	<b>PO4 , PSO1, PSO2</b>		
<b>Prerequisites:</b>	<ul style="list-style-type: none"> <li>• Basic knowledge of concepts like - population, sample, sampling frame, sampling distribution.</li> <li>• knowledge of probability and mean &amp; variance.</li> </ul>		
<b>Course Outcomes (CO)</b>	<p>The students will be:</p> <p>CO1: Able to Learn the difference between probability and non probability sampling.</p> <p>CO2: Able to Learn Comparison between different types of sampling teaching.</p> <p>CO3: Able to explain and compare various allocations using stratified random sampling.</p> <p>CO4: Able to learn when are use simple random, stratified, cluster, Systematic sampling.</p> <p>CO5: Able to learn comparison between different techniques of non-probability sampling.</p>		
<b>Unit No.</b>	<b>Contents</b>		<b>Total Hrs (60)</b>
I	<p><b>Sampling</b> : concept of and definition of sampling, population, sample, sampling unit, sampling distribution, sampling frame, Different types of sampling techniques? a) probability sampling b) Non-probability sampling.</p> <p>Types of probability sampling techniques and non-probability sampling techniques, Advantages and disadvantages of sampling.</p> <p><b>Mapping of CO: CO1,CO2</b></p>		10
II	<p><b>Simple random sampling:</b> Definitions and concept of SRS. Concept of SRSWR &amp; SRSWOR, method of selecting simple random sample - a) Lottery system method b) mechanical randomization or random numbers method, Notation and terminology of SRS, some important results: a) sample mean is an unbiased estimator of population mean b) Variance of sample mean. Situation to use simple random sampling. Steps How to perform simple random sampling, advantages and disadvantages of SRS.</p> <p><b>Mapping of CO: CO1,CO2,CO4</b></p>		12
III	<p><b>Stratified random sampling:</b> Definition, notation &amp; terminology of stratified random sampling, Determination of number of strata, construction of strata. Types of stratified Random sampling: a) proportionate stratified sampling b) Disproportionate stratified sampling. Steps to conduct stratified random sampling, situation to use stratified Random sampling. Advantages and disadvantages of stratified random sampling.</p> <p><b>Mapping of CO : CO3,CO4</b></p>		10
IV	<p><b>Systematic &amp; cluster sampling:</b></p> <p><b>Systematic sampling:</b> Definition, notations &amp; terminologies of Systematic sampling, mean &amp; variance of systematic sampling. Types of systematic sampling: a) systematic random sampling b) Linear systematic sampling. c) Circular systematic sampling. Situation to use systematic sampling. Advantages and disadvantages of systematic sampling.</p> <p><b>cluster sampling:</b> Definition, concept &amp; notation of cluster sampling. Steps to conduct cluster sampling, advantages and disadvantages of cluster sampling.</p> <p><b>Mapping of CO: CO4</b></p>		14

V	<p><b>Non-probability sampling :</b>          Concept and definition of non-probability sampling, some non probability sampling techniques: a) Quota sampling: concept, application, merits &amp; demerits. b) Convenience sampling: concept, application, merits &amp; demerits. c) Judgmental sampling: concept, application, merits &amp; demerits. d) Snow ball sampling: concept, application, merits &amp; demerits.</p> <p><b>Mapping of CO: CO5</b></p>	14
	<p><b>Books:</b></p> <ol style="list-style-type: none"> <li>1. S.C .Gupta, V. K. Kapoor, Fundamentals of Mathematical statistics,11th edition, Sultan Chand &amp; Sons, New Delhi (2000).</li> <li>2. R. S. N. Pillai, V. Bagavathi, Statistics theory and practice, 7th edition, Sultan Chand &amp; Sons, New Delhi (2003).</li> <li>3. Goon A.M., Gupta M.K., Das Gupta B., An outline of statistical theory, 4th edition, The World press, Calcutta (2003).</li> <li>4. S.P.Gupta, Statistical methods 38th edition, Sultan Chand &amp; Sons, New Delhi (2009).</li> </ol>	
	<p><b>References:</b></p> <ol style="list-style-type: none"> <li>1. Goon A.M., Gupta M.K., Das Gupta B., Fundamentals of Statistics, Vol.-I &amp; II, The World press, Calcutta (1999).</li> <li>2. J. Medhi, Statistical methods, an introductory text, New Age International,(1992).</li> <li>3. Brase &amp; Brase, Understandable Statistics, 11th edition, Cengage Learning, (2014).</li> <li>4. Croxton F. E., Cowden D.J., and Kelin S., Applied general Statistics, 2nd edition, Prentice-Hall of India Pvt Ltd., New Delhi (1955).</li> </ol>	

<b>Course Code</b>	<b>22BSC507</b>	<b>Programme Code</b>	<b>BSC2022</b>
<b>Course Name</b>	<b>PRACTCAL BASED ON ELECTIVE THEORY-V (SAMPLING THEORY)</b>		
<b>Credits</b>	<b>2</b>	<b>Course Type : Discipline Specific Practical</b>	

**List of Practical**

- 1) Estimation of population mean using SRS.
- 2) Estimation of Population variance using SRS.
- 3) Estimation of population mean using proportional allocation in Stratified
- 4) Sampling.
- 5) Estimation of population variance using proportional allocation in Stratified sampling.
- 6) Estimation of population mean using Neyman allocation in Stratified sampling.
- 7) Estimation of gain in precision due to Stratification.
- 8) Estimation of population mean using Systematic sampling.
- 9) Estimation of population variance using Systematic sampling.
- 10) Comparison of Systematic sampling with Stratified & SRS for the population following linear trend

