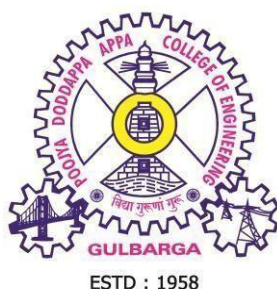# CURRICULUM
FOR THE ACADEMIC YEAR 2022-2023

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

(B.E in COMPUTER SCIENCE & DESIGN)

B.E. III SEMESTER

POOJYA DODDAPPA APPA COLLEGE OF ENGINEERING
(An autonomous college under VTU)
KALABURAGI

About the institution: The Hyderabad Karnataka Education (HKE) society founded byLate Shri Mahadevappa Rampure, a great visionary and educationist. The HKE Society runs 46 educational institutions. Poojya DoddappaAppa College of Engineering, Gulbarga is the first institution established by the society in 1958. The college is celebrating its golden jubilee year, setting new standards in the field of education and achieving greater heights. The college was started with 50% central assistance and 50% state assistance, and a desire to impart quality technical education to this part of Karnataka State. The initial intake was 120 with degree offered in three branches of engineering viz, Civil, Mechanical and Electrical Engineering. Now, it houses 11 undergraduate courses, 10 post Graduate courses and 12 Research centers, established in Civil Engg., Electronics & Communication Engg, Industrial & Production Engg, Mechanical Engg, Electrical Engg., Ceramic Cement Tech., Information Science & Engg., Instrumentation Technology, Automobile Engg., Computer Sc. and Engg.,Mathematics and Chemistry All the courses are affiliated to Visveswaraya Technological University, Belgaum. At present the total intake at UG level is 980 and PG level 193.

The college receives grant in aid funds from state government. A number of projects have been approved by MHRD /AICTE, Govt. of India for modernization of laboratories. KSCST, Govt. of Karnataka is providing financial assistance regularly for the student's projects.

The National Board of Accreditation, New Delhi, has accredited the College in the year 2005-08 for 09 UG Courses out of which 08 courses are accredited for three years and 01 course is accredited for five years. And second time accredited for Six Course in the year 2009-2012

Our college is one among the 14 colleges selected under TEQIP, sponsored by World Bank. It has received a grant of Rs 10.454 Crores under this scheme for its development. The institution is selected for TEQIP phase II in year 2011 for four years. Institution is receivinga grant of Rs 12.50 Crores under TEQIP Phase -II scheme for its development and selected for TEQIP-III as mentoring Institute for BIETJhansi(UP).

Recognizing the excellent facilities, faculty, progressive outlook, high academic standards and record performance, the VTU Belgaum reposed abundant confidence in the capabilities of the College and the College was conferred Autonomous Status from the academic year 2007-08, to update its own programme and curriculum, to devise and conduct examinations, and to evaluate student's performance based on a system of continuous assessment. The academic programmers are designed and updated by a Board of Studies at the department level and Academic Council at the college level. These statutory bodies are constituted as per the guidelines of the VTU Belgaum. A separate examination section headed by a Controller of Examinations conducts the examinations.
At present the college has acquired the Academic autonomous status for both PG and UG courses from the academic year 2007-08 and it is one among the six colleges in the state of Karnataka to have autonomous status for both UG and PG courses.

One of the unique features of our college is, it is the first college in Karnataka State to start the Electronics and Communication Engineering branch way back in the year 1967, to join NIT Surathkal and IISc, Bangalore. Also, it is the only college in the state and one among the three colleges across the country, offering a course in Ceramic and Cement Technology. This is the outcome of understanding byfaculty and management about the basic need of this region, keeping in view of the available raw material and existing Cement Industries.

Bharatiya Vidya Bhavan National Award for an Engineering College having Best Overall Performance for the year 2017 by ISTE (Indian Society for Technical Education). In the year 2000, the college was awarded as Best College of the year by KSCST, Bangalore in thestate level students projects exhibition.

The college campus is spread over 71 acres of land on either side of Mumbai-Chennai railway track and has a sprawling complex with gardens and greenery all around.

About the department: The Computer Science and Engineering department was started in the year 1984 with an intake of 40 students for UG. The department has seen phenomenal growth and now the department has increased UG intake to 120 students and offering two Post Graduation programmes : PG (Computer Science and Engineering with an intake of 25 students) and PG(Computer Network and Engineering with an intake of 18 students). The department is offering research program under its recognized research center. The department is having state-of-the-art computing facilities with high speed internet facilities and laboratories. The department library provides useful resources like books and journals. The department has well qualified and experienced teaching faculty. The department has been conducting several faculty development programs and student training programs.

Vision of the Institution

To be an institute of excellence in technical education and research to serve the needs of the industry and society at local and global levels.

Mission of the Institution

- To provide a high quality educational experience for students with values and ethics that enablesthem to become leaders in their chosen professions.
- To explore, create and develop innovations in engineering and science through research anddevelopment activities.
- To provide beneficial service to the national and multinational industries and communitiesthrough educational, technical, and professional activities

Vision of the Department

- To become a premier department in Computer education, research and to prepare highly competent IT professionals to serve industry and society at local and global levels.

Mission of the Department

- To impart high quality professional education to become a leader in Computer science and Engineering.
- To achieve excellence in Research for contributing to the development of the society.
- To inculcate professional and ethical behaviour to serve the industry.

Program Educational Objectives (PEO):

PEO1:	To prepare graduates with core competencies in mathematical and engineering fundamentals to solve and analyze computer science and engineering problems
PEO2:	To adapt to evolving technologies and tools for serving the society
PEO3:	To perform as team leader, effective communicator and socially responsible computer professional in multidisciplinary fields following ethical values
PEO4:	To encourage students to pursue higher studies, engage in research and to become entrepreneurs

<u>Program Outcomes:</u>

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

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

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

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

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

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

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

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

09. **Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

10. **Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

11. **Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one„s own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

12. **Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

SCHEME OF TEACHING FOR III SEMESTER - 2022-2023

B.E. (COMPUTER SCIENCE & DESIGN)

