Curriculum Structure & Detailed Syllabus

Master of Computer Applications (Integrated)

(5-Year Integrated UG & PG Program)

Silicon University

Silicon Hills, Patia, Bhubaneswar - 751024

Odisha, India.

`https://silicon.ac.in`

Effective From Academic Year 2024-25

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Approval History

ACM#	Date	Resolutions
SU-1	27/04/2024	The curriculum structure of Integrated MCA (IMCA) was approved in principle by the Academic Council.
SU-2	17/08/2024	The curriculum structure of Integrated MCA (IMCA) and detailed syllabus of 1st Year was approved by the Academic Council.

Program Outcomes

Graduates Attributes (GAs) form a set of individually assessable outcomes that are the components indicative of the graduate's potential to acquire competence to practice at the appropriate level.

PO1. Apply knowledge of computing fundamentals, mathematics and domain knowledge appropriate for computing models from defined problems and requirements.

PO2. Design and develop applications to analyze and solve all computer science related problems.

PO3. Design applications for any desired needs with appropriate considerations for any specific need on societal and environmental aspects.

PO4. Analyze and review literature to invoke the research skills to design, interpret and make inferences from the resulting data.

PO5. Integrate and apply efficiently the contemporary IT tools to all computer applications.

PO6. Solve and work with a professional context pertaining to ethics, social, cultural and cyber regulations.

PO7. Function effectively both as a team leader and team member on multi disciplinary projects to demonstrate computing and management skills.

PO8. Communicate effectively and present technical information in oral and written reports.

PO9. Ability to understand the impact of system solutions in a contemporary, global, economical, environmental, and societal context for sustainable development.

PO10. Appreciate the importance of goal setting and to recognize the need for life-long learning.

Program Specific Outcomes (PSOs)

PSO1. Understand the concepts and applications in various fields of Computer Application like Web designing and development, Mobile application development, and Network & communication technologies.

PSO2. Apply standard practices and strategies in software development & project development using open-ended programming environments to deliver quality applications for business success.

PSO3. Employ modern computer languages, technologies, environments, and platforms in creating innovative career paths to be an entrepreneur, and a zest for higher studies.

Program Educational Objectives (PEOs)

PEO1. Develop software solutions to problems across a broad range of application domains through analysis and design.

PEO2. Work professionally and communicate effectively in interdisciplinary environment, either independently or in team, and demonstrate leadership in academia and industry.

PEO3. Utilize computational techniques and develop software by integrating existing technologies and adapt to new technologies for building rich software applications for benefit of the society.

Course Categories & Definitions

L	Lecture
T	Tutorial
P	Practical / Laboratory / Sessional
WCH	Weekly Contact Hours
UCR	University Core Course
UMC	University Mandatory Course (0-Credit)
PCR	Program Core Course
PEL	Program Elective Course
OEL	Open Elective Course
HNS	Honours (Choice-based) Course
MNR	Minor (Choice-based) Course
OOC	Open Online Course (on NPTEL / Swayam / Other)
INT	Summer Internship
PSI	Practice School / Industry Internship
PRJ	Project Work
SEC	Skill Enhancement Course
VAC	Value Addition Course

Contents

Part I

Curriculum Structure

Curriculum Structure

1st Year Integrated MCA

Category	Code	Course Title	WCH L-T-P			Credits L-T-P		
Semester I								
THEORY								
UCR	MG1001	Financial Accounting	3	0	0	3	0	0
UCR	CH1002	Environmental Science & Sustainability	3	0	0	3	0	0
PCR	EC1003	Electronics & Semiconductor Devices	3	0	0	3	0	0
PCR	EC1004	Digital Logic & Computer Design	3	0	0	3	0	0
PCR	CS1005	Computer Programming - I	3	0	0	3	0	0
PRACTICAL								
PCR	EC1005	Digital Logic & Computer Design Lab	0	0	2	0	0	1
PCR	CS1006	Computer Programming - I Lab	0	0	2	0	0	1
PCR	CS1007	Office Productivity Tools Lab	0	0	2	0	0	1
UCR	HS1001	Communicative & Technical English	0	0	4	0	0	2
		SUB-TOTAL	**15**	**0**	**10**	**15**	**0**	**5**
		TOTAL	**25**			**20**		

Category	Code	Course Title	WCH L-T-P			Credits L-T-P		
Semester II								
THEORY								
UCR	MT1003	Linear Algebra & Numerical Methods	3	0	0	3	0	0
UCR	BL1001	Biology for Computer Applications	3	0	0	3	0	0
PCR	EC1006	Microprocessors & Microcontrollers	3	0	0	3	0	0
PCR	CS1008	Computer Programming - II	3	0	0	3	0	0
PCR	CS1009	Web Design with HTML & CSS	3	0	0	3	0	0
PRACTICAL								
PCR	CS1010	Microprocessors & Microcontrollers Lab	0	0	2	0	0	1
PCR	CS1011	Computer Programming - II Lab	0	0	2	0	0	1
PCR	CS1012	Web Design with HTML & CSS Lab	0	0	2	0	0	1
UCR	HS1002	Corporate Communication Skills	0	0	4	0	0	2
		SUB-TOTAL	**15**	**0**	**10**	**15**	**0**	**5**
		TOTAL	**25**			**20**		

2nd Year Integrated MCA

Semester III								
Category	Code	Course Title	WCH L-T-P			Credits L-T-P		
THEORY								
UCR		Probability & Statistics	3	1	0	3	1	0
UCR		Principles of Management	3	0	0	3	0	0
PCR		Data Structures Using C	3	0	0	3	0	0
PCR		Object Oriented Programming in C++	3	0	0	3	0	0
PCR		JavaScript & DHTML	3	0	0	3	0	0
PRACTICAL								
PCR		Data Structures Using C Lab	0	0	4	0	0	2
PCR		Object Oriented Programming in C++ Lab	0	0	4	0	0	2
PCR		JavaScript & DHTML Lab	0	0	2	0	0	1
INT		Summer Internship - I	0	0	0	0	0	1
		SUB-TOTAL	15	1	10	15	1	6
		TOTAL	26			22		

Semester IV								
Category	Code	Course Title	WCH L-T-P			Credits L-T-P		
THEORY								
PCR		Discrete Mathematics	3	1	0	3	1	0
UCR		Managerial Economics	3	0	0	3	0	0
PCR		Java Programming	3	1	0	3	1	0
PCR		Computer Networks	3	1	0	3	1	0
UCR		Human Values & Professional Ethics	2	0	0	2	0	0
PRACTICAL								
PCR		Java Programming Lab	0	0	4	0	0	2
PCR		Computer Networks Lab	0	0	2	0	0	1
UCR		Personality Development & Soft Skills	0	0	4	0	0	2
		SUB-TOTAL	14	3	10	14	3	5
		TOTAL	27			22		

3rd Year Integrated MCA

Semester V								
Category	**Code**	**Course Title**	**WCH** L-T-P			**Credits** L-T-P		
THEORY								
PCR		Operating Systems	3	0	0	3	0	0
PCR		Database Management Systems	3	1	0	3	1	0
PCR		E-Commerce & Knowledge Management	3	0	0	3	0	0
PCR		System Analysis & Design	3	0	0	3	0	0
UCR		Organizational Behaviour	3	0	0	3	0	0
PRACTICAL								
PCR		Operating Systems Lab	0	0	2	0	0	1
PCR		Database Management Systems Lab	0	0	2	0	0	1
PCR		Programming in Python Lab	0	0	4	0	0	2
INT		Summer Internship - II	0	0	0	0	0	1
		SUB-TOTAL	15	1	8	15	1	5
		TOTAL		24			21	

Semester VI								
Category	**Code**	**Course Title**	**WCH** L-T-P			**Credits** L-T-P		
THEORY								
PCR		Operations Research	3	0	0	3	0	0
PCR		Design & Analysis of Algorithms	3	0	0	3	0	0
PCR		Computer Organization & Architecture	3	0	0	3	0	0
PEL		Program Elective - I	3	0	0	3	0	0
UCR		Constitution of India	2	0	0	2	0	0
PRACTICAL								
PCR		Design & Analysis of Algorithms Lab	0	0	2	0	0	1
PCR		Computer Organization & Architecture Lab	0	0	2	0	0	1
PCR		Systems & Network Administration Lab	0	0	2	0	0	1
PRJ		Project - I	0	0	8	0	0	4
		SUB-TOTAL	14	0	14	14	0	7
		TOTAL		28			21	

Note:

If a student opts to exit the Integrated MCA program after successful completion of the 3rd Year, then s/he shall be awarded with only a Bachelor in Computer Applications (BCA) degree as per the provisions of the Academic Regulations.