<b>Course Code</b>	<b>22BSC601</b>	<b>Programme Code</b>	<b>BSC2022</b>
<b>Course Name</b>	<b>Java Programming</b>		
<b>Credits</b>	<b>4</b>	<b>Course Type : Core Course Theory</b>	
<b>Course Objectives</b>	<ul style="list-style-type: none"> <li>To be able to explain and implement basic Programming techniques.</li> <li>To use methods&amp; concepts for programming purposes.</li> </ul>		
<b>Mapping of Programme Outcome(PO) &amp; Programme Specific Outcome(PSO)</b>	<b>PO1,PO4, PO6,PSO1,PSO2,PSO3</b>		
<b>Prerequisites:</b>	<ul style="list-style-type: none"> <li>Students should be familiar with Object Oriented Programming.</li> <li>Basic concepts related to programming are required.</li> </ul>		
<b>Course Outcomes (CO)</b>	<p>The students will learn</p> <p>CO1: programming logic is developed which will help them to create programs &amp; applications.</p> <p>CO2: to implement class, objects, Interface, Packages, Exception Handling, Multithreaded Programming, Applet, Event Handling, etc.</p> <p>CO3: get better opportunity in software industry.</p> <p>CO4: professional programming, practices to align with Industry Expectations.</p>		
<b>Unit No.</b>	<b>Contents</b>		<b>Total Hrs (60)</b>
I	<b>Introduction to JAVA:</b> Introduction, Features, Java Virtual Machine(JVM), Java Development Kit(JDK),Data Types, Keywords, Operators & Expressions, Control Structures(if, if-else,switch statement),Looping Structures(for,while, do-while,continue,break statement). <b>Mapping of CO:CO1</b>		10
II	<b>Class &amp; Inheritance:</b> Introduction to class & objects, defining a class, Creating an Objects, Method Overloading, Constructor, Constructor Overloading, Static variables & methods, new, delete & this keyword. Introduction to Inheritance, types of Inheritance, Super & Extended Class, Final variables, methods & classes, Abstract methods & class, Overriding methods. <b>Mapping of CO:CO1</b>		12
III	<b>Interface &amp; Packages:</b> Introduction to Interface, Defining & Implementing Interface, Defining Packages, Importing Packages, API Packages. Access Specifiers: public, private & protected. <b>Mapping of CO:CO1, CO2</b>		12
IV	<b>Exception Handling &amp; Multithreaded Programming:</b> Concept of Exception & Exception Handling, Types of Exception, use of try-throw-catch mechanism, Multiple catch blocks, use of finally block, Catch all & Uncaught Exception. Thread basics, Thread Life Cycle, Concept of Multithreading, Creating& Running Threads. <b>Mapping of CO:CO1, CO2,CO4</b>		13
V	<b>Applet, AWT &amp; Event Handling:</b> Introduction to Applet, Applet Life Cycle, Difference between Application & Applet, Applet tag, Different Applet methods, Introduction to AWT, Working with Text, Windows, Graphics & Colors, Drawing lines, Circles, Polygon, Rectangles, Ellipses, Circles, Arcs, working with Colors, Handling Mouse & Keyboard events through Applet. <b>Mapping of CO:CO1, CO2,CO3,CO4</b>		13
	<b>Text Books :</b> 1. E. Balagurusamy - Programming with Java (4/e) (Tata-McGraw Hill) 2. Herbert Schildt- The Complete Reference Java 2 (5/e) (Tata-McGraw Hill) 3. Dietel&Dietel - Java How to Program (Pearson Education)		
	<b>References :</b> 1. Y. Daniel Liang – Introduction to Java Programming (2/e) (PHI) 2. Horstmann& Cornell - Core Java 2 (Vol-1) (Sun Microsystems) 3. S. Chavan - Programming in Java Shroff Publication.		

<b>Course Code</b>	<b>22BSC605</b>	<b>Programme Code</b>	<b>BSC2022</b>
<b>Course Name</b>	<b>LABORATORY OF JAVA PROGRAMMING</b>		
<b>Total Credits</b>	<b>2</b>	<b>Course Type : Core Course Practical</b>	
<b>List of Practicals</b>			<b>Total Hours (30)</b>
<ol style="list-style-type: none"> <li>1. Write a Java Program Logical, Bitwise, Relational operator.</li> <li>2. Write a Java Program for Printing Multiplication Table of a given Number.</li> <li>3. Write a Java Program for demonstrating static variable and methods.</li> <li>4. Write a Java Program for demonstrating final variable and methods.</li> <li>5. Write a Java Program for demonstrating an application with two classes.</li> <li>6. Write a Java Program for demonstrating concept of Method Overloading.</li> <li>7. Write a Java Program for demonstrating concept of Constructor Overloading.</li> <li>8. Write a Java Program for demonstrating concept of Inheritance.</li> <li>9. Write a Java Program for demonstrating concept of Method Overriding.</li> <li>10. Write a Java Program for demonstrating the use of Packages.</li> <li>11. Write a Java Program for demonstrating concept of try-catch.</li> <li>12. Write a Java Program for demonstrating concept to Multithreading.</li> <li>13. Write an Applet Program for drawing Lines &amp; Rectangle.</li> <li>14. Write an Applet Program for drawing Polygon.</li> <li>15. Write an Applet Program for drawing Square Inside Circle.</li> <li>16. Write an Applet Program for drawing Circle Inside Square.</li> <li>17. Write an Applet Program for drawing an Olympic Symbol.</li> <li>18. Write an Applet Program for displaying Human Smiling Face.</li> <li>19. Write an Applet Program for displaying Ice-Cream Cone.</li> <li>20. Write an Applet Program for displaying Numeric Values.</li> </ol>			