Sl. No	Course Code	Course Title	Teaching Hours/Week				Examination				Credits
			Theory Lecture(L)	Tutorial(T)	Practical	Self Study	Duration in hours	CIE Marks	SEE Marks	Total Marks	
1	21MA31D	Computational Method for Computer Science	3	0	0	0	3	50	50	100	3
2	21CG32	Digital System Design	3	0	0	0	3	50	50	100	3
3	21CG33	Data Structures	3	0	0	0	3	50	50	100	3
4	21CG34	Microprocessors and Microcontrollers	3	0	0	0	3	50	50	100	3
5	21HU35	Constitution of India & Professional Ethics	0	2	0	0	3	50	50	100	1
6	21INT36	Summer Internship-I	0	0	0	0	0	50	0	50	2
7	21CGAE36A	HTML and CSS	0	0	2	0	3	50	50	100	1
8	21UHV36B	Universal Human Values –I	0	2	0	0	2	50	50	100	1
9	21CGL31	Digital System Design Lab	0	0	2	0	3	50	50	100	1
10	21CGL32	Data Structures Lab	0	0	2	0	3	50	50	100	1
11	21CGL33	Microprocessors and Microcontrollers Lab	0	0	2	0	3	50	50	100	1
		Total	**12**	**4**	**8**	**0**	**29**	**550**	**500**	**1050**	**20**

AUTONOMOUS SYLLABUS FOR B.E III SEMESTER 2022-2023

Course Title: COMPUTATIONAL METHODS FOR COMPUTER SCIENCE			
Subject Code : **21MA31D**	Credit : 03		CIE: 50
Number of Lecture Hours/Week	**3 Hrs**		SEE: 50
Total Number of Lecture Hours	**42**		SEE Hours: 03

Prerequisites: Students should have knowledge of Differential calculus, Integral calculus and Differential equations.

Course Objectives: To enable the students to obtain the knowledge of Engineering Mathematics in the following topics
1. Interpolation methods , Numerical differentiation and Numerical integration
2. Solve the problems using probability theory.
3. Numerical solution of ordinary differential equations.
4. Methods of least squares to fit straight line and second degree parabola
5. Linear programming problems

MODULES	Teaching Hours
Module I **Solution of Algebraic And Transcendental Equations**: Bisection method Newton's- Raphson method and Regula falsi method. **Finite differences:** Forward and Backward differences, Interpolation, Newton's Forward and Backward interpolation formulae and examples. Langrange's interpolation and inverse interpolation formulae and examples. (all formulae and rules without proof	**9 hours**
Module II **Numerical differentiation:** Numerical differentiation using Newton's forward and backward interpolation formulae and problems. **Numerical integration**: Introduction, Simpson's $1/3^{rd}$, Simpson's $3/8^{th}$ rule and Weddle's rule. (all formulae without proof) **Time series and Forecasting:** Moving averages, smoothening of curves, forecasting models and methods, Statistical Quality control methods	**9 hours**
Module III **Numerical solutions of first order and first degree ordinary differential equations**: Taylors series method, Runge –Kutta method of fourth order, modified Euler's method and Milne's and Adam's-Bashforth predictor and corrector methods and problems. Numerical solution of Simultaneous ordinary differential equations of first order and second order differential equations by Runge-kutta method. (all formulae without proof)	**8 hours**

Module IV	
Statistical methods: Curve fitting by the method of least squares: Straight line, second degree parabola and the curves of the form $y = ab^x$, $y = ax^b$ and $y = ae^x$. Correlation and lines of regression, angle between two regression lines and rank correlation.	**8 hours**
Module V	
Optimization techniques: Linear Programming, Mathematical formulation of linear Programming problem (LPP), Types of solutions, Graphical Method, basic feasible solution, canonical and standard forms and simplex method	**8 hours**

Question paper pattern:

The question paper will have ten questions.

There will be 2 questions from each module, covering all the topics from a module. The students will have to answer 5 full questions, selecting one full question from each module**.**

TEXT BOOKS:

1. Higher Engineering Mathematics by B.S.Grewal, Khanna publishers; 40th Edition.2007

2. Engineering Mathematics by N. P. Bali and Manish Goyal. Laxmi publications, latest edition

Reference books:

1. Advanced Engineering Mathematics by E. Kreyszig, John Willey & sons 8th Edn.

2. A short course in differential equations – Rainvile E.D.9th Edition.

3. Advanced Engineering Mathematics by R.K.Jain & S.R.K Iyengar; Narosa publishing House.

4.Introductory methods of numerical analysis by S.S.Sastry

4. Statistical Methods Authored By Gupta S.P. Publisher: Sultan Chand & Sons. Publishing   Year: 2021

5. Fundamentals of Mathematical Statistics Authored By Gupta S.C.& Kapoor V.K.

  Publisher: Sultan Chand & Sons.Publishing Year: 2020

   E-Books and Online resources:

- http://.ac.in/courses.php?disciplineID=111
- http://www.class-central.com/subject/math(MOOCs)
- http://academicearth.org/

Course outcomes:

On completion of the course, the student will have the ability to:

Course Code	CO #	Course Outcome (CO)
21MA31D	**CO1**	Solve the numerical problems in algebraic and transcendental equations and computation of interpolating polynomials using given data
	CO2	Compute derivatives of the functions numerically using given data and Evaluate integrations numerically.
	CO3	Apply numerical methods to solve ordinary differential equations.
	CO4	Apply the method of least square to estimate the parameters in regression model
	CO5	Apply optimization techniques and LPP for real life problems.

Course Title: DIGITAL SYSTEM DESIGN		
Subject Code : **21CG32**	Credits :3	CIE: 50
Number of Lecture Hours/Week	**3 Hrs**	SEE: 50
Total Number of Lecture Hours	42	SEE Hours: 03

Prerequisites:
- Knowledge of Basic Electronics and Boolean algebra.

Course Objectives:
- Recall and Recognize characteristics of PDs, optocouplers, BJT.
- Demonstrate and analyze operational amplifier circuits and their applications
- Describe and analyze combinational logic circuits, simplifications of algebraic equations using Karnaugh maps and Quine McClaskey techniques
- Design decoders, encoders and substractors , Binary comparators latches and flip flops.
- Design registers and counters , A/D and D/A converter.