4th Year Integrated MCA

Semester VII								
Category	**Code**	**Course Title**	**WCH** L-T-P			**Credits** L-T-P		
THEORY								
PCR		Simulation & Modelling	3	1	0	3	1	0
PCR		Internet of Things	3	0	0	3	0	0
PCR		Software Engineering & UML	3	0	0	3	0	0
PCR		Advanced Java Programming	3	1	0	3	1	0
PEL		Program Elective - II	3	0	0	3	0	0
PRACTICAL								
PCR		Software Engineering & UML Lab	0	0	2	0	0	1
PCR		Internet of Things Lab	0	0	2	0	0	1
PCR		Advanced Java Programming Lab	0	0	4	0	0	2
INT		Summer Internship - III	0	0	0	0	0	1
		SUB-TOTAL	**15**	**2**	**8**	**15**	**2**	**5**
		TOTAL	**25**			**22**		

Semester VIII								
Category	**Code**	**Course Title**	**WCH** L-T-P			**Credits** L-T-P		
THEORY								
PCR		Cryptography & Internet Security	3	1	0	3	1	0
PCR		Web Application Development	3	1	0	3	1	0
PEL		Program Elective - III	3	0	0	3	0	0
PEL		Program Elective - IV	3	0	0	3	0	0
UCR		Entrepreneurship Development	3	0	0	3	0	0
PRACTICAL								
PCR		Web Application Development Lab	0	0	4	0	0	2
SEC		Emerging Technologies Lab/ Entrepreneurship & Innovation	0	0	4	0	0	2
UCR		Presentation Skills & Technical Seminar	0	0	2	0	0	1
VAC		Yoga / NCC / NSS	0	0	2	0	0	0
		SUB-TOTAL	**15**	**2**	**12**	**15**	**2**	**5**
		TOTAL	**29**			**22**		

5th Year Integrated MCA

Semester IX								
Category	**Code**	**Course Title**	**WCH** L-T-P			**Credits** L-T-P		
THEORY								
OOC		MOOC - I	0	0	0	3	0	0
PRACTICAL								
PRJ/PSI		Project - II / Industry Internship - I	0	0	24	0	0	12
		SUB-TOTAL	**0**	**0**	**24**	**3**	**0**	**12**
		TOTAL	**24**			**15**		

Semester X								
Category	**Code**	**Course Title**	**WCH** L-T-P			**Credits** L-T-P		
THEORY								
OOC		MOOC - II	0	0	0	3	0	0
PRACTICAL								
PRJ/PSI		Project - III / Industry Internship - II	0	0	24	0	0	12
		SUB-TOTAL	**0**	**0**	**24**	**3**	**0**	**12**
		TOTAL	**24**			**15**		

		GRAND TOTAL (10 SEMESTERS)	**257**		**200**

Note:
1. Courses offered under each elective are given in "List of Electives" on Page 7.
2. MOOC - Massive Open Online Course (on NPTEL / Swayam / Other).
3. Approved list of courses for MOOC (self study) shall be published by the department. Students are advised to complete and pass the same before the end of the final semester.
4. Students opting for Project Work shall undergo the same under the guidance of a faculty member.
5. Students selected for Industry Internship shall be attached to a faculty member as mentor.
6. The Value Addition Course (Yoga / NSS / NCC) may be assigned in a different semester depending on available capacity.

List of Electives

Code	Elective # and Subjects
	Program Elective - I
	Data Mining & Data Warehousing
	Soft Computing
	Mobile Computing
	Program Elective-II
	Artificial Intelligence
	Theory of Computation
	Realtime Systems
	Program Elective-III
	Machine Learning
	Compiler Design
	Cloud Computing
	Program Elective-IV
	Software Testing
	Software Project Management
	Computer Graphics

Note:
1. The list of electives may be modified as per the recommendation of the Board of Studies.
2. The department shall offer subjects under each program elective depending on available capacity.
3. Unless adequate number of students choose an elective subject offered by the department, the subject shall not be offered and the students shall be assigned with a different elective subject.

Part II

Detailed Syllabus

Category	Code	Financial Accounting	L-T-P	Credits	Marks
UCR	MG1001		3-0-0	3	100

Objectives	To provide basic knowledge of financial accounting and equip the students with the knowledge of accounting process and preparation of final accounts.
Pre-Requisites	Basic knowledge of day to day transactions of any business organization.
Teaching Scheme	Regular classroom lectures with use of ICT as and when required, sessions are planned to be interactive with problem solving activities.

Evaluation Scheme

Attendance	Teacher's Assessment	Mid-Term	End-Term	Total
10	20	20	50	100

Detailed Syllabus

Module-#	Topics	Hours
Module-1	Fundamentals of Accounting: Accounting as a business function and language of business, Functions and objectives of Accounting, Users of Accounting information, Limitations of Accounting, Cyclical nature of business and Accounting cycles, Accounting concepts – as applicable to Balance sheet and Income Statements, The rule of debit and credit.	7 Hours
Module-2	Accounting equations, Accounting events and transactions, Classification of transaction and their effect on Accounting Equation, Statement showing the effect of transaction on assets, liabilities and capital, Capital and revenue transactions, Fixed assets and depreciation policy and methods.	8 Hours
Module-3	Recording of transaction: The journal, The ledger postings, Subsidiary Books of Accounts: purchase books, sales books, Cash books.	7 Hours
Module-4	Preparation of Financial Statements of a sole trader: Trial balance, Trading Account, Manufacturing Account, Profit and Loss account, Balance sheet with basic adjustments.	10 Hours
Module-5	Company Accounts: Types of Companies - Private sector, Public sector, Private limited, public limited, Govt. company, holding company and subsidiary company, Capital and types of capital - Authorized Share Capital, Subscribed, issued, paid up share capital, Shares - Equity Shares, Preference shares and types of preference shares, Issue of share capital and treatment of books of Accounts, Journal entries for issue only (forfeiture of shares excluded).	10 Hours
	Total	**42 Hours**

Text Books:
T1. A. Dash, S. Sahu, and R. K. Bal, *A New Approach to Financial Accounting for Professional Student*, S. Chand Publication, 2010.
T2. S. P. Jain and K. L. Narang, *Financial Accounting*, Latest Edition, Kalyani Publishers.

Reference Books:
R1. A. K. Bhattacharya, *Financial Accounting*, Latest Edition, Prentice Hall of India.
R2. S. N. Maheshwari, Sharad K. Maheshwari, and Suneel K. Maheshwari, *Principles of Financial Accounting*, Vikas Publishing, 2013.

Online Resources:
1. https://www.mbacrystalball.com/blog/accounting/financial-accounting/
2. https://www.myaccountingcourse.com/accounting-basics/financial-accounting
3. http://accounting-simplified.com/financial/fixed-assets/capital-and-revenue-expenditure.html
4. https://accountlearning.com/understanding-various-types-of-assets-and-liabilities/
5. https://syskool.com/a-company-definition-features/

Course Outcomes: *At the end of this course, the students will be able to:*

CO1	Understand the concepts of accounting and its application in engineering projects.
CO2	Determine the effects of a transaction on assets, liabilities and capital.
CO3	Apply financial record keeping principles in creating accounting software systems.
CO4	Apply the methods of profit & loss computation of an organization in software systems.
CO5	Manage shares and market position of the company by use of computer applications.

Program Outcomes Relevant to the Course:

PO1	Apply knowledge of computing fundamentals, mathematics and domain knowledge appropriate for computing models from defined problems and requirements.
PO3	Design applications for any desired needs with appropriate considerations for any specific need on societal and environmental aspects.
PO4	Analyze and review literature to invoke the research skills to design, interpret and make inferences from the resulting data.
PO5	Integrate and apply efficiently the contemporary IT tools to all computer applications.
PO7	Function effectively both as a team leader and team member on multi disciplinary projects to demonstrate computing and management skills.
PO8	Communicate effectively and present technical information in oral and written reports.
PO9	Ability to understand the impact of system solutions in a contemporary, global, economical, environmental, and societal context for sustainable development.
PO10	Appreciate the importance of goal setting and to recognize the need for life-long learning.