<b>Course Code</b>	<b>22BSC602</b>	<b>Programme Code</b>	<b>BSC2022</b>
<b>Course Name</b>	<b>Analytical statistics</b>		
<b>Credits</b>	<b>4</b>	<b>Course Type : Core Course Theory</b>	
<b>Course Objectives</b>	<ul style="list-style-type: none"> <li>• Gain a thorough understanding of applied principles of statistics.</li> <li>• Demonstrate the ability to summarize a technical report and statistical analysis and interpret results also show the ability for broader implication of application in the statistical field.</li> <li>• Communicate statistical concepts clearly and professionally in oral form.</li> <li>• Demonstrate preparedness to provide guidance in statistical design and analysis.</li> </ul>		
<b>Mapping of Programme Outcome(PO)&amp; Programme Specific Outcome(PSO)</b>	<b>PO4 , PSO1, PSO2</b>		
<b>Prerequisites:</b>	<ul style="list-style-type: none"> <li>• Basic knowledge of concepts like - population, sample, sampling frame, sampling distribution, estimation and testing of hypothesis.</li> <li>• Knowledge of measures of averages, mean &amp; variance.</li> </ul>		
<b>Course Outcomes (CO)</b>	<p>The students will:</p> <p>CO1: Identify the appropriate measure of central tendency and test for analysis for a particular situation.</p> <p>CO2: Apply the formula and calculate descriptive measures of statistics.</p> <p>CO3: Frame the questionnaire and collect primary data and select a source of secondary data.</p> <p>CO4: Understand test of significance, test based on normal, t, F and chi square distribution.</p> <p>CO5: Learn to apply one-way and two-way classification.</p>		
<b>Unit No.</b>	<b>Contents</b>		<b>Total Hrs (60)</b>
I	<p><b>Basic concepts used in analysis:</b> population, sample, parameter, statistics, sampling frame, sampling error, Statistical Inference, Estimation, Estimator, Point Estimation and Interval Estimation.</p> <p>Data, types of data, frequency, frequency distribution (Discrete, continuous and cumulative). Definition of analytical statistics and its types.</p> <p><b>Mapping of CO: CO1</b></p>		10
II	<p><b>Collection of data:</b> primary and secondary method, Different types of Primary method, pilot survey, questionnaire, schedule, qualities of good questionnaire ,coding of questionnaire editing of the collected data, statistical errors: sources and types (absolute, relative biased, unbiased). Definition of classification and its types, Definition of tabulation and parts of table.</p> <p><b>Mapping of CO: CO3,</b></p>		12
III	<p><b>Concept of measures of averages:</b> mathematical average and positional average with definition. Quality of ideal average, variance, standard deviation, standard error. Testing of hypothesis: concept and definition, Null hypothesis, Alternative hypothesis Type-I and Type- II error, critical region. One-sided and two sided test, level of significance. Concept of parametric and non-parametric test (definition and types) Definition of t, F and z test.</p> <p><b>Mapping of CO :CO1,CO2,CO4</b></p>		10

IV	<p><b>Analytical test :</b></p> <p>1) Test for a population mean when (population variance is known )</p> <p>II) Test for population mean (when the population Variance is unknown).</p> <p>III) Test for a population variance (when population mean is known and when population mean is unknown.</p> <p>IV) Test for Equality of Two population means. (population variances are equal and known)</p> <p>VI) Test for equality of two population proportions.</p> <p>VI) Test for population correlation coefficient equal to zero.</p> <p>VII) Test for equality of two population means (population variance are equal and unknown).</p> <p>VIII) Test for paired observation.</p>	14
<b>Mapping of CO: CO1,CO4</b>		
V	<p><b>Analytical test-II:</b></p> <p><b>Chi-square test:</b> Concept and definition of chi-square test, Assumption for validity of chi-square test, application of chi-square test.</p> <p>Test for goodness of fit, Test for consistency in a 2x2 Table, Test for independence of attributes.</p> <p><b>Analysis of variance:</b> I) Concept and definition of ANOVA, assumption for ANOVA test. Concept of one way ANOVA, mathematical model of one way ANOVA for fixed effect model, Test for one-way ANOVA with one observation per cell for fixed effect.</p> <p>II) Concept two way ANOVA, mathematical model for fixed effect for two way classified data.</p> <p>V) Test for two way ANOVA with one observation per cell for fixed effect.</p>	14
<b>Mapping of CO: CO5</b>		
<p><b>Books:</b></p> <ol style="list-style-type: none"> <li>1. S.C .Gupta, V. K. Kapoor, Fundamentals of Mathematical statistics,11th edition, Sultan Chand &amp; Sons, New Delhi (2000).</li> <li>2. V. Ragagopalan, Selected Statistical tests, New age international(p),limited, publishers.</li> <li>3. R. S. N. Pillai, V. Bagavathi, Statistics theory and practice, 7th edition, Sultan Chand &amp; Sons, New Delhi (2003).</li> <li>4. Goon A.M., Gupta M.K., Das Gupta B., An outline of statistical theory, 4th edition, The World press, Calcutta (2003).</li> <li>5. S.P.Gupta, Statistical methods 38th edition, Sultan Chand &amp; Sons, New Delhi (2009).</li> </ol>		
<p><b>References:</b></p> <ol style="list-style-type: none"> <li>1. Goon A.M., Gupta M.K., Das Gupta B., Fundamentals of Statistics, Vol.-I &amp; II, The World press, Calcutta (1999).</li> <li>2. J. Medhi, Statistical methods, an introductory text, New Age International,(1992).</li> <li>3. Brase &amp; Brase, Understandable Statistics, 11th edition, Cengage Learning, (2014).</li> <li>4. Croxton F. E., Cowden D.J., and Kelin S., Applied general Statistics, 2nd edition, Prentice-Hall of India Pvt Ltd., New Delhi (1955).</li> </ol>		

<b>Course Code</b>	<b>22BSC606</b>	<b>Programme Code</b>	<b>BSC2022</b>
<b>Course Name</b>	<b>LABORATORY OF ANALYTICAL STATISTICS</b>		
<b>Total Credits</b>	<b>2</b>	<b>Course Type : Core Course Practical</b>	
<b>List of Practicals</b>			
	<ol style="list-style-type: none"> <li>1) Problem based on mathematical and positional averages.</li> <li>2) Test for a population mean when population variance is known.</li> <li>3) Test For equality of two population means. (Population variances are equal and known).</li> <li>4) Test for equality of two population means (population variance are equal and unknown).</li> <li>5) Test for equality of two population proportions.</li> <li>6) Test for population correlation coefficient equal to zero</li> <li>7) Test for population mean (when the population Variance is unknown).</li> <li>8) Test for independence of attributes.</li> <li>9) ANOVA for one-way classification for fixed effect model.</li> <li>10) ANOVA for Two-way classification with one observation per cell for fixed effect model.</li> </ol>		<b>Total Hours (30)</b>