MODULES	Teaching Hours
Module - I Photo diodes , Light emitting diodes, Optocouplers, BJT Biasing: Fixed Bias , Collector to Base Bias, Voltage Divider Bias, Operational Amplifiers, Application circuits: Multivibrators using 555 IC, Peak detector, Schmitt trigger, Active filters, Non linear Amplifier, Relaxation Oscillator, Current to voltage, voltage to Current converter, Regulated power supply parameters, Adjustable voltage Regulator.	**10 Hrs**
Module - II The Basic Gates: Review of Basic Logic gates, Positive and Negative Logic. Combinational Logic Circuits: Sum-of-Products Method, Truth Table to Karnaugh Map, Pairs Quads, and Octets, Karnaugh Simplifications, Don't-care Conditions, Product-of-sums Method, Product-of-sums simplifications, Simplification by Quine-McClusky Method, Hazards and Hazard covers	**8 Hrs**
Module – III Data-Processing Circuits: Multiplexers, Demultiplexers, 1-of-16 Decoder, BCD to Decimal Decoders, Seven Segment Decoders, Encoders, Exclusive-OR Gates, Parity Generators and Checkers, Magnitude Comparator, Programmable Array Logic, Programmable Logic Arrays, Arithmetic Building Blocks: Half-adder, Full adder, Adder &Substractor, arithmetic logic unit. Flip- Flops: RS Flip-Flops, Gated Flip-Flops, Edge-triggered RS FLIP-FLOP, Edge-triggered D FLIP-FLOP,T FLIP-FLOP, Edge-triggered JK FLIP-FLOP.	**8 Hrs**

Module - IV Flip- Flops: FLIP-FLOP Timing, JK Master-slave FLIP-FLOP, Switch Contact Bounce Circuits, Various Representation of FLIP-FLOPs. Registers: Types of Registers, Serial In - Serial Out, Serial In - Parallel out, Parallel In - Serial Out, Parallel In - Parallel Out, Universal Shift Register, Applications of Shift Registers. Counters: Asynchronous Counters, Decoding Gates, Synchronous Counters, Changing the Counter Modulus.	**8 Hrs**
Module - V Counters: Decade Counters, Presettable Counters, Counter Design as a Synthesis problem, A Digital Clock. D/A Conversion and A/D Conversion: D/A Converters Variable, Resistor Networks, Binary Ladders, , D/A Accuracy and Resolution, A/D Converter-Simultaneous Conversion, A/D Converter- Counter Method, A/D Accuracy and Resolution.	**8 Hrs**

Question paper pattern:

The question paper will have ten questions.

There will be 2 questions from each module, covering all the topics from a module.

The students will have to answer 5 full questions, selecting one full question from each module**.**

Text Books:
1. Anil K Maini, Varsha Agarwal, "Electronic Devices and Circuits", Wiley, 2012.
2. Donald P Leach, Albert Paul Malvino&GoutamSaha, "Digital Principles and Applications", 8th Edition, Tata McGraw Hill, 2015

Reference Books:
1. R D Sudhaker Samuel, "Illustrative Approach to Logic Design", Sanguine-Pearson, 2010.
2. M Morris Man, "Digital Logic and Computer Design", 10th Edition, Pearson, 2008.

Course outcomes:

On completion of the course, the student will have the ability to:

Course Code	CO #	Course Outcome (CO)
21CG32	**CO1**	To understand the principle of operation of different analog circuits.
	CO2	Analyze combinational circuits.
	CO3	Acquire the knowledge of Flip Flop operations and application of shift registers.
	CO4	Design and analyze synchronous and asynchronous counters.
	CO5	Understand the working and applications of A/D, D/A converters.

Course Title: DATA STRUCTURES		
Subject Code : **21CG33**	Credits :3	CIE: 50
Number of Lecture Hours/Week	3 Hrs	SEE: 50
Total Number of Lecture Hours	42	SEE Hours: 03

Prerequisites: C language fundamentals and programming skill, Basic knowledge of algorithm development, Knowledge of linear and Non-linear data types

Course Objectives:
- To study the behavior of data structures such as stacks, queues, trees, hash tables, search trees and their representations.
- To choose the appropriate data structure for a specified application.
- To analyze various searching and sorting algorithms.

MODULES	Teaching Hours
Module - I **Structures and Unions:** Structure definition, giving value to members, Structure initialization, Comparison of structure variables , Arrays of structures, Arrays within structures, Structure within structures, Structure and functions, Unions, Size of structures, Bit-fields. **Pointers:** Understanding pointers, and the address of operator, Declaring and initializing pointer, Accessing a variable through it's pointer, Pointer and arrays, Pointer and character strings, Pointer and functions, Pointer and Structures. **Dynamic memory allocation:** Meaning of dynamic memory allocation, MALLOC, CALLOC, Free and REALLOC functions, Pointer revisited. **File management:** Definition and opening a file, closing a file, I/O operations on files, Error handling during file operation, Radom access to files, Command line arguments	**08 Hrs**
Module - II **Definition and Representing Stack in C:** Primitive operation, Example. Implementing the pop() operation, Testing for exceptional conditions, Implementing the push() operation, Example: Infix, Postfix and Prefix, Basic definitions and Examples, Evaluating a postfix expression, Program to evaluate postfix expression , Converting an expression from infix to postfix, Program to convert expression from infix to postfix. **Recursive definition and processes:** Factorial function, Multiplication of natural numbers, Fibonacci sequence, Binary search, Properties of recursive definition or algorithm Recursion in C: Factorial of a number Generation of Fibonacci numbers, Binary searching, Towers of Hanoi problem.	**08 Hrs**

Module – III **The queue and it's sequential representation:** C implementation of queues, Insert operation, Priority queues, Array implementation of priority Linked lists: Inserting and removing nodes from a list. Linked implementation of stacks, Get node and Free node operations, Linked list implementation of queues, Linked list as a data structure, Example of list operations, Header nodes. Array implementation of list, Linked implementation of lists. Limitations of array implementation, Allocating and freeing dynamic variables, Linked list using dynamic variable, Queues as lists in C, Example of list operations in C, Non- integer and non -homogeneous lists. .	**08 Hrs**
Module - IV **Other list structures:** Circular lists, Stack as circular list, Queues as a circular list, Primitive operations on circular list, doubly linked list. **Binary trees:** Operations on binary trees and applications of binary trees Binary tree representation: Node representation of binary tree, Internal and external nodes, Implicit array representation of binary trees, Choosing a binary tree representation, Binary tree traversals in C, Threaded Binary trees. **Trees and their applications:** C representation of trees, Tree traversals, General expression as trees, Evaluating an expression tree, Constructing a tree.	**09 Hrs**
Module - V **Sorting & Searching:** Binary tree sort, Simple insertion sort, Address calculation sort, Radix sort. Sequential searching, Searching an ordered table, Indexed sequential search, Interpolation search. **Tree searching:** Inserting into a binary search tree, Deleting from a binary search tree. **Hashing:** Resolving hash clashed by open addressing, Choosing a hash function.	**09 Hrs**

Question paper pattern:
 The question paper will have ten questions.
There will be 2 questions from each module, covering all the topics from a module.
The students will have to answer 5 full questions, selecting one full question from each module**.**

Text book :
1. E. Balgurusamy , "*Programming in ANSI C*", 7 th Edition, Tata McGraw-Hill Publication, 2017.
2. Yedidyah Langsam, Moshe J. Augenstein and Aaron M. Tannenbaum, "*Data Structures Using C and C++"*, 2nd Edition, Prentice-Hall of India publication, 2005.