Mapping of COs to POs and PSOs (1: Low, 2: Medium, 3: High)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	1		1					1	1	3			1
CO2	1				1		1			2	1		2
CO3			1	1			1			2			1
CO4	1		1	1			1			2		1	2
CO5			1	1			1						2

Category	Code	Environmental Science & Sustainability	L-T-P	Credits	Marks
UCR	CH1002		3-0-0	3	100

Objectives	The objective of this course is to sensitize the students with essential knowledge of environment & sustainability including pollution, laws, management of solid, hazardous, and e-waste for enhancing long-term sustainability.
Pre-Requisites	Basic knowledge of physics, chemistry and biology is adequate.
Teaching Scheme	Regular classroom lectures with use of ICT as and when required; sessions are planned to be interactive with focus on examples and case studies.

Evaluation Scheme

Attendance	Teacher's Assessment	Mid-Term	End-Term	Total
10	20	20	50	100

Detailed Syllabus

Module-#	Topics	Hours
Module-1	**Ecology, Ecosystems & Biogeochemical Cycles**: Introduction, Ecological perspective, Ecosystems and processes, Trophic pyramids, Biodiversity of species, Water, Oxygen, Nitrogen and Carbon cycle, Environmental gradient and tolerance levels of environmental factors.	**9 Hours**
Module-2	**Water and Waste-Water Treatment**: Water quality standards and parameters, Water table, Aquifer, Pre-treatment, Conventional treatment processes of Water, DO, BOD, COD and Microbial Waste-Water treatment.	**8 Hours**
Module-3	**Atmosphere, Soil and Noise**: Atmospheric chemistry, Air pollution and associated control equipment, Climate change, Soil chemistry, Noise standards, Noise measurement and noise abatement.	**8 Hours**
Module-4	**Waste Management**: Types and management of MSW (Municipal Solid Waste), Hazardous waste and e-waste, Life Cycle Assessment (LCA).	**8 Hours**
Module-5	**Sustainability**: Sustainable Development Goals (SDGs), Environmental audit, EIA (Environmental Impact Assessment), EIS (Environmental Impact Statement), Indian environmental laws, UN conferences, Human population and the environment.	**9 Hours**
	Total	**42 Hours**

Text Books:
- T1. G. M. Masters and W. P. Ela, **An Introduction to Environmental Engineering and Science**, 3rd *Ed.*, PHI Learning, 2015.
- T2. G. Kiely, **Environmental Engineering**, Spl. Indian Edition, McGraw-Hill, 2007.

Reference Books:
- R1. M. L. Davis and S. J. Masten, **Principles of Environmental Engineering and Science**, 2nd *Ed.*, McGraw-Hill, 2017.
- R2. H. D. Kumar and U. N. Dash, **Environmental Studies**, 2nd *Ed.*, IndiaTech Publishers, 2017.

Online Resources:
1. http://nptel.ac.in/courses/120108002/: Aquatic Biodiversity and Environmental Pollution.
2. http://nptel.ac.in/courses/120108004/: Environment Management.
3. http://nptel.ac.in/courses/120108005/: Municipal Solid Waste Management.
4. https://www.epa.gov/environmental-topics/: All Current Environmental Issues.

Course Outcomes: *At the end of this course, the students will be able to:*

CO1	Describe the concepts of ecology, ecosystems, and biogeochemical cycles in the environment.
CO2	Explain the process of water and wastewater treatment for prevention of water pollution.
CO3	Understand the pollutants in the environment and explore the principles for their eradication.
CO4	Explore waste minimization and management of different types of wastes generated.
CO5	Understand various environmental laws for sustainability and prevention of pollution.

Program Outcomes Relevant to the Course:

PO3	Design applications for any desired needs with appropriate considerations for any specific need on societal and environmental aspects.
PO6	Solve and work with a professional context pertaining to ethics, social, cultural and cyber regulations.
PO9	Ability to understand the impact of system solutions in a contemporary, global, economical, environmental, and societal context for sustainable development.
PO10	Appreciate the importance of goal setting and to recognize the need for life-long learning.

Mapping of COs to POs and PSOs (1: Low, 2: Medium, 3: High)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1			1			1			1	1			1
CO2			1			1			1	1			1
CO3			1			1			1	1			1
CO4			1			1			2	1			1
CO5			1			2			2	1			1

Category	Code	Electronics & Semiconductor Devices	L-T-P	Credits	Marks
PCR	EC1003		3-0-0	3	100

Objectives	The objectives of this course is to introduce the students to the concepts of basic electricity, semiconductors, construction, characteristics of diodes, different types of transistors and Op-Amps in electronic circuits for various applications.
Pre-Requisites	Basic knowledge of physics and mathematics of 12th class level is required.
Teaching Scheme	Regular classroom lectures with use of ICT as and when required, sessions are planned to be interactive with problem solving activities.

Evaluation Scheme

Attendance	Teacher's Assessment	Mid-Term	End-Term	Total
10	20	20	50	100

Detailed Syllabus

Module-#	Topics	Hours
Module-1	Electric current, Resistance, Ohm's Law, Series & parallel combination of resistances, Kirchoff's current & voltage laws, Thevenin's theorem, Norton's Theorem, Superposition Theorem and Maximum Power Transfer Theorem, Alternating Current (AC) and Direct Current (DC), Instantaneous, Average and RMS values of AC.	8 Hours
Module-2	Classification of solids, Semiconductor, Intrinsic and extrinsic semiconductors, n-type and p-type semiconductors, p-n junction diode, V-I characteristics, Forward and reverse resistances of diode, Rectifiers – half wave and full wave, Zener diode as a voltage regulator.	8 Hours
Module-3	Bipolar Junction Transistors (BJT), Characteristics of Common-base, Common-emitter and Common-collector configurations, Comparison – Transistor as an amplifier (CE), Transistor Biasing – Fixed biased and voltage divider bias method.	8 Hours
Module-4	Field Effect Transistors (FET), Construction, Types of FET – Junction field effect transistor (JFET), Working of JFET, Metal Oxide Semiconductor FET (MOSFET), Construction, Operation and static V-I characteristics of Depletion type and Enhancement type MOSFET.	9 Hours
Module-5	Feedback Amplifier, Positive and Negative feedback amplifiers (Qualitative study only), Applications of Op-Amp – Inverting, Non-inverting, Differential amplifier, Summing amplifier, Integrator and differentiator; Oscillators – Conditions for oscillation, Types of oscillator – RC phase shift, Wien Bridge Oscillator.	9 Hours
	Total	42 Hours

Text Books:
  T1. R. L. Boylestad and L. Nashelsky, ***Electronic Devices and Circuit Theory***, 11th *Ed.*, Pearson Education, 2013.
  T2. A. S. Sedra and K. C. Smith, ***Microelectronic Circuits***, 7th *Ed.*, Oxford University Press, 2014.
  T3. B. L. Theraja and A. K. Theraja, ***Textbook of Electrical Technology***, Vol-I, 23rd *Ed.*, S. Chand & Co.Ltd., 2002.

Reference Books:

R1. A. Agarwal and J. Lang, ***Foundations of Analog and Digital Electronic Circuits***, 1st *Ed.*, Morgan Kaufmann, 2005.

R2. V. K. Mehta and R. Mehta, ***Principles of Electronics***, 3rd *Ed.*, S. Chand Publishing, 1980.

Online Resources:

1. https://nptel.ac.in/courses/117/103/117103063/: by Prof. G. Barua, IIT Guwahati
2. https://nptel.ac.in/courses/108/101/108101091/: By Prof. M. B. Patil, IIT Bombay
3. https://nptel.ac.in/courses/122/106/122106025/: By Prof. T. S. Natarajan, IIT Madras
4. https://nptel.ac.in/courses/117/107/117107095/: Web Content by IIT Roorkee
5. https://nptel.ac.in/courses/122/104/122104013/: Web Content by IIT Kanpur

Course Outcomes: *At the end of this course, the students will be able to:*

CO1	Differentiate between DC and AC sources and analyze various types of electrical networks.
CO2	Design different rectifier circuits using diodes for various applications.
CO3	Apply transistors in different configurations and biasing in various electronic circuits.
CO4	Compare the operation and characteristics of JFET and MOSFET with different biasing.
CO5	Analyze the characteristics of Op-Amp and design circuits using them for various applications.