<b>Course Code</b>	<b>22BSC603</b>	<b>Programme Code</b>	<b>BSC2022</b>
<b>Course Name</b>	<b>Digital Communication (Elective-VII)</b>		
<b>Credits</b>	<b>4</b>	<b>Course Type : Discipline Specific Theory</b>	
<b>Course Objectives</b>	<ul style="list-style-type: none"> <li>To expose students to the characteristics of Digital Data.</li> <li>To understand basic Digital Communication systems.</li> <li>To expose students to the Digital Multiplexing Techniques</li> </ul>		
<b>Mapping of Programme Outcome(PO) &amp; Programme Specific Outcome(PSO)</b>	<b>PO1,PO4,PO6,PSO1,PSO2</b>		
<b>Prerequisites:</b>	<ul style="list-style-type: none"> <li>Basic concepts of Digital Electronics.</li> <li>Basic knowledge of various Electronic devices.</li> </ul>		
<b>Course Outcomes (CO)</b>	<p>The students will be:</p> <p>CO1: able to understand the principles and concept of digital Communications.</p> <p>CO2: able to understand the various process of Modulation.</p> <p>CO3: able to To understand the various multiplexing technique and multiple Access Schemes.</p>		
<b>Unit No.</b>	<b>Contents</b>		<b>Total Hrs (60)</b>
I	<p><b>Introduction to Digital Communication:</b> Historical perspective of Digital Communication, Elements of digital communication system with its block diagram, Communication channels types and their characteristics (bit rate, bandwidth, repeater distance) applications, comparison of analog and digital communication system. Line Coding formats: Classification of Line codes, Unipolar-RZ, RZ, NRZ-I, NRZ-L, Polar, NRZ &amp; RZ, Bipolar NRZ/AMI, RZ, Manchester split phase and differential Manchester. Polar quaternary and their waveform</p> <p><b>Mapping of CO: CO1</b></p>		14
II	<p><b>Pulse Modulation Techniques:</b> Sampling process, Types of Sampling, Nyquist sampling theorem, Aliasing effect, Pulse code modulation (PCM): Transmitter and Receiver block diagram and its working, Advantages and disadvantages, Differential pulse code modulation (DPCM): Transmitter and Receiver block diagram and its working, Advantages and disadvantages.</p> <p><b>Mapping of CO: CO2</b></p>		12
III	<p><b>Digital Modulation Techniques:</b> Digital Signals : Bit Interval (<math>T_b</math>), Bit Rate, Baud Rate Amplitude shift keying (ASK): Generation &amp; waveforms, Advantages, disadvantages, applications. Frequency shift keying (FSK): Generation &amp; waveforms, Advantages, disadvantages, applications. Phase shift keying (PSK): Generation &amp; waveforms, Advantages, disadvantages, applications. Differential Phase shift keying (DPSK): DPSK Transmitter &amp; DPSK Receiver, Advantages of DPSK, Disadvantages of DPSK</p> <p><b>Mapping of CO: CO1, CO2, CO3</b></p>		12
IV	<p><b>Multiplexing:</b> Concept, necessity, types of multiplexing, Frequency Division Multiplexing (FDM): Concept, Advantages &amp; Disadvantages, Applications, Time Division Multiplexing (TDM): Concept, Advantages &amp; Disadvantages, Applications. Code Division Multiplexing (CDM): Concept, Advantages &amp; Disadvantages, Applications, Comparison between different types of Multiplexing. Concept of Wavelength Division Multiplexing, Concept of Synchronous Multiplexing &amp; Asynchronous Multiplexing.</p> <p><b>Mapping of CO: CO1, CO3</b></p>		12
V	<p><b>Multiple Access Techniques:</b> Frequency Division Multiplexing Access (FDMA): Concept, features, Advantages &amp; Disadvantages, Time Division Multiplexing Access (TDMA): Concept, features, Advantages &amp; Disadvantages, Problems with FDMA and TDMA, Code Division Multiplexing Access (CDMA): Concept, features, Advantages &amp; Disadvantages, Comparison of FDMA, TDMA and CDMA.</p> <p><b>Mapping of CO: CO1, CO3</b></p>		10
	<p><b>Text Books:</b></p> <ol style="list-style-type: none"> <li>P. Ramakrishna Rao, Digital Communication, 1st edition, Tata McGraw Hill, (2011)</li> <li>Amitabh Bhattacharya, Digital Communication, 1st edition, Tata McGraw Hill, (2005)</li> <li>Wayne Tomasi, Electronics Communication System, 5th edition Pearsons</li> </ol>		

	<p><b>References:</b></p> <ol style="list-style-type: none"><li>1. Upen Dalal, Wireless Communication, 1st edition Oxford Higher Education, (2009)</li><li>2. Simon Hykin, Communication System, 4th edition John Wiley &amp; sons., (2013)</li><li>3. John G. Proakis, Digital communication, 4th edition, McGraw Hill, (2003)</li></ol>	
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<b>Course Code</b>	<b>22BSC607</b>	<b>Programme Code</b>	<b>BSC2022</b>
<b>Course Name</b>	<b>PRACTICAL BASED ON ELECTIVE THEORY-VII (DIGITAL COMMUNICATION)</b>		
<b>Credits</b>	<b>2</b>	<b>Course Type : Discipline Specific Practical</b>	
	<b>List of Experiments</b>		<b>Total Hours (30)</b>
	<ol style="list-style-type: none"> <li>1. Study &amp; observe the waveform of ASK Modulation.</li> <li>2. Study &amp; Observe the waveform of ASK Demodulation</li> <li>3. Study &amp; Observe the waveform of FSK Modulation.</li> <li>4. Study &amp; Observe the waveform of FSK Demodulation.</li> <li>5. Study &amp; Observe the waveform of PSK Modulation.</li> <li>6. Study &amp; Observe the waveform of PSK Demodulation.</li> <li>7. Study &amp; Observe the waveform of pulse Code Modulation</li> <li>8. Study &amp; Observe the waveform of pulse Code Demodulation</li> <li>9. Study &amp; Observe the waveform of Time Division Multiplexing</li> <li>10. Study &amp; Observe the waveform of Time Division De-multiplexing</li> </ol>		