Reference Books:
1. Debasis Samanta, "Classic Data Structures", 2nd Edition, PHI, 2009.
2. Richard F. Gilberg and Behrouz A. Forouzan:, "Data Structures APseudocode Approachwith C", Cengage   Learning, 2005.
3. Robert Kruse & Bruce Leung, "Data Structures & ProgramDesign in C", Pearson Education, 2007.
4. Mark Allen Weiss, "Data Structures and Algorithm Analysis in C", 2nd Edition, Pearson Education, 2007.

Course outcomes:
On completion of the course, the student will have the ability to:

Course Code	CO #	Course Outcome (CO)
21CG33	CO1	Apply the fundamental knowledge of pointers, dynamic memory allocation and recursion for designing data structures.
	CO2	Demonstrate the usage of stack, queue data structure for design of applications.
	CO3	Illustrate basic operations on linked lists and construct various data structures using linked lists.
	CO4	Design Binary trees and binary search trees using tree data structure.
	CO5	Compare, analyze and implement different sorting and searching Techniques.

Course Title: **MICROPROCESSOR AND MICROCONTROLLER**		
SubjectCode:**21CG34**	Credit:3	CIE:50
Number of Lecture Hours/Week	**03 Hrs**	SEE:50
Total Number of Lecture Hours	42	SEEHours:03

Pre-requisites: Basic Electronics

Course objectives:
- Explore the microprocessor architecture and its instruction set.
- Develop skills for programming in Assembly language.
- Interface Peripheral devices with 8086 Microprocessor and ARM Processor

Modules	Teaching Hours
Module-I **The 8086/8088 Processors :** Architecture of 8086 microprocessor, Signal Descriptions of 8086, Physical Memory Organization, Minimum and Maximum Mode 8086 System and Timings, The Processor 8088. **8086/8088 Instruction Set Assembler Directives :** Machine Language Instruction Formats, Addressing Modes of 8086, Instruction Set of 8086/8088, Machine language Conversion, Assembler Directives and Operation.	**08 Hrs**
Module-II **Assembly Language Programming with 8086/8088:** A Few Machine Level Programs, Machine Coding the Programs, Programming with an Assembler, Assembly Language Example Programs. **Special Architectural Features and Related Programming:** Introduction to stack, stack structure of 8086/88, interrupts and interrupt service routines, Interrupt cycle of 8086/88, Non maskable interrupt, Maskable interrupt, Interrupt programming, passing parameter to procedures, MACROs, Timings and Delays.	**08 Hrs**
Module-III **Special Architectural Features and Related Programming Cont..:** passing parameter to procedures, MACROs, Timings and Delays. **Basic Peripherals and their Interfacing with 8086/88:** Semiconductor Memory interfacing, Dynamic RAM interfacing, Interfacing I/O ports, P/O 8255, Modes of operations of 8255. Interfacing Analog to digital Converter, Interfacing Digital to Analog Converter, Stepper Motor interfacing	**09 Hrs**
Module-IV **Microcontrollers** - Types of Microcontrollers - Criteria for selecting a microcontroller - Example Applications. Characteristics and Resources of a microcontroller. Organization and design of these resources in a typical microcontroller - 8051. 8051 Architecture, Register Organization, Memory and I/O addressing, Interrupts and Stack.	**08 hrs**

Module-V	
Microcontrollers: 8051 Addressing Modes, Different types of instructions and Instruction Set, Simple programs. Peripheral Chips for timing control - 8254/8253. **ARM Processor Fundamentals**: Registers, Current Program Status Register, Pipeline, Exceptions, Interrupts, and the Vector Table, Core Extensions. **ARM Instruction Set:** Data Processing Instructions, Branch Instructions, Software Interrupt Instructions, Program Status Register Instructions, Coprocessor Instructions, Loading Constants, Simple programming exercises.	**09 Hrs**

Question paper pattern:

 The question paper will have ten questions.

There will be 2 questions from each module, covering all the topics from a module.

The students will have to answer 5 full questions, selecting one full question from each module**.**

Text Books:
 1. Bhurchandi and Ray, Advanced Microprocessors and Peripherals, Third Edition McGraw Hill, 2012
 2. Raj Kamal, Microcontrollers: Architecture, Programming, Interfacing and System Design, Pearson Education, 2011.

Reference Books:

1. Barry B. Brey, The Intel Microprocessors – Architecture, Programming and Interfacing, Eighth Edition, Pearson Education, 2015

2. A. Nagoor Kani, Microprocessors and Microcontrollers, Second Edition, Tata McGraw Hill, 2012.

Course outcomes:

On completion of the course, the student will have the ability to:

Course Outcome	CO#	Course Outcome(CO)
21CG34	**CO1**	Describe internal architecture of 8086/8088 microprocessors and demonstrate instruction set and assembler directives.
	CO2	Demonstrate assembly language proficiency using various addressing modes, data transfer instructions and stack.
	CO3	Design hardware interfacing using the microprocessor.
	CO4	Describe internal architecture, register organization of 8051 microcontroller
	CO5	Describe ARM processor and demonstrate instruction set with program.