Program Outcomes Relevant to the Course:

PO1	Apply knowledge of computing fundamentals, mathematics and domain knowledge appropriate for computing models from defined problems and requirements.
PO2	Design and develop applications to analyze and solve all computer science related problems.
PO3	Design applications for any desired needs with appropriate considerations for any specific need on societal and environmental aspects.
PO4	Analyze and review literature to invoke the research skills to design, interpret and make inferences from the resulting data.
PO5	Integrate and apply efficiently the contemporary IT tools to all computer applications.
PO10	Appreciate the importance of goal setting and to recognize the need for life-long learning.

Mapping of COs to POs and PSOs (1: Low, 2: Medium, 3: High)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	3	1	2	1	2					1	2	2	2
CO2	2	1	2	2	2					1	2		2
CO3	3		3	2	2					1	2	1	2
CO4	3	2	3	1	1					1	2		2
CO5	2		2	1	2					1	2		1

Category	Code	Digital Logic & Computer Design	L-T-P	Credits	Marks
PCR	EC1004		3-0-0	3	100

Objectives	The objective of this course is to develop an understanding of the concepts and techniques associated with the digital electronics systems and their application in designing modern computer systems.
Pre-Requisites	Basic knowledge of number systems and electronics is required.
Teaching Scheme	Regular class room lectures with use of ICT as and when required; sessions are planned to be interactive with focus on problem solving activities.

Evaluation Scheme

Attendance	Teacher's Assessment	Mid-Term	End-Term	Total
10	20	20	50	100

Detailed Syllabus

Module-#	Topics	Hours
Module-1	Number System and their Conversion, Arithmetic Operation using 1's and 2's compliments, Logic Gates, Universal Logic Gates, Boolean Algebra and De Morgan's Theorem; Realization of Boolean Function using logic gates, Universal Logic Gates, Binary codes, their application and Code Conversion.	**8 Hours**
Module-2	Boolean Function Simplification, SOP & POS forms, Min term, Max term, Canonical forms, Karnaugh maps up to 4 variables, Combinational Logic Design – Half and Full Adders and Subtractors, Multipliers, Digital Comparators, Multiplexers, De-Multiplexors, Encoder and Decoder.	**9 Hours**
Module-3	Sequential Logic Design, Flip Flops – 1-bit memory, The clocked S-R, J-K, T and D Flip Flop, Race around Condition, Master-Slave JK Flip Flop, Triggering of Flip Flop, Conversion between the Flip Flop, Ripple, Synchronous and Mod-N Counters.	**8 Hours**
Module-4	Shift Registers and Counters, Shift Registers SISO, SIPO, PISO, PIPO, Universal Shift Register, Applications of Shift Registers Ring Counter, Twisted Ring Counter (Johnson Counter); Design of Synchronous Counters, Gray Code and Random Sequence Counters using State Diagrams; Finite State Machines (FSMs)– Mealy and Moore models of Finite State Machines.	**9 Hours**
Module-5	Programmable Logic Devices, Programmable Logic Array (PLA), Programmable Array Logic (PAL), Semiconductor Memories – Basics of ROM, SRAM and DRAM.	**8 Hours**
	Total	**42 Hours**

Text Books:
   T1. A. A. Kumar, *Fundamentals of Digital Circuits*, 3rd *Ed.*, PHI Learning, 2014.
   T2. M. M. Mano, *Digital Logic and Computer Design*, 1st *Ed.*, Pearson Education, 2016.

Reference Books:
   R1. D. V. Hall, *Digital Circuits and Systems*, International Student Edition, McGraw-Hill Education, 1989.
   R2. W. H. Gothmann, *Digital Electronics - An Introduction to Theory and Practice*, 2nd *Ed.*, PHI Learning, 1982.
   R3. R. P. Jain, *Modern Digital Electronics*, 4th *Ed.*, McGraw-Hill Education, 2009.

Online Resources:
1. https://nptel.ac.in/courses/117106086/: by Prof. S. Srinivasan, IIT Madras
2. https://nptel.ac.in/courses/117103064/: Prof. A. Mahanta and Prof. R. P. Palanthinkal, IIT Guwahati
3. https://nptel.ac.in/courses/117105080/: by Prof. D. Roychoudhury, IIT Kharagpur
4. https://swayam.gov.in/course/1392-digital-circuits-and-systems
5. http://www.allaboutcircuits.com

Course Outcomes: *At the end of this course, the students will be able to:*

CO1	Represent numbers under various number systems and convert one number system to another.
CO2	Simplify any function and implement in the lab using universal logic gates.
CO3	Design various sequential logic circuits and be familiar with counter design.
CO4	Design digital circuits in real time applications including digital watch, digital displays.
CO5	Differentiate between various memory chips and Interface external memory to devices.

Program Outcomes Relevant to the Course:

PO1	Apply knowledge of computing fundamentals, mathematics and domain knowledge appropriate for computing models from defined problems and requirements.
PO2	Design and develop applications to analyze and solve all computer science related problems.
PO3	Design applications for any desired needs with appropriate considerations for any specific need on societal and environmental aspects.
PO4	Analyze and review literature to invoke the research skills to design, interpret and make inferences from the resulting data.
PO5	Integrate and apply efficiently the contemporary IT tools to all computer applications.
PO10	Appreciate the importance of goal setting and to recognize the need for life-long learning.

Mapping of COs to POs and PSOs (1: Low, 2: Medium, 3: High)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	3	2	2	2	2					1	2	1	2
CO2	2	3	2	2	2					1	3	1	2
CO3	2	3	2		3					1	3	1	1
CO4	2	3	2	1	2					2	2	1	2
CO5	1	2	2	2	2					2	2	1	1

Category	Code	Computer Programming - I	L-T-P	Credits	Marks
PCR	CS1005		3-0-0	3	100

Objectives	The objectives of this course is to introduce the fundamentals of computer programming and provide exposure to problem-solving through computer programs written using the C Programming language.
Pre-Requisites	Basic analytical and logical understanding including basic knowledge and usage of computers is required for this course.
Teaching Scheme	Regular classroom lectures with the use of ICT as and when required; sessions are planned to be interactive with problem-solving and programming activities.

Evaluation Scheme

Attendance	Teacher's Assessment	Mid-Term	End-Term	Total
10	20	20	50	100

Detailed Syllabus

Module-#	Topics	Hours
Module-1	**Computer Fundamentals**: Definition, Characteristics, Computer Hardware – Major components, Block diagram, Input-output devices, CPU, Memory, Computer Software – System software, Operating system, Assemblers, Compilers, Interpreters, Linkers, Loaders, Application Software, Evolution of programming languages, Algorithms, Flowchart.	8 Hours
Module-2	**Programming in C**:Structure of a C program, Character set, Identifier, Keywords, Constants, Variables, Fundamental data types, Operators, Expressions, Statements, Operator precedence and associativity, Type conversion, Input/output statements, Formatted input & output.	9 Hours
Module-3	**Decision Making & Branching**: Basic concepts, if, if-else, Nested if-else, if-else-if ladder, The switch-case construct, Iterative execution using loops – while, for, do-while, Nested loops, Controlling loop behavior – break, continue, goto, and exit.	9 Hours
Module-4	**Arrays (1-D & 2-D)**: Derived data type, Declaration, initialization, and accessing array elements, Operations on 1-D arrays – Insertion, Deletion, Searching, Sorting, Merging, etc., Operations on 2-D arrays, Multi-dimensional arrays.	8 Hours
Module-5	**Functions in C**: Monolithic vs Modular programming, Library functions vs User-defined functions, Functions in C – function prototype, function definition, function call, parameter passing, Recursion, Storage classes.	8 Hours
	Total	42 Hours

Text Books:
T1. P. K. Sinha and P. Sinha, *Computer Fundamentals*, 6th *Ed.*, BPB Publications, 2004.
T2. E. Balagurusamy, *Programming in ANSI C*, 7th *Ed.*, McGraw-Hill Education, 2017.
T3. Y. Kanetker, *Let Us C*, 16th *Ed.*, BPB Publications, 2018.