<b>Course Code</b>	<b>22BSC603</b>	<b>Programme Code</b>	<b>BSC2022</b>
<b>Course Name</b>	<b>Electronic Communication (EC)(Elective-VII)</b>		
<b>Credits</b>	<b>4</b>	<b>Course Type : Discipline Specific Theory</b>	
<b>Course Objectives</b>	<ul style="list-style-type: none"> <li>To expose the students about basics of electronic communication.</li> <li>To introduce the students about fiber optic communication.</li> </ul>		
<b>Mapping of Programme Outcome(PO) &amp; Programme Specific Outcome(PSO)</b>	<b>PO1,PO4,PO6,PSO1,PSO2</b>		
<b>Prerequisites:</b>	<ul style="list-style-type: none"> <li>Basic knowledge of analog and digital devices.</li> <li>Basic knowledge of analog and digital signals.</li> </ul>		
<b>Course Outcomes (CO)</b>	<p>The students will</p> <p>CO1: gain knowledge about electronic communication system.</p> <p>CO2: gain knowledge about modulation techniques.</p> <p>CO3: gain knowledge about fiber optic communication system.</p> <p>CO4: gain knowledge about sources and detectors use in fiber optic communication system.</p>		
<b>Unit No.</b>	<b>Contents</b>		<b>Total Hrs (60)</b>
I	<b>Introduction to Electronic Communication:</b> Importance, Block diagram of Communication System, Types Of Electronic Communications, Simplex, Duplex – Full And Half, Applications of Communication System, Analog Communication System:Defination, advantages, disadvantages, applications.		10
	<b>Mapping of CO: CO1</b>		
II	<b>Modulation:</b> Defination, Need of Modulation, Types of Modulation, Theory of AM: Modulation Index, Theory of FM, problems		14
	<b>Mapping of CO:CO2</b>		
III	<b>Demodulation,Transmitters &amp; Receivers:</b> Defination of Demodulation, diode detectors, Balanced Slope Detectors, AM & FM transmitters, <b>Receivers:</b> TRF Receivers, Superheterodyne receivers		12
	<b>Mapping of CO: CO1,CO2</b>		
IV	<b>Optical Fiber Communication System:</b> Introduction , Principle of Optical Fibers, Structure of Optical Fibers, Types of Optical Fibers:Single Mode & Multimode Fibers,Step index & Graded Index Optical fibers, Block diagram of Optical Communication System		12
	<b>Mapping of CO: CO3</b>		
V	<b>Optical Sources &amp; Photo Detectors:</b> <b>Optical Sources:</b> <b>LED:</b> principle, construction, working & application , <b>LASER:</b> photon absorption ,Spontaneous Emmision,Stimulated Emmision, <b>Photo Detectors:</b> <b>PIN photodiode:</b> Construction & Working, Characteristics: Quantum Efficiency, Responsivity, <b>Avalanche Photodiode:</b> principle, construction, working.		12
	<b>Mapping of CO: CO3, CO4</b>		

	<p><b>Text Books:</b></p> <ol style="list-style-type: none"> <li>1. V Chandra Sekar, Analog Communication, Oxford University Press</li> <li>2. Louis E Frenzel, Communication Electronics , TATA Mc-Graw Hill 5<sup>th</sup> Edition</li> <li>George Kennedy, Bernard Davis, SRM Prasanna, Electronic communication Systems, TATA Mc-Graw Hill 5<sup>th</sup> Edition.</li> </ol>	
	<p><b>References:</b></p> <ol style="list-style-type: none"> <li>1. Dennis Roddy, John Coolen, Electronic Communications Pearsons Prentice hall of India Pvt. Ltd.</li> <li>2. Gerd Keiser , Optical Fiber Communications, Tata McGraw Hill</li> <li>3. Sanjeev Gupta , Electronics Devices &amp; Circuits, Dhanpat Rai publications</li> <li>4. B.L.Theraja , Basic Electronics, S. Chand and Company</li> <li>U.A.Bakshi, A.P. Godse, Basic Electronics Engineering, technical publication pune</li> </ol>	

<b>Course Code</b>	<b>22BSC607</b>	<b>Programme Code</b>	<b>BSC2022</b>
<b>Course Name</b>	<b>PRACTICAL BASED ON ELECTIVE THEORY-VII (ELECTRONIC COMMUNICATION)</b>		
<b>Credits</b>	<b>2</b>	<b>Course Type : Discipline Specific Practical</b>	
<b>List of Experiments</b>			
<ol style="list-style-type: none"> <li>1. Study of amplitude modulation.</li> <li>2. Study of amplitude demodulation.</li> <li>3. Study of frequency modulation.</li> <li>4. Study of frequency demodulation.</li> <li>5. Study of diode detector.</li> <li>6. Study of fiber optic communication.</li> <li>7. Study of Superheterodyne receiver.</li> <li>8. Study of photo diode.</li> <li>9. Study of PIN photo diode.</li> <li>10. Study of LASER diode.</li> </ol>			