Course Title: **CONSTITUTION OF INDIA AND PROFESSIONAL ETHICS**			
Subject Code: **21HU35**	Credit:1		CIE:50
Number of Lecture Hours/Week	**02 Hrs**		SEE:50
Total Number of Lecture Hours	28		SEEHours:03
Pre-requisites:			

Course Objectives :
To enable the students to obtain the basic knowledge about The Constitution of India and Professional Ethics in the following topics:-
- Introduction and Fundamental Rights
- Directive Principles of the State Policy and the State Executive
- The Union Executive
- Constitutional Provisions for women, Children & SC/ST 'S , Emergency
- Provisions and Election Process
- Engineering Ethics

Modules	Teaching Hours
Module-I **Introduction and Fundamental Rights:** The Constitution of India. Evolution of the Constitution. The Constituent Assembly of India. Sources and Features of the Indian Constitution. Preamble to the Constitution of India. Salient Features of Fundamental Rights and their classification. General exercise of Fundamental Rights and their limitations. RTI (Right to Information Act of 2005 Under Article 19(1)) and The Right of Children to Free and Compulsory Education Act or Right to Education Act (RTE) Under Article 21-A of the Constitution. Special Provisions (Article 370.371 & 371J) for some States	**06 Hrs**
Module-II **Directive Principles of the State Policy and The State Executive**: Under Article 36 to 51 of The Constitution and their Relevance. Fundamental Duties Under Article 51A of The Constitution and their Relevance. State Government - The Governor- Appointment, Powers and Functions of the Governor. The Appointment of Chief Minster, his Powers and Functions. The State Council of Ministers and their Functions. The State legislature and The State Council. The High Court of the State, its Powers and Jurisdiction. Appointment and Qualifications of High Court Judges.	**06 Hrs**
Module-III **The Union Executive**: Central Government. The President of India, his Election, Powers and Functions. The Vice-President of India, his Election, Powers and Functions. The Supreme Court of India and its Structure. Appointment and Qualification of Supreme Court Judges. Their Powers and Functions. The Structure of Judiciary in India. The Parliament of India. The Prime Minister, his Appointment, Powers and Functions. The Union Council of Ministers their Powers and Responsibilities. Concept of Public Interest Litigation (PIL)	**06 Hrs**

Module-IV	
Constitutional Provisions and Emergency Provisions and Election Process : Constitutional for Women, Children, Backward Classes and Scheduled Caste and Scheduled Tribes under different Article of The Constitution. Different types of Emergencies under Article 352, 356 and 360 of the Constitution of India. The Election Commission of India- its Powers and Functions. The State Election Commission	**05 Hrs**
Module-V	**05 Hrs**
Engineering Ethics: Its Aims and Scope, Responsibilities of Engineers, Impediments to their Responsibilities, Honesty, Integrity, Reliability, Risk and Safety Measures, Liabilities of Engineers.	

Question paper pattern:

 The question paper will have ten questions.

There will be 2 questions from each module, covering all the topics from a module.

The students will have to answer 5 full questions, selecting one full question from each module**.**

Textbooks:
1. An introduction to the constitution of India and Profession Ethics.
   By B. R. Venkatesh and Merunandan K. B. Publisher : Idea International Publication Bangalore.
2. The Constitution of India and Professional Ethics.
   By K. R. Phaneesh. Publisher : Sudha Publication Bangalore.

3. Professional Ethics.
   By S. Chand. Publisher : S. Chand & Company Ltd. Ram Nagar, New Delhi - 110055.

Reference Books:
1. 1. Constitution of India and Professional Ethics
   By : M Raja Ram. Publisher : New Age International(P) Limited, New Delhi.

2. The Constitutional law of India
   By : J.N.Pandhey . Publisher : Central Law agency , Allahabad.

Course outcomes:
On completion of the course, the student will have the ability to:

Course Outcome	CO#	Course Outcome(CO)
	CO1	Explain the evolution and features of constitution, fundamental rights and their classification
	CO2	Describe the directive principles of state policy, fundamental duties and The State Executive
21HU35	CO3	Describe about The Union Executive and concept of Public Interest Litigation
	CO4	Explain the Constitutional Provisions for women, children, SC/ST'S, Emergency Provisions and Election Process
	CO5	Identifies the qualities required for an professional engineers to be ethical

Course Title: HTML and CSS (Ability EnhancementCourses)		
Subject Code : **21CGAE36A**	Credit : 1	CIE: 50
Number of Practical Hours/Week	**02 Hrs**	SEE: 50
		SEE Hours: 03

Pre-requisites: Basic computer knowledge.

Course objectives:
- Understand the principles of creating an effective web page, including HTML and CSS.
- Develop skills to create a web site.

List of Programs

1. HTML-Introduction, Coding syntax, Document structure, basic HTML code
Create a basic HTML document, inserting a   sentence / multiple sentences (For example: Welcome to my website) in between the tags.

2. HTML – Basic Formatting Tags: Paragraphs, Line Breaks, Headings, Horizontal Rules.
Create a HTML document with paragraph, Make different Levels Headings, use line breaks. Insert a horizontal rule between the heading and the paragraphs.

3. Simple Text Effects and Lists: font family, font face, font size, font color, Underline, Struck through, Bold, Italic, Ordered Lists, Unordered Lists, Definition Lists.
Create a HTML document with three different lists with text effects. There should be a minimum of 3 entries in each one.

4. Image Effects: Image formats, Inserting Images, Alt Tag, width and height tags, Alignment, Borders and Spacing
Create a html document and insert image within it using "relative" linking, add alt text to the image, also insert some text after image and top align the text. Put a border around the image (size of your choice) and also spacing around the image (size of your choice).

5. File Management: Linking Text, Linking Images, Embedding Other Media.
Create a HTML document to create a Home page having three links: About College, Departments and Subjects. Create separate web pages for the three links.

6.Tables: Basics, Table border, Table header, Cellspacing, Cellpadding, Cellspanning, Create a HTML document to display your education details in a tabular format.

7. HTML forms : <form>, <input>, <textarea>, <select>, <option>, <fieldset>
Create a HTML document which shows a feedback and newsletter sign-up form.

8. HTML frames : <frame>, <frameset>, <iframe>
Create a HTML document to create a frameset having header, navigation and content sections.

9. Introduction to CSS: Introduction, applying CSS, selectors, coding syntax.
Create a HTML document which creates a simple web page that is styled using CSS.

  01.   Understand the usage of text and background properties in CSS
Create a HTML document which creates a web page that CSS style with Text and Background Properties.