Reference Books:
R1. R. Thareja, *Programming in C*, 2nd *Ed.*, Oxford University Press, 2006.
R2. B. W. Kernighan and D. M. Ritchie, *The C Programming Language*, 2nd *Ed.*, Pearson Education, 2015.
R3. H. Schildt, *C: The Complete Reference*, 4th *Ed.*, McGraw-Hill, 2017.

Online Resources:
1. https://nptel.ac.in/courses/106105171/: by Prof. A. Basu, IIT Kharagpur
2. https://nptel.ac.in/courses/106102066/: by Prof. S. A. Kumar, IIT Delhi
3. https://nptel.ac.in/courses/106104074/: by Prof. D. Gupta, IIT Kanpur
4. https://www.cs.uic.edu/~jbell/CourseNotes/C_Programming/
5. http://www.stat.cmu.edu/~hseltman/c/CTips.html
6. https://www.learn-c.org/
7. https://c-faq.com/

Course Outcomes: *At the end of this course, the students will be able to:*

CO1	Explain the basics of a computer system and express the logic of a problem using flowcharts.
CO2	Write C programs for simple problems with proper inputs and display formatted output.
CO3	Develop structured C programs with branching and looping using appropriate constructs.
CO4	Solve problems involving 1-D and 2-D arrays and write programs to operate on them.
CO5	Design modular C programs using functions and solve problems using recursive approach.

Program Outcomes Relevant to the Course:

PO1	Apply knowledge of computing fundamentals, mathematics and domain knowledge appropriate for computing models from defined problems and requirements.
PO2	Design and develop applications to analyze and solve all computer science related problems.
PO3	Design applications for any desired needs with appropriate considerations for any specific need on societal and environmental aspects.
PO4	Analyze and review literature to invoke the research skills to design, interpret and make inferences from the resulting data.
PO5	Integrate and apply efficiently the contemporary IT tools to all computer applications.
PO7	Function effectively both as a team leader and team member on multi disciplinary projects to demonstrate computing and management skills.
PO10	Appreciate the importance of goal setting and to recognize the need for life-long learning.

Mapping of COs to POs and PSOs (1: Low, 2: Medium, 3: High)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	3	3	2	2	1		1			2	1	1	2
CO2	3	3	3	2	1		1			1	1	1	2
CO3	3	3	3	2	1		2			2	2	1	2
CO4	3	3	3	2	1		2			2	3	1	2
CO5	3	3	3	2	1		2			2	3	1	2

Category	Code	Digital Logic & Computer Design Lab	L-T-P	Credits	Marks
PCR	EC1005		0-0-2	1	100

Objectives	The objective of the course is to understand the internal structure of logic gates, their implementation using Boolean algebra, designof digital circuits like counters and registers and their application in modern computer systems.
Pre-Requisites	Basic knowledge of digital electronics is required.
Teaching Scheme	Regular laboratory experiments to be conducted under supervision of the faculty with use of ICT as and when required, with the focus on implementation using hardware and software tools.

Evaluation Scheme

Attendance	Daily Performance	Lab Record	Lab Test / Project	Viva-voce	Total
10	30	15	30	15	100

Detailed Syllabus

Experiment-#	Assignment/Experiment
1	Digital Logic Gates: Investigate logic behavior of AND, OR, NAND, NOR, EX-OR, EX-NOR, Invert, Buffer gates and use of Universal NAND Gate.
2	Gate-level minimization: Two level and multi level implementation of Boolean functions.
3	Combinational Circuits: Design, assemble and test: adders and subtractors (Half and Full).
4	Code Converters, Gray code to Binary and Binary to Gray code.
5	BCD to 7-segment Decoder/Display.
6	Design, implement and test a given design example with: (a) NAND Gates only, (b) NOR Gates only and (c) Using minimum number of Gates.
7	Design with multiplexers and de-multiplexers.
8	Flip-Flop: assemble, test and investigate operation of SR, T, D and J-K Flip-Flops.
9	Shift Registers: Design and investigate the operation of all types of shift registers with parallel load.
10	Counters: Design, assemble and test various ripple and synchronous Counters- decimal counter and Binary Counter with parallel load.
11	Memory Unit: Investigate behavior of RAM and its storage capacity – 16×4 RAM: testing, simulating and memory expansion.
12	Clock-pulse generator: design, implement and test.
13	Parallel adder and accumulator: design, implement and test.
14	Binary Multiplier: design and implement a circuit that multiplies 4-bit unsigned numbers to produce a 8-bit product.

Text Books:

T1. A. A. Kumar, *Fundamentals of Digital Circuits*, 3rd *Ed.*, PHI Learning, 2014.
T2. M. M. Mano, *Digital Logic and Computer Design*, 1st *Ed.*, Pearson Education, 2016.

Reference Books:

R1. D. V. Hall, *Digital Circuits and Systems*, International Student Edition, McGraw-Hill Education, 1989.

R2. W. H. Gothmann, **Digital Electronics - An Introduction to Theory and Practice**, 2nd *Ed.*, PHI Learning, 1982.

R3. R. P. Jain, **Modern Digital Electronics**, 4th *Ed.*, McGraw-Hill Education, 2009.

Online Resources:

1. https://www2.mvcc.edu/users/faculty/jfiore/Resources/DigitalElectronics1LaboratoryManual.pdf
2. https://www.elprocus.com/top-digital-electronic-projects-for-electronics-engineering-students/

Course Outcomes: *At the end of this course, the students will be able to:*

CO1	Analyze the function of logic gates and implement Boolean functions.
CO2	Explain universal gates and implement Boolean expressions using the same.
CO3	Design and analyze different combinational circuits.
CO4	Design various asynchronous and synchronous circuits.
CO5	Explore the internal circuitry and logic behind any digital computer system.

Program Outcomes Relevant to the Course:

PO1	Apply knowledge of computing fundamentals, mathematics and domain knowledge appropriate for computing models from defined problems and requirements.
PO2	Design and develop applications to analyze and solve all computer science related problems.
PO3	Design applications for any desired needs with appropriate considerations for any specific need on societal and environmental aspects.
PO4	Analyze and review literature to invoke the research skills to design, interpret and make inferences from the resulting data.
PO5	Integrate and apply efficiently the contemporary IT tools to all computer applications.
PO10	Appreciate the importance of goal setting and to recognize the need for life-long learning.

Mapping of COs to POs and PSOs (1: Low, 2: Medium, 3: High)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	3	2	2	3	2					1	2	1	2
CO2	2	3	3	2	1					1	3	1	2
CO3	2	3	2	2	2					1	3	1	2
CO4	2	3	2	1	1					1	2	1	1
CO5	2	2	2	1	2					2	2	1	2

Category	Code	Computer Programming - I Lab	L-T-P	Credits	Marks
PCR	CS1006		0-0-2	1	100

Objectives	The objective of the course is to understand the internal structure of logic gates, their implementation using Boolean algebra, designof digital circuits like counters and registers and their application in modern computer systems.
Pre-Requisites	Basic knowledge of C programming language is required.
Teaching Scheme	Regular laboratory classes are conducted under the supervision of the teacher. The experiments shall comprise of programming assignments.

Evaluation Scheme

Attendance	Daily Performance	Lab Record	Lab Test / Project	Viva-voce	Total
10	30	15	30	15	100

Detailed Syllabus

Experiment-#	Assignment/Experiment
1	Introduction to Linux operating system, Linux commands.
2	Introduction to the vi editor, using vi editor to write programs.
3	Compilation and execution of simple C programs with arithmetic operators.
4	Programs using relational, logical, and conditional operators.
5	Formulate problems on Decision-making statements using if-else and nested if-else.
6	Implement decision-making statements using switch-case constructs.
7	Implement loop-control structures using while, do-while, and for loops.
8	Programs on loop-control structures using nested loops.
9	Programs on control transfer statement using break, continue, goto.
10	Programs on 1-dimensional array operations.
11	Programs on 2-dimensional array operations.
12	Programs on functions using call by value.
13	Programs on functions using recursion.
14	Programs on storage classes and study of their effects.