<b>Course Code</b>	<b>22BSC603</b>	<b>Programme Code</b>	<b>BSC2022</b>
<b>Course Name</b>	<b>Microcontroller 8051 (MIC) (Elective-VII)</b>		
<b>Credits</b>	<b>4</b>	<b>Course Type : Discipline Specific Theory</b>	
<b>Course Objectives</b>	<ul style="list-style-type: none"> <li>To expose students to the concept of Microcontroller and embedded system</li> <li>To learn and understand the working of 8051 microcontroller.</li> </ul>		
<b>Mapping of Programme Outcome(PO) &amp; Programme Specific Outcome(PSO)</b>	<b>PO1,PO4,PO6,PSO1,PSO2</b>		
<b>Prerequisites:</b>	Basic knowledge of Microprocessor Basics knowledge of Assembler		
<b>Course Outcomes (CO)</b>	The students will CO1: Gain basic knowledge of microcontroller with its architecture. CO2: Be able to understand the instruction sets. CO3: Develop the logic for assembly level programming		
<b>Unit No.</b>	<b>Contents</b>		<b>Total Hrs (60)</b>
I	<b>Architecture Of 8051:</b> Introduction of Microcontroller, Comparison of Microprocessor and Microcontroller, Overview of 8051 family ,Salient features of 8051,Block diagram of 8051 Microcontroller,Pin diagram of 8051 microcontroller,Flag register of 8051,registers organization, internal RAM and ROM Organization of 8051		12
	<b>Mapping of CO: CO1</b>		
II	<b>Addressing Modes And Instruction Set :</b>  Concept of Addressing Modes,Different addressing modes of 8051 , Classification of 8051 Instructions , Data transfer instructions:MOV,MOVX,MOVC,PUSH,POP,Exchange & Exchange Digit, Arithmetic Instructions:Addition,Addition with Carry,Subtraction with Borrow,Increment,Decrement,Multiply,Divide & Decimal Adjustment After addition, Boolean instructions:Set,Clear,Complement,Logical AND & Logical OR , BranchControl Instructions:SJMP,AJMP,LJMP,ACALL,LCALL,CJNE,DJNZ,JC,JNC,JZ,JNZ,JB,JNB,JBC		12
	<b>Mapping of CO:CO2</b>		
III	<b>Assembly language Programming:</b> Development Tools:Editor,Complier,Linker,introduction to Assembler, assembler directives:ORG,EQU,SET,DB,DW,END,USING,BIT,CODE,DATA, and Assembly language programming examples: 8 bit Addition ,8 bit subtraction,8 Bit Multiplication and Division ,Logical AND operation, Logical OR operation, Logical NOT operation, Logical NAND operation, Logical NOR operation, Logical EX-OR operation,BCD Addition.		12
	<b>Mapping of CO: CO2,CO3</b>		
IV	<b>Timer And I/O Port Programming:</b> Bit addresses for I/O and RAM, I/O programming, 8051 Timers, Timer 0 and Timer 1 registers ,Different modes of Timer,TMOD Register,TCON Register,SCON Register		12
	<b>Mapping of CO: CO1,CO3</b>		
V	<b>Interrupts:</b> Introduction to Interrupts,Steps in Executing an Interrupt, Internal timer,external hardware interrupts and Serial Port Interrupt, Interrupt enable register,Interrupt Priority Register, Vectored & Non-Vectored Interrupts ,Interrupt vector table		12
	<b>Mapping of CO: CO1,CO2,CO3</b>		
	<b>Text Books:</b> 1. M. A. Mazadi, J. C. Mazadi ,The 8051 Microcontroller and Embedded Systems 2nd edition, (Pearson Education, Asia),(2007) 2. Kenneth J. Ayala ,The 8051 Microcontroller architecture, Programming & Applications,3rd edition, Cengage Learning,(2004) 3. D. A. Godse, A. P. Godse, Microprocessor, microcontroller & applications, 3rd edition, Technical Publications,(2008)		

	<b>References:</b> 1. R. Theagarajan, Microprocessor and Microcontroller, 2 ndedition, Sci Tech Publication, Chennai, (2004) 2.Scott MacKenzie, The 8051 Microcontroller, 3rd edition, Prentice Hall, (1999)	

<b>Course Code</b>	<b>22BSC607</b>	<b>Programme Code</b>	<b>BSC2022</b>
<b>Course Name</b>	<b>PRACTICAL BASED ON ELECTIVE THEORY-VII (MICROCONTROLLER 8051)</b>		
<b>Credits</b>	<b>2</b>	<b>Course Type : Discipline Specific Practical</b>	
	<b>List of Experiments</b>		<b>Total Hours (30)</b>
	<ol style="list-style-type: none"> <li>1. Write an 8051 ALP for addition two 8-bit numbers.</li> <li>2. Write an 8051 ALP for BCD addition two 8-bit numbers.</li> <li>3. Write an 8051 ALP for Subtraction two 8-bit numbers.</li> <li>4. Write an 8051 ALP for Multiplication two 8-bit numbers.</li> <li>5. Write an 8051 ALP for Multiplication by shifting operation of two numbers.</li> <li>6. Write an 8051 ALP for Division two 8-bit numbers.</li> <li>7. Write an 8051 ALP to perform Logical AND Operation.</li> <li>8. Write an 8051 ALP to perform Logical OR Operation.</li> <li>9. Write an 8051 ALP to perform Logical EX-OR Operation.</li> <li>10. Write an 8051 ALP to perform Logical NOT Operation.</li> <li>11. Write an 8051 ALP to perform Logical NAND Operation.</li> <li>12. Write an 8051 ALP to perform Logical NOR Operation.</li> <li>13. Write an 8051 ALP to calculate LCM of Two numbers</li> <li>14. Write an 8051 ALP to calculate HCF of Two numbers</li> <li>15. Write an 8051 ALP to flash display "hvpnm" on LCD</li> </ol>		