11. Develop own website for real world problem using HTML and CSS tags.

Text books:
  1. Robert W. Sebsta, "Programming the World Wide Web"- 4th Edition, Pearson Education, 2008.
  2. Randy Connolly, Ricardo Hoar, "Fundamentals of Web Development", Pearson Education India, 1st Edition, 2016

Reference Books/ Links:
  1. M Deitel, P.J. Deitel, A.B Goldberg, "Internet & World Wide Web How to H Program"-3rd Edition, Pearson Education/PHI, 2004
  2. Chris Bates, "Web Programming Building Internet Applications"- 3rd Edition, Wiley India, 2006.

  https://www.w3schools.com/html/
  https://wtf.tw/ref/duckett.pdf

Course outcomes:
On completion of the course, the student will have the ability to:

Course Code	CO #	Course Outcome (CO)
21CGAE36 A	**CO1**	Identify the structure and paired tags of HTML, use them for designing web pages
	CO2	Implement web pages that adds effects to fonts, lists and images also demonstrate the knowledge of self closing and utility based tags
	CO3	Design with HTML/XHTML documents which can embed other media and tables
	CO4	Design web pages with HTML tags forms and frames
	CO5	Develop the ability to create own website for given assignment and also perform dynamic designing using CSS

Course Title : UNIVERSAL HUMAN VALUES-I		
Course Code : **21UHV36B**	Credits**:1**	CIE: 50
Number of Lecture Hours/Week	2hrs (Tutorial)	SEE: 50
Total Number of Theory Hours	14	SEE Hours: 02

Course Objectives:
- To help the students appreciate the essential complementarily between 'VALUES' and 'SKILLS' to ensure sustained happiness and prosperity, and understand the core aspirations of all human beings?
- To facilitate the development of a Holistic perspective among students towards life and profession as well as towards happiness and prosperity based on a correct understanding of the Human reality and the rest of Existence. Such a holistic perspective forms the basis of Universal Human Values and movement towards value-based living in a natural way.
- To highlight plausible implications of such a Holistic understanding in terms of ethical human conduct, trustful and mutually fulfilling human behaviour and mutually enriching interaction with Nature.

Modules	Teaching Hours
Module I **Introduction To Value Education:** Understanding Value Education, Need Of Value Education, Basic Guidelines For Value Education, The Content Of Value Education, The Process Of Value Education. **Self- Exploration As The Process For Value Education:** Starting To Observe Inside, What Is Self-Exploration? What Is Its Purpose? Content Of Self-Exploration, Natural Acceptance, What Is The State Today?, What Is The Way Out? What Do We Need To Do?.	**3 hrs**
Module II **The Basic Human Aspirations- Continuous Happiness And Prosperity:** Continuous Happiness And Prosperity- Our Basic Aspiration, Exploring Happiness And Prosperity, A Look At The Prevailing Notions Of Happiness And Prosperity, Some Possible Questions/ Confusions. **The Program To Fulfill Basic Aspiration:** Basic Requirements For Fulfillment Of Human Aspirations, What Is Our State Today?, Why Are We In This State?- Living With Wrong Assumptions, What Is The Solution?- The Need For Right Understanding, Our Program: Understand And Live In Harmony At All Levels Of Living, Our State Today?, Our Natural Acceptance For Harmony At All Levels Of Our Living, Human And Animal Consciousness.	**3 hrs**
Module III **Understanding The Harmony At Various Levels:** Understanding The Human Being As Co-Existence Of Self(I) And Body, Human Being Is More Than Just The Body, Understanding Myself As Coexistence Of Self And The Body, Understanding The Needs Of The Self And Needs Of The Body, Understanding The Self(I) As A Conscious Entity, The Body As The Material Entity, Exercise On Distinguishing Needs Of The Self(I) And The Body, Exercise On Distinguishing Activities Of The Self(I) And Body, Understanding The Body As An Instrument Of 'I'(I Being The Seer, Doer And Enjoyer).	**3 hrs**

Harmony In Self(I)- Understanding Myself: Why Should I Study Myself?, Getting To Know The Activities In I Related?, The Activities In I Are Continuous, What Is The Problem Today?, Effects Of The Problem, What Then Is The Solution?, Result Of Realization And Understanding-Living With Definiteness. **Harmony With The Body- Understanding *Sanyama* And *Svashtya:*** Our Body- A Self-Orgnaised Unit, Harmony Of I With The Body: *Sanyama* And *Svashtya*, What Is Our State Today?, What Is The Way Out?, Understanding And Living With Sanyama, Correct Appraisal Of Our Physical Needs.	
Module IV **Harmony In The Family- Understanding Values In Human Relationships:** Family As The Basic Unit Of Human Interaction, Harmony In The Family, Justice*(Nyaya)*, What Is The State Today?, Values In Human Relationships, Trust(*Visvasa*),Respect(*Sammana*), The Basis For Respect, Assumed Bases For Respect Today, The Problem Due To Differentiation, Difference Between Attention And Respect, What Is The Way Out?, Affection (*Sneha*), Care(*Mamata*), Guidance(*Vatsalya*),Reverence(*Shraddha*),Glory(*Gaurava*),Gratitude(*Krit agyata*),Love(*Prema*), Harmony From Family To World Family: Undivided Society. **Harmony In The Society-From Family Order To World Family Order:** Extending Relationship From Family To Society, Identification Of The Comprehensive Human Goal, Where Are We Today?, Programs Needed To Achieve The Comprehensive Human Goal: Five Dimensions Of Human Endeavour, Education-Right Living (*Siksha-Sanskara*), Health-Self-Regulation (*Svasthya-Sanyama),* Justice-Preservation (Nyaya-Suraksha), Production-Work (*Utpadana-Karya*), Exchange-Stotage (*Vinimaya-Kosa*), What Is Our State Today?, Harmony From Family Order To World Family Order: Universal Human Order.	**3 hrs**
Module V **Harmony In Nature-Understanding The Interconnectedness And Mutual Fulfillment:** The Four Orders Of Nature, Incconnectedness And Mutual Fulfillment(Parasparta And Paraspara Purakata), Recyclability And Self-Regulation In Nature, Understanding The Four Orders- Things (Vastu), Activity(Kriya), Innateness(Dharana), Natural Characteristic(Svabhava), Basic Activity, Conformance(Anu-Sangita), Human Beings-Our State Today, What Is The Way Out?. **Harmony In Existence-Understanding Existence As Co-Existence**:An Introduction To Space(Sunya), Co-Existence Of Units In Space, Limited And Unlimited, Active And No-Activity, Energised And Energy In Equilibrium, Each Unit Recognizes…. Space Is Reflecting Or Transparent, Self-Organised And Self-Organisation Is Available, Existence Is Co-Existence, What Are We Doing Today?, Where Do We Want To Be?	**2 hrs**
Text Books: 1. The Text Book R.R Gaur, R Sangal, G P Bagaria, A Foundation Course In Human Values And Professional Ethics, Excel Books, New Delhi, 2010, ISBN 978-8-174-	