Text Books:
T1. E. Balagurusamy, *Programming in ANSI C*, 7th *Ed.*, McGraw-Hill Education, 2017.
T2. M. Sprankle and J. Hubbard, *Problem Solving and Programming Concepts*, 9th *Ed.*, Pearson Education, 2011.

Reference Books:
R1. B. W. Kernighan and D. M. Ritchie, *The C Programming Language*, 2nd *Ed.*, PHI, 2012.
R2. H. M. Deitel and P. J. Deitel, *C How to Program*, 3rd *Ed.*, Pearson Education Asia,2001.
R3. H. Schildt, *C: The Complete Reference*, 4th *Ed.*, McGraw-Hill Education, 2017.

Online Resources:
1. https://nptel.ac.in/courses/106105171/: by Prof. A. Basu, IIT Kharagpur
2. https://nptel.ac.in/courses/106102066/: by Prof. S. A. Kumar, IIT Delhi
3. https://nptel.ac.in/courses/106104074/: by Prof. D. Gupta, IIT Kanpur
4. https://www.cs.uic.edu/~jbell/CourseNotes/C_Programming/

5. http://www.stat.cmu.edu/~hseltman/c/CTips.html
6. https://www.learn-c.org/
7. https://c-faq.com/

Course Outcomes: *At the end of this course, the students will be able to:*

CO1	Write C programs using variables, expressions, and input/output statements.
CO2	Formulate the logic of a problem using relational, logical, and conditional operators.
CO3	Develop structured C programs involving decision-making and different control constructs.
CO4	Develop C programs to solve problems involving a similar set of data items using arrays.
CO5	Construct modular C programs using functions for better maintenance and reusability.

Program Outcomes Relevant to the Course:

PO1	Apply knowledge of computing fundamentals, mathematics and domain knowledge appropriate for computing models from defined problems and requirements.
PO2	Design and develop applications to analyze and solve all computer science related problems.
PO3	Design applications for any desired needs with appropriate considerations for any specific need on societal and environmental aspects.
PO4	Analyze and review literature to invoke the research skills to design, interpret and make inferences from the resulting data.
PO5	Integrate and apply efficiently the contemporary IT tools to all computer applications.
PO7	Function effectively both as a team leader and team member on multi disciplinary projects to demonstrate computing and management skills.
PO10	Appreciate the importance of goal setting and to recognize the need for life-long learning.

Mapping of COs to POs and PSOs (1: Low, 2: Medium, 3: High)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	3	3	3	1	1		1			1	1	1	1
CO2	3	3	3	2	1		1			1	1	1	1
CO3	3	3	3	2	2		2			2	3	1	2
CO4	3	3	3	2	2		2			2	3	1	2
CO5	3	3	3	2	2		2			2	3	1	2

Category	Code	Office Productivity Tools Lab	L-T-P	Credits	Marks
PCR	CS1007		0-0-2	1	100

Objectives	The objective of this laboratory course is to provide practical exposure on common office productivity software for creating documents, spreadsheets, presentations, email, and other modern tools used in daily life of a computer professional.
Pre-Requisites	Basic knowledge of using computers is adequate for this course.
Teaching Scheme	Regular laboratory classes conducted under the supervision of the teacher; the experiments shall comprise of assignments on different office productivity tools.

Evaluation Scheme

Attendance	Daily Performance	Lab Record	Lab Test / Project	Viva-voce	Total
10	30	15	30	15	100

Detailed Syllabus

Experiment-#	Assignment/Experiment
1	Working with MS Word documents, basic formatting, fonts, bullets & numbering, page setup & margins, indentation, multiple columns, tables, alignment & spacing.
2	Spelling & grammar checking, working with layout and borders in a Word document.
3	Working with objects, inserting text boxes, pictures, shapes, clip arts, etc.
4	Page breaks & section breaks, headers & footers, different types of views.
5	Working with MS Excel, basics of spreadsheet & workbook, working with multiple sheets, creating, opening, saving, and closing of a workbook.
6	Rows and columns in a sheet, resizing and inserting new rows and columns, inserting different types of data, formatting of data.
7	Cell reference, absolute & relative reference, ranges, entering formula, basic formulae, auto-fill, fill handle, referencing cells in a different file.
8	Sorting and filtering of data in a spreadsheet, conditional formatting.
9	Working with formulae, data analysis and manipulation, working with Pivot Table.
10	Creating charts from data, borders, page layout, and margins, printing of a spreadsheet.
11	Working with MS PowerPoint, Creating slides, basic formatting, layout, and designs.
12	Enhancing slides with clip arts, pictures, and SmartArt, themes and masters.
13	Enhancing slides with animation, transitions, multimedia, delivering a presentation.
14	Creating group e-mail IDs, working with Google Forms and Google Sheets

Text Books:
T1. S. Jain, ***Computer Course: Windows 10 with MS Office 2016***, 1st *Ed.*, BPB Publications, 2018.
T2. V. P. Singh, ***Quintessential Course on MS Office 2016***, 1st *Ed.*, Computech Publications, 2016.

Reference Books:
R1. R. Arora, ***Mastering Advanced Excel***, BPB Publications, 2023.
R2. M. Nigam, ***Data Analysis with Excel***, BPB Publications, 2019.

Online Resources:
1. https://edu.gcfglobal.org/en/word/
2. https://www.javatpoint.com/ms-word-tutorial

3. https://edu.gcfglobal.org/en/excel/
4. https://www.javatpoint.com/excel-tutorial
5. https://edu.gcfglobal.org/en/powerpoint/
6. https://www.javatpoint.com/powerpoint-tutorial
7. https://www.analyticsvidhya.com/blog/2021/11/a-comprehensive-guide-on-microsoft-excel-for-data-analysis/

Course Outcomes: *At the end of this course, the students will be able to:*

CO1	Create well formatted word documents using basic word processing features.
CO2	Create professional grade documents and insert external objects in a document.
CO3	Utilize spreadsheets for various data processing tasks with formulas and functions.
CO4	Design and deliver effective presentations for various requirements.
CO5	Explore and use free productivity apps on cloud like forms, docs, and sheets.

Program Outcomes Relevant to the Course:

PO3	Design applications for any desired needs with appropriate considerations for any specific need on societal and environmental aspects.
PO4	Analyze and review literature to invoke the research skills to design, interpret and make inferences from the resulting data.
PO5	Integrate and apply efficiently the contemporary IT tools to all computer applications.
PO8	Communicate effectively and present technical information in oral and written reports.
PO10	Appreciate the importance of goal setting and to recognize the need for life-long learning.

Mapping of COs to POs and PSOs (1: Low, 2: Medium, 3: High)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1			1	1	2			3		2	1		
CO2			2	1	2			3		2	1		
CO3			2	2	2			3		2	1		
CO4			2	1	2			3		2	1		
CO5			2	2	2			3		2	1		

Category	Code	Communicative & Technical English	L-T-P	Credits	Marks
UCR	HS1001		0-0-4	2	100

Objectives	The objective of this laboratory course is to provide practice sessions to enhance the communication ability of the students in the four language skills with special focus on technical communication.
Pre-Requisites	Knowledge of general communication in English is required.
Teaching Scheme	Regular laboratory classes with various tasks designed to facilitate technical communication through pair and/or team activities with regular assessments, presentations, discussions, role-playing, audio-visual supplements, writing activities, business writing practices and vocabulary enhancement.

Evaluation Scheme

Attendance	Daily Performance	Lab Record	Lab Test / Project	Viva-voce	Total
10	30	15	30	15	100

Detailed Syllabus

Experiment-#	Assignment/Experiment
1	Introduction to the course and diagnostic test.
2	JAM: content development, structuring and delivery.
3	Group presentation.
4	Effective Verbal Communication exercises: plain English, bias-free language, formal and informal style, usage etc.
5	Activities on non-verbal communication.
6	Sounds of English: Vowels and consonants.
7	Sounds of English: Transcription.
8	Sounds of English: Syllable and stress.
9	Sounds of English: Rhythm.
10	Sounds of English: Intonation I.
11	Sounds of English: Intonation II.
12	Role play on simulated business contexts considering different channels of business communication.
13	Listening comprehension.
14	Practice on elements of business writing.
15	Composing effective paragraphs with unity, coherence, cohesion, progression.
16	Process writing.
17	Writing memos.
18	Emails and email etiquette.
19	Business letter I.
20	Business letter II.
21	Error correction: usage and grammar.
22	Reading Comprehension I: Essay – skimming, scanning, inferential comprehension, critical reading.