<b>Course Code:</b>	<b>22BCA101</b>	<b>Program Code:</b>	<b>BCA2022</b>
<b>Course Name:</b>	<b>Computer Fundamental</b>		
<b>Credits :</b>	<b>4</b>	<b>Course Type: Core</b>	
Course Objectives	<ul style="list-style-type: none"> <li>To acquire the basic knowledge about computer system functions.</li> <li>To learn the basic knowledge about various components, capabilities and limitations of computer.</li> <li>To understand the various hardware and software components of computer.</li> </ul>		
Mapping of Programme Outcome(PO) and Programme Specific Outcome (PSO)	PO1, PSO1		
Prerequisites	<ul style="list-style-type: none"> <li>Basic knowledge of Computer hardware &amp; software should be known.</li> </ul>		
Course outcomes (CO)	<b>The Student Will</b> CO1: Converse in basic computer terminology. CO2: To able to identify and demonstrate peripherals of computer system. CO3: To able to demonstrate operating system functions. CO4: To able to demonstrate DOS commands and how they are used. CO5: Student will be able to demonstrate how to organize files & folders and window exploring.		

Units	Contents	Total Hrs:60
I	<b>Computer Basics:</b> Definition of Computer, Few Application, uses and Characteristic of Computer, block diagram of computer, types of computer, Generation of Computer, ASCII Codes, EBCDIC Code. <b>Memory:</b> Primary Memory: RAM, ROM, PROM, EPROM.	12
	<b>Mapping of CO : CO1</b>	
II	<b>Input/ Output Devices:</b> Description of I/O units, Keyboard, Mouse, MICR, OCR, Bar coding, Monitor, Printer and its Types. <b>Secondary storage:</b> Floppy disk, Hard disk, optical disk, and other types of secondary storage devices.	12
	<b>Mapping of CO : CO2</b>	
III	<b>Software:</b> Types of software, system software, application software, utility software, assembler, compiler, Interpreter. <b>Operating System:</b> Need of Operating System, Batch operating System, Multi programming, Multitasking, Real time OS.	12
	<b>Mapping of CO : CO3</b>	
IV	<b>Introduction to operating system:</b> DOS: Booting processing, Formatting, directory structure, FAT. <b>Internal DOS operating Commands:</b> REN,CD,MD,RD,DIR,DEL,COPY,TYPE,DATE, TIME,COPYCON. <b>External DOS operating Commands:</b> FORMAT, XCOPY, CHKDSK, PATH, ATTRIB.	12
	<b>Mapping of CO : CO4</b>	
V	<b>Windows:</b> Introduction Features of windows, Customizing Desktop, Creating shortcuts, moving, deleting icons. <b>Windows Explorer:</b> Copying, renaming, moving, deleting operations on files and folders. <b>Standard Folders:</b> My computer, My documents, Control Panel, Recycle bin. <b>Windows Accessories:</b> Paint, Notepad, Calculator.	12
	<b>Mapping of CO : CO5</b>	
	<b>Text Books :</b> <ol style="list-style-type: none"> <li>V. Rajaraman, Fundamental of computer, Prentice Hall India Pvt., Limited Prentice-Hall Of India Pvt. Limited, 01-Oct-2003.</li> <li>B. Ram, Computer Fundamental , Nas. Age Pub. 2014</li> <li>Pradeep K. Sinha, Priti Sinha, Computer Fundamental, BPB Publications, 01-Nov-2004</li> <li>D. M. Dhamdhare, System Software and operating system, TMH</li> <li>Silberschatz, Galvin, Gagne, Operating System Concepts, 7th Edition, Addison Education</li> <li>Achyut S. Godbole, Operating system, Tata McGraw-Hill Education, 2005.</li> </ol>	

**References :**

1. Roger Hunt & John Shelly, Computers and Commonsense, Prentice-Hall of India Pvt. Ltd. New Delhi
2. William Stalling, Operating Systems: Internals and Design Principles,8th Edition.
3. Crowley, Operating System,Tata McGraw-Hill Education, 2001.
4. Peterson, Operating System concepts (2nd edition) Addison-Wesley Longman Publishing Co.1985

<b>Course Code:</b>	<b>22BCA102</b>	<b>Program Code:</b>	<b>BCA2022</b>
<b>Course Name:</b>	<b>DATA COMMUNICATION NETWORK</b>		
<b>Credits :</b>	<b>4</b>	<b>Course Type: Core</b>	
Course Objectives	<ul style="list-style-type: none"> <li>To understand the basic concept of data communication, layered model, protocols.</li> <li>To learn the inter working between computer networks and switching components in telecommunication systems.</li> <li>To understand the nature, uses and implications of internet technology.</li> </ul>		
Mapping of Programme Outcome(PO) ) and Programme Specific Outcome (PSO)	PO1, PSO1		
Prerequisites	<ul style="list-style-type: none"> <li>Basic knowledge of Computer hardware &amp; software should be known.</li> </ul>		
Course outcomes (CO)	<p><b>The Student Will</b></p> <p>CO1: To able to understand various types of transmission media. Evaluation of performance for each media and device.</p> <p>CO2: To able to identify and demonstrate interconnected computing devices that can exchange data and share resources with each other.</p> <p>CO3: To able to recognize the multiplexing technologies used for modern communication.</p> <p>CO4: To describe the concept of world wide web and requirements of effective web design.</p> <p>CO5: Study the function of OSI layers. Gain familiarity with common networking and application protocol</p>		
<b>Units</b>	<b>Contents</b>		<b>Total Hrs:60</b>
I	<p><b>Introduction to Computer Network</b>, Advantages of computer network, Types of computer networks: LAN, MAN, WAN</p> <p><b>Introduction to Transmission Media-</b> Bounded media: Twisted pair cable, Coaxial cable, Fiber optic cable. Unbounded Media: Microwave, Satellite, Infrared.</p> <p><b>Mapping of CO : CO1</b></p>		12
II	<p><b>Communication:</b> Communication system and its components. <b>Mode of Transmission:</b> Simplex, Half duplex, full duplex. Asynchronous and Synchronous transmission of data, Digital signal, Analog Signal , bit rate, baud rate <b>Network Topology:</b> Bus, Ring, Star, Mesh</p> <p><b>Mapping of CO : CO2</b></p>		12
III	<p><b>Modulation:</b> Amplitude modulation, Frequency Modulation, Phase Modulation. <b>Multiplexing:</b> Multiplexers, Frequency Division Multiplexing, Time Division Multiplexing <b>Switching Techniques:</b> Switching Concept, Circuit switching, packet switching, Message switching, PBX (Private Branch Exchange)</p> <p><b>Mapping of CO : CO3</b></p>		12
IV	<p><b>Network Devices:</b> NIC, Hub, Bridges, Router, Switches, Gateways, modem and modem types <b>Internet:</b> History, applications of Internet- WWW, E-mail, FTP, Telnet, Voice chat, Video conferencing.</p> <p><b>Mapping of CO : CO4</b></p>		12
V	<p><b>Network Protocols:</b> OSI Model, X.25 Protocol, Transmission Control Protocol/Internet Protocol (TCP/IP), Ethernet, Token Ring, Datagram . Broadband ISDN, Fascimile(FAX)</p> <p><b>Mapping of CO : CO5</b></p>		12
	<p><b>Text Books:</b></p> <ol style="list-style-type: none"> <li>Jerry FitzGerald, Alan Dennis, Fundamentals of Business Data Communications, Tenth Edition, Wisley India Pvt Ltd. New Delhi, India(2009)</li> <li>Michael A. Miller, Introduction to digital and data Communications, JAICO Publishing House, Mumbai,India(2006)</li> </ol>		