46781-2.
2. The teacher's manual R.R Gaur, R Sangal, G P Bagaria, A foundation course in Human Values and professional Ethics – Teachers Manual, Excel books, New Delhi, 2010

Reference Books:
1. B L Bajpai, 2004, Indian Ethos and Modern Management, New Royal Book Co., Lucknow. Reprinted 2008.
2. PL Dhar, RR Gaur, 1990, Science and Humanism, Commonwealth Purblishers.
3. Sussan George, 1976, How the Other Half Dies, Penguin Press. Reprinted 1986, 1991
4. Ivan Illich, 1974, Energy & Equity, The Trinity Press, Worcester, and HarperCollins, USA
5. Donella H. Meadows, Dennis L. Meadows, Jorgen Randers, William W. Behrens III, 1972, limits to Growth, Club of Rome's Report, Universe Books.
6. Subhas Palekar, 2000, How to practce Natural Farming, Pracheen(Vaidik) Krishi Tantra Shodh, Amravati.
7. A Nagraj, 1998, Jeevan Vidya ek Parichay, Divya Path Sansthan, Amarkantak.
8. E.F. Schumacher, 1973, Small is Beautful: a study of economics as if people mattered, Blond & Briggs, Britain.
9. A.N. Tripathy, 2003, Human Values, New Age International Publishers.

Question paper pattern:
1. The question paper will have 40% of MCQ questions covering the entire syllabus, students need to answer all the questions.
2. 60% of descriptive questions consist of 2 questions from each module of 12 marks each; students need to answer FIVE full questions, selecting ONE full question from each module.

Course outcomes:
On completion of the course, the student will have the ability to:

Course Code	CO	Course Outcome (CO)
21UHV36B	**CO1**	Develop a universal approach to value education by the right understanding of reality (i.e. a worldview of the reality "as it is") through the process of self-exploration.
	CO2	Develop a Holistic perspective towards life and profession as well as towards happiness and prosperity based on a correct understanding of the Human reality and the rest of existence.
	CO3	Proficient to understand the harmony at various levels.
	CO4	Evaluate the need of right understanding to live with the harmony at family and society levels.
	CO5	Skilled to understand the harmony in nature/existence and participation of human being in the nature/existence.

Course Title: DIGITAL SYSTEM DESIGN LAB		
Subject Code : **21CGL31**	Credits : 1	CIE: 50
Number of Practical Hours/Week	**2 Hrs**	SEE: 50
		SEE Hours: 03

Prerequisite: Knowledge of Basic Electronics and Boolean algebra.

Course Objectives :

- To illustrate the students different electronic circuit and their application in practice.
- To impart knowledge on assessing performance of electronic circuit through monitoring of sensitive parameters.
- To evaluate the use of computer-based analysis tools to review performance of semiconductor device circuit

List of Experiments

1. Design and construct a Schmitt trigger using OP-Amp for given UTP and LTP values and demonstrate its working.
2. Design and implement an Astable multivibrator circuit using 555 timer for a given frequency and duty cycle.

3. Design and implement Half adder, Full Adder, Half Subtractor, Full Subtractor using basic gates.
4. Given a 4-variable logic expression, simplify it using Entered Variable Map and realize the simplified logic expression using 8:1 multiplexer IC.
5. Design and implement code converter I)Binary to Gray (II) Gray to Binary Code using basic gates.
6. Design and verify the Truth Table of 3-bit Parity Generator and 4-bit Parity Checker using basic Logic Gates with an even parity bit.
7. Realize a D,T,JK Flip-Flop using NAND gates and verify its truth table.

8. Design and implement a mod-n (n<8) synchronous up counter using JK Flip Flop ICs and Demonstrate its working
9. Design and implement an Asynchronous counter using decade counter IC to count from 0 to n(n<=9) and demonstrate on seven segment display(using IC 7447).
10. Design SISO and PISO shift register.
11. Generate a Ramp output waveform using DAC0800 (Inputs are given to DAC through IC74393 dual 4-bit binary counter).
12. To study 4-bitALU using IC-74181.

Question paper pattern:
Note: Conduction of Practical Examination: All laboratory experiments (1 to 11 nos) are to be included for practical examination.

Course outcomes:
On completion of the course, the student will have the ability to:

Course Code	CO #	Course Outcome (CO)
	CO1	**Use of various devices like CRO, function generator, multimeter, bread board, Make us of electronic components, ICs, instruments and tools for design and testing of circuits for given inputs.**
	CO2	Evaluate and design the combinational circuit.
21CGL33	**CO3**	Evaluate and design registers and counters using flip-flops.
	CO4	**Design and develop D/A convertors.**
	CO5	Analyze the working and implementation of ALU.

Course Title: DATA STRUCTURES LAB		
Subject Code : **21CGL32**	Credits : 1	CIE: 50
Number of Practical Hours/Week	**2 Hrs**	SEE: 50
		SEE Hours: 03

Prerequisite: C Language : Functions and Pointers

Course Objectives :
1. To study the working of data structures such as stacks, queues, trees, hash tables,search trees.
2. Apply the appropriate data structure for a specified application.
3. To learn various searching and sorting algorithms.

List of Programs

1. Design, Develop and Implement a menu driven Program in C for thefollowing Array operations
   a. Creating an Array of N IntegerElements
   b. Display of Array Elements with Suitable Headings
   c. Inserting an Element (ELEM) at a given valid Position (POS)
   d. Deleting an Element at a given valid Position(POS)
   e. Exit.
   Support the program with functions for each of the above operation.

2. Design, Develop and Implement a program in C for thefollowing operations on Strings
   a. Read a Main String (STR), a Pattern String (PAT) and aReplace String (REP).
   b. Perform Pattern Matching Operation: Find and Replace all occurrences of PAT in STR with REP if PAT exists in STR.Repostsuitable messages in case PAT does not exist in STR.
   Support the program with functions for each of the above operations. Don"tuse built-in functions.