Cont'd...

Experiment-#	Assignment/Experiment
23	Reading Comprehension II: Short story – Analysing the tone of the author.
24	Reading Comprehension III: News editorial – Differentiating facts from opinion.
25	Reading Comprehension IV: Texts on Science and Technology – Identifying discourse markers.
26	Reading Comprehension V: Texts on Science and Technology – Intensive reading and note-taking.
27	Note-making and summary writing.
28	Verbal Advantage: Vocabulary exercises.

Text Books:
- T1. M. A. Rizvi, **Effective Technical Communication**, 2nd Edition, Tata McGraw Hill, 2017.
- T2. M. Raman and S. Sharma, **Technical Communication: Principles and Practices**, Oxford University Press.
- T3. B. K. Das, K. Samantray, R. Nayak, S. Pani, and S. Mohaty, **An Introduction to Professional English & Soft Skills**, Cambridge Univ. Press, 2009.

Reference Books:
- R1. J. Seeley, **The Oxford Guide to Effective Writing and Speaking: How to Communicate Clearly**, 3rd Ed., Oxford University Press, 2013.
- R2. S. Kumar and P. Lata, **Communication Skils**, Oxford University Press, 2011.
- R3. T. Panigrahi, **Communicative Competence**, 1st Ed., Notion Press, 2024.

Online Resources:
1. https://nptel.ac.in/courses/109/106/109106094/: by Prof. A. Iqbal, IIT Madras
2. https://nptel.ac.in/courses/109/104/109104031/: by Dr. T. Ravichandran, IIT Kanpur
3. https://ocw.mit.edu/courses/comparative-media-studies-writing/21w-732-5-introduction-to-technical-communication-explorations-in-scientific-and-technical-writing-fall-2006/download-course-materials/

Course Outcomes: *At the end of this course, the students will be able to:*

CO1	Communicate with clarity, fluency and impact.
CO2	Develop comprehensive understanding of communication concepts, its importance, types, barriers and principles.
CO3	Communicate effectively in business set-ups.
CO4	Compose coherent, clear and impactful business correspondences.
CO5	Practice sub-skills of reading and become adept readers.

Program Outcomes Relevant to the Course:

PO4	Analyze and review literature to invoke the research skills to design, interpret and make inferences from the resulting data.
PO6	Solve and work with a professional context pertaining to ethics, social, cultural and cyber regulations.
PO7	Function effectively both as a team leader and team member on multi disciplinary projects to demonstrate computing and management skills.
PO8	Communicate effectively and present technical information in oral and written reports.

Cont'd...

PO9	Ability to understand the impact of system solutions in a contemporary, global, economical, environmental, and societal context for sustainable development.
PO10	Appreciate the importance of goal setting and to recognize the need for life-long learning.

Mapping of COs to POs and PSOs (1: Low, 2: Medium, 3: High)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1				1		1	2	2	3	3	1	1	1
CO2				1		1	1	2	3	3	1	1	1
CO3				1		2	2	3	3	3	1	1	1
CO4				2		2	1	3	1	3	1	1	1
CO5				2		1	1	2	1	3	1	1	1

Category	Code	Linear Algebra & Numerical Methods	L-T-P	Credits	Marks
UCR	MT1003		3-0-0	3	100

Objectives	The objective of this course is to familiarize the students with the Linear Algebra and various computational methods to handle Linear Systems, large-scale Matrices and Interpolations.
Pre-Requisites	Basic concepts of system of Linear Equations and Matrix Algebra, Coordinate Geometry and Elementary Calculus.
Teaching Scheme	Regular classroom lectures with use of ICT as and when required; sessions are planned to be interactive with focus on problem solving activities.

Evaluation Scheme

Attendance	Teacher's Assessment	Mid-Term	End-Term	Total
10	20	20	50	100

Detailed Syllabus

Module-#	Topics	Hours
Module-1	Geometry of Linear Equations, Gaussian Elimination, Vector Space & Subspaces, Solving a Linear System, Linear Independence, Basis and Dimension, The Four Fundamental Subspaces, Linear Transformation, Orthogonal Vectors, Projections to a line, Projections and Least Squares, Orthogonal Bases and Gram-Schmidt.	**10 Hours**
Module-2	Eigen Values and Eigen Vectors, Diagonalization of a Matrix, Complex Matrices, Similarity Transformation, Test for Positive Definiteness, Singular Value Decomposition.	**8 Hours**
Module-3	Error Analysis, Solution of Non-Linear Equations, Bisection Method, Fixed Point Iteration Method, Secant Method and Newton Method.	**8 Hours**
Module-4	Interpolation by Polynomials, Lagrange Interpolation, Newton Divided Differences, Newton's forward & backward Interpolation, Cubic Spline Interpolation; Numerical Integration, Trapezoidal and Simpson's Rules, Composite Rules, Error Formulae and Gaussian Quadrature Rules.	**8 Hours**
Module-5	Linear System of Equations, LU Decomposition, Jacobi and Gauss-Seidel Methods, Eigen Value Problems – Power Method and Inverse Power Method.	**8 Hours**
	Total	**42 Hours**

Text Books:
T1. G. Strang, *Linear Algebra and Its Applications*, 4th *Ed.*, Cengage Learning, 2015.
T2. M. K. Jain, S. R. K. Iyengar, and R. K. Jain, *Numerical Methods for Scientific and Engineering Computation*, 3rd *Ed.*, New Age International Publishers, 2020.

Reference Books:
R1. E. Kreyszig, *Advanced Engineering Mathematics*, 8th *Ed.*, Wiley India, 2015.

Online Resources:
1. https://nptel.ac.in/courses/111108066/: by Prof. V. Rao, IISc Bangalore
2. https://nptel.ac.in/courses/117103064/: by Prof. R. Usha, IIT Madras

P.T.O

Course Outcomes: *At the end of this course, the students will be able to:*

CO1	Solve an inconsistent linear system by least square approximation.
CO2	Factorize a matrix using different methods for computational applications.
CO3	Solve a transcendental equation by numerical methods.
CO4	Interpolate a data set using appropriate mathematical technique.
CO5	Apply appropriate numerical methods to solve linear systems and Eigen value problems.

Program Outcomes Relevant to the Course:

PO1	Apply knowledge of computing fundamentals, mathematics and domain knowledge appropriate for computing models from defined problems and requirements.
PO2	Design and develop applications to analyze and solve all computer science related problems.
PO3	Design applications for any desired needs with appropriate considerations for any specific need on societal and environmental aspects.
PO4	Analyze and review literature to invoke the research skills to design, interpret and make inferences from the resulting data.
PO5	Integrate and apply efficiently the contemporary IT tools to all computer applications.

Mapping of COs to POs and PSOs (1: Low, 2: Medium, 3: High)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	3	3	2	1							2	1	1
CO2	3	3	2	1	1						2	1	1
CO3	3	3	2	2	1						3	1	1
CO4	3	3	2	2	1						3	1	1
CO5	3	3	2	2	1						3	1	1

Category	Code	Biology for Computer Applications	L-T-P	Credits	Marks
UCR	BL1001		3-0-0	3	100

Objectives	The objective of this course is to introduce the basic concepts of modern biology to allow computer professionals analyze problems from both an engineering and biological perspectives, anticipate specific issues in working with living systems, and formulate possible solutions through application of computers.
Pre-Requisites	Basic knowledge of biology, chemistry, and physics is adequate.
Teaching Scheme	Regular classroom lectures with use of ICT as and when required; sessions are planned to be interactive with real-world examples and applications.

Evaluation Scheme

Attendance	Teacher's Assessment	Mid-Term	End-Term	Total
10	20	20	50	100

Detailed Syllabus

Module-#	Topics	Hours
Module-1	**Introduction**: Physical and chemical principles involved in maintaining life processes; Cell Structure & Functions (Prokaryotic and Eukaryotic cells), Structure and functions of cellular components, Cell wall, Plasma membrane, Endoplasmic reticulum; Tissue systems – Overview of animal and plant tissue systems, Cell cycle & cell division.	8 Hours
Module-2	**Biomolecules**: Structure and function of carbohydrates, Lipids, Amino acids, Proteins, and Nucleic acids; Metabolism – Enzymes, Catalysis mechanisms, The spontaneity of biochemical reactions, ATP as an energy currency, Concept of energy charge, Aerobic respiration, Gluconeogenesis.	9 Hours
Module-3	**Genetics**: Laws of heredity (Mendelian and Non-Mendelian), Mutations – Cause, types, and effects on species, Generic basis of diseases, Origin of Life – Haldane and Oparin's concepts; Evolution – Modern concept of natural selection and speciation, Lamarckism, Darwinism & Neo-Darwinism.	8 Hours
Module-4	**Microorganisms & Human Health**: Concept of single-celled organisms, Concept of species and strains, Ecological aspects of single-celled organisms, Microbial diseases, Epidemiology, and Public Health; Human immune mechanism, Types of immunity, Antigen & Antibody reactions, Immunological disorders, Auto-immune diseases, Immunological databases and tools.	9 Hours
Module-5	**Biotechnology**: Basic concepts on Totipotency and Cell manipulation, Recombinant DNA technology and its application in Agriculture, Medicine, and Health; Bioinformatics – Introduction, Software, and Tools of Bioinformatics.	8 Hours
	Total	42 Hours

Text Books:
- T1. Wiley Editorial, ***Biology for Engineers***, John Wiley & Sons, 2018.
- T2. S. Singh, T. Allen, ***Biology for Engineers***, 1st *Ed.*, Vayu Education of India, 2014.
- T3. A. D. Baxevanis and B. F. F. Ouellette, ***Bioinformatics: A Practical Guide to the Analysis of Genes and Proteins***, 2nd *Ed.*, Wiley India, 2004.
- T4. U. Satyanarayana, ***Biotechnology***, 12th *Ed.*, Books and Allied. 2019.

Reference Books:

R1. A. T. Johnson, ***Biology for Engineers***, 1ˢᵗ *Ed.*, CRC Press, 2010.

R2. C. D. Tamparo and M. A. Lewis, ***Diseases of the Human Body***, 6ᵗʰ *Ed.*, F. A. Davis Co., 2016.

R3. N. A. Campbell, L. A. Urry, M. L. Cain, S. A. Wasserman, P. V. Minorsky, and J. B. Reece, ***Biology: A Global Approach***, 10ᵗʰ *Ed.*, Pearson Education, 2014.

Online Resources:

1. https://nptel.ac.in/courses/121106008: by Dr. M. Dixit and Prof. G.K. Suraishkumar, IIT Madras
2. https://www.genome.gov/genetics-glossary/Bioinformatics

Course Outcomes: *At the end of this course, the students will be able to:*

CO1	Explain the structure & composition of cells and cellular components.
CO2	Comprehend structure & functions of different types of biomolecules and their interactions.
CO3	Describe basic concepts of genetics and explain hereditary patterns, mutation, and evolution.
CO4	Recognize microbial diseases, defense mechanisms, and immunological databases and tools.
CO5	Explore applications of bioinformatics & biotechnology to solve problems in different domains.

Program Outcomes Relevant to the Course:

PO1	Apply knowledge of computing fundamentals, mathematics and domain knowledge appropriate for computing models from defined problems and requirements.
PO3	Design applications for any desired needs with appropriate considerations for any specific need on societal and environmental aspects.
PO4	Analyze and review literature to invoke the research skills to design, interpret and make inferences from the resulting data.
PO9	Ability to understand the impact of system solutions in a contemporary, global, economical, environmental, and societal context for sustainable development.
PO10	Appreciate the importance of goal setting and to recognize the need for life-long learning.

Mapping of COs to POs and PSOs (1: Low, 2: Medium, 3: High)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	1		1	1					1		1	1	1
CO2	2		1	1					1		2	1	1
CO3	2		2	2					2	1	2	1	2
CO4	2		2	2					2	1	2	1	3
CO5	3		3	3					2	2	3	2	3

Category	Code	Microprocessors & Microcontrollers	L-T-P	Credits	Marks
PCR	EC1006		3-0-0	3	100

Objectives	The objective of this course is to study different microprocessors and microcontrollers to develop assembly level programs as per user requirements, and interface them with other external devices.
Pre-Requisites	Basic knowledge of digital electronic circuits is required.
Teaching Scheme	Regular classroom lectures with use of ICT as and when required, sessions are planned to be interactive with problem solving activities.

Evaluation Scheme

Attendance	Teacher's Assessment	Mid-Term	End-Term	Total
10	20	20	50	100

Detailed Syllabus

Module-#	Topics	Hours
Module-1	**Introduction**: 8085 microprocessor & its organization, General architecture, Bus organization, Memory concepts, Pins and Signals, Timing diagram, Instruction Set & programming, Addressing modes, Memory interfacing, Interrupts.	**9 Hours**
Module-2	**Intel 8086 Microprocessor**: Bus Interface unit, Execution Unit, Register Organization, Memory Segmentation, Pin architecture, Minimum and Maximum mode, Physical Memory Organization, Memory Interfacing, Interrupts, Addressing Modes, Instructions; Advanced Co-processor Architectures – Intel 80386, Pentium.	**9 Hours**
Module-3	**Interfacing with Peripheral ICs**: System level interfacing design with various ICs like 8255 Programmable Peripheral Interface, 8257 DMA Controller, 8259 Programmable Interrupt Controller, 8251 Programmable Communication Interface.	**8 Hours**
Module-4	**Microcontrollers** : 8051 systems – Introduction, Architecture, Memory Organization, Special Function Register, Port Operation, Memory Interfacing, I/O Interfacing, Serial Data Transfer Scheme, On board Communication Interfaces – I2C Bus, SPI Bus, USART, External Communication Interfaces- RS232, USB.	**8 Hours**
Module-5	**Microcontroller Programming**: 8051 Instruction set, Interrupts, Programming and Applications: Servo motor, Stepper motor control; 8051 Timers and Counters, Serial Communication, I/O Interfacing using 8255, Light Emitting Diodes(LEDs), Push Buttons, Relays and Latch Connections.	**8 Hours**
	Total	42 Hours

Text Books:
T1. R. S. Gaonkar, *Microprocessor Architecture, Programming and Applications with the 8085*, 6th *Ed.*, Penram International Publishing, 2013.
T2. A. K. Ray and K. M. Bhurchandani, *Advanced Microprocessors and Peripherals*, 2nd *Ed.*, McGraw Hill Education, 2006.
T3. M. A. Mazidi, J. G. Mazidi, R. McKinlay, *The 8051 Microcontroller and Embedded Systems: Using Assembly and C*, 2nd *Ed.*, Pearson Education, 2011.

Reference Books:

R1. K. Kant, *Microprocessors and Microcontrollers: Architecture, Programming and System Design 8085, 8086, 8051, 8096*, 2nd *Ed.*, Prentice Hall India, 2013.

R2. D. Hall, *Microprocessors and Interfacing*, 3rd *Ed.*, McGraw-Hill Education, 2017.

R3. K. J. Ayala, *The 8051 Microcontrollers*, 3rd Edition, Cengage Learning, 2004.

Online Resources:

1. https://nptel.ac.in/courses/108107029/: by Dr. P.Agarwal, IIT Roorkee
2. https://nptel.ac.in/courses/106108100/: by Prof. Krishna Kumar IISc Bangalore
3. http://www.electrical4u.com/circuit-analysis.htm
4. http://www.allaboutcircuits.com
5. https://www.electronics-tutorials.ws/

Course Outcomes: *At the end of this course, the students will be able to:*

CO1	Describe the architecture & functionality of microprocessors, modes & memory management.
CO2	Explain the architecture, programming & memory interfacing of 8086 Microprocessor, virtual memory and co-processor architecture in different advanced processors.
CO3	Interface external devices like keyboard & display with the processors as per user requirements.
CO4	Describe the functionality of microcontrollers and program them to perform tasks as per needs.
CO5	Explore microprocessor and microcontroller based systems for real world applications