**References:**

1. Andrew S. Tanenbaum, David J. Wetherall, Computer Networks, Fifth Edition, Pearson Publications, New Delhi, India(2011)
2. Pradeep K Sinha, Priti Sinha ,Computer Fundamentals ,Sixth Edition, BPB Publications,New Delhi, , India, (2011)
3. Behrouz A. Forouzan, Data Communications and Networking, Fifth Edition, Tata Mc Graw- Hill ,New Delhi, India, (2008).
4. Uyles D. Black, data Communications and Distributed Networks, Third Edition, PHI Learning private Limited, New Delhi, , India, (2009)

<b>Course Code:</b>	<b>22BCA103</b>	<b>Program Code:</b>	<b>BCA2022</b>
<b>Course Name:</b>	<b>Fundamentals of Electronics</b>		
<b>Credits :</b>	<b>4</b>	<b>Course Type: Discipline Specific</b>	
Course Objectives	<ul style="list-style-type: none"> <li>To introduce the binary numbers used in computer system.</li> <li>To make understand how logic circuit works inside microprocessor.</li> <li>To expose the students to the concepts of digital systems.</li> </ul>		
Mapping of Programme Outcome(PO) and Programme Specific Outcome (PSO)	PO1, PSO1		
Prerequisites	<ul style="list-style-type: none"> <li>Basic knowledge of electronics</li> <li>Basic knowledge of binary numbers</li> </ul>		
Course outcomes (CO)	<b>The Student Will</b> CO1: Understand digital circuits CO2: Design basic digital circuits		

Units	Contents	Total Hrs:60
I	<b>Number Systems and inter conversions:</b> Decimal, Binary, Octal, Hexadecimal and their mutual conversion, addition and subtraction of binary numbers, addition and subtraction using 1's and 2's complement method, BCD, 8421.	12
	<b>Mapping of CO : CO1</b>	
II	<b>Logic gates:</b> OR, AND, NOT, NAND, NOR, XOR gates and their truth table, Boolean Laws, De Morgans and Duality theorems, use of NAND and NOR as universal building blocks	12
	<b>Mapping of CO : CO1</b>	
III	<b>Karnaugh Maps:</b> pair, quads, octets, minterm, max term in K Map, K-map for 2, 3, 4 variables, concept of SOP and POS, simplification of SOP and POS logic expressions using K-map	12
	<b>Mapping of CO : CO1</b>	
IV	<b>Combinational Logic Circuits:</b> Half Adder, full adder, half subtractor and full subtractor, Concept of Encoder, Concept of Decoder: BCD to seven segment converter, 4-bit Full Adder/ subtractor, Concept of multiplexer, 4:1 mux using gate, Concept of demultiplexer, 1:4 demux using gate	12
	<b>Mapping of CO : CO1,2</b>	
V	<b>Sequential Logic Circuits:</b> Construction, working of R-S,Clocked R-S, JK, D and T- type, JKMS Flip Flop, Concept of preset and clear terminals, Race around Condition in JK FF. Counters: Modulus of counter,4 bit Ripple counter, decade counter.	12
	<b>Mapping of CO : CO1,2</b>	
	<b>Text Books:</b> <ol style="list-style-type: none"> <li>R. P. Jain :Modern Digital Electronics:4<sup>th</sup> edition Tata Mc-Graw Hill(2010)</li> <li>A. Anand Kumar :Fundamental of Digital Circuits:2<sup>nd</sup> edition (PHI)(2003)</li> <li>A. P. Malvino, D. P. Leach: Digital principles and applications 4th edition: McGraw Hill (1975)</li> </ol>	
	<b>References:</b> <ol style="list-style-type: none"> <li>M.B.Matsagar,V.S.Kale: Principles of digital Electronics, Vision publication</li> <li>Floyd,Jain : Digital fundamentals, Pearson</li> <li>S.P.Bali, Y.N.Bapat :Electronic circuits and systems Analog and digital, Tata McGraw Hill</li> <li>B.S.Nair :Digital electronics and logic design, Prentice hall</li> <li>Malvino,Brown :Digital computer electronics, Tata McGraw Hill</li> <li>C.V.Dhuley and V. M. Ghodki :Fundamentals of Digital Electronics</li> </ol>	