3. Design, Develop and Implement a menu driven Program in C for the following operations on STACK of Integers (Array Implementation of Stack with maximum size MAX)
   a. Push an Element on toStack
   b. Pop an Element from Stack
   c. Display the status of Stack
   d. Demonstrate Overflow and Underflow situations on Stack
   e. Exit
   Support the program with appropriate functions for each of the aboveoperations.

4. Design, Develop and Implement a Program in C for converting an Infix Expression to Postfix Expression. Program should support forboth parenthesized and free parenthesized expressions with the operators: +, -, *, /, %(Remainder), ^ (Power) and alphanumeric operands.

5. Design, Develop and Implement a Program in C for the following Stack Applications
   a. Evaluation of Suffix expression with single digit operands and operators: +, -, *, /, %, ^
   b. Solving Tower of Hanoi problem with n disks

6. Design, Develop and Implement a menu driven Program in C for the following operations on QUEUE of Characters (Array Implementation of Queue with maximum size MAX)
   a. Insert an Element on to QUEUE
   b. Delete an Element from QUEUE
   c. Demonstrate Overflow and Underflow situations on QUEUE
   d. Display the status of QUEUE
   e. Exit

   Support the program with appropriate functions for each of the above operations.

7. Design, Develop and Implement a menu driven Program in C for the following operations on Singly Linked List (SLL) of integer values
   a. Create a SLL of N integers by using front insertion.
   b. Display the status of SLL and count the number of nodes in it
   c. Perform Insertion and Deletion at End of SLL
   d. Perform Insertion and Deletion at Front of SLL

8. Design, Develop and Implement Program in C to Reverse a Singly Linked List (SSL) of a given integers.

9. Design, Develop and Implement a menu driven Program in C for the following operations on Priority Queue.
   a. Create a Priority queue by using Insert function.
   b. Insertion data and Priority values as Input.
   c. Perform Deletion operation.
   d. Display the elements of Priority queue.

10. Design, Develop and Implement a Program in C for the following operations on Binary Search Tree(BST) of Integers
    a. Create a BST of N integers: 6,9,5,2,8,15,24,14,7,8,5,2.
    b. Traverse the BST in Inorder
    c. Traverse the BST in Preorder
    d. Traverse the BST in Postorder

11. Given a File of N employee records with a set K of Keys(4- digit) which uniquely determine the records in file F. Assume that file F is maintained in memory by a Hash Table(HT) of m memory locations with L as the set of memory addresses (2- digit) of locations in HT. Let the keys in K and Addresses in L are Integers. Design and develop a Program in C that uses Hash function H: K ®L as H(K)=K mod m (remainder method), and implement hashing technique to map a given key K to the address space L. Resolve the collision (if any) using linear probing.

Course outcomes:
On completion of the course, the student will have the ability to:

Course Code	CO #	Course Outcome (CO)
21CGL32	**CO1**	Demonstrate the concepts of arrays and strings.
	CO2	Design and develop various data structure using pointers ,dynamic memory allocation and recursion
	CO3	Demonstrate basic operations on linked list using suitable data structures.
	CO4	Illustrate the implementation of different sorting and searching techniques.
	CO5	Construct Binary trees and binary search trees and demonstrate the concepts of hashing technique.

Course Title: MICROPROCESSOR AND MICROCONTROLLER LAB		
Subject Code: **21CGL33**	Credits:1	CIE:50
Number of Practical Hours/Week	**2 Hrs**	SEE:50
		SEEHours:03
Prerequisite: C Programming		
Course Objectives: Explore the microprocessor architecture and instruction set		

List of Programs

PART A

1. Design an ALP to separate even and odd numbers from an array.

2. Design an ALP to find Factorial of a given 8-bit number.

3. Design an ALP to convert 8 bit binary number to its BCD equivalent

4. Design an ALP to generate first 'n' Fibonacci series.

5. Design an ALP to count the number of 0's and 1's in a given number.

6. Design an ALP to create a file and delete an existing file.

7. Design an ALP to display the list of alphabets on the screen.

8. Design and develop an assembly language program to search a key element "X" in a list of "n" 16-bit numbers. Adopt linear search algorithm in your program for searching.

9. Design and develop an assembly program to sort a given set of "n" 16- bit numbers in ascending order. Adopt Bubble Sort algorithm to sort given elements.

10. Develop an assembly language program to reverse a given string and verify whether it is a palindrome or not. Display the appropriate message.

11. Develop an assembly language program to compute nCr using recursive procedure. Assume that "n" and "r" are non-negative integers.

12. Design and develop an assembly language program to read the current time and Date from the system and display it in the standard format on the screen.

PARTB

13. Design anddevelopanassemblyprogramtointerface4*4matrixkeyboard.

Using ARM TTDMI / LPC2148.

14. Design and develop an assembly program to implement the buzzer using ARM TTDMI / LPC2148

15. Design and develop an assembly program to drive a Stepper Motor interface and rotate the motor in specified direction (clockwise or counter- clockwise) by N steps (Direction and N are specified by the examiner). Introduce suitable delay between successive steps. (Any arbitrary value for the delay may be assumed by the student) using ARM TTDMI/LPC2148.

16. Design and develop an assembly language program to
    a. Generate the Sine Wave using DAC interface (The output of the DAC is to be displayed on the CRO).
    b. Generate a Half Rectified Sine wave form using the DAC interface.) Using ARMTTDMI/LPC2148.

17. To interface LCD with ARM processor ARM7TDMI/LPC2148. Write and execute programs in C language for displaying text messages and numbers on LCD.

Question paper pattern:
Conduction of Practical Examination:
- All laboratory experiments are to be included for practical examination.
- Software Required: Open source ARM Development platform, KEIL IDE

Course outcomes:
On completion of the course, the student will have the ability to:

Course Code	CO#	Course Outcome(CO)
21CGL33	**CO1**	Develop ALP to implement arithmetic operations using 8086 microprocessor.
	CO2	Design and develop assembly programs using 8086 DOS functions, subroutines and micros in assembly language
	CO3	Develop ALP for searching and sorting using 8086 microprocessor.
	CO4	Design and interface different peripherals with ARM microcontroller.
	CO5	Construct and interface for DAC and LCD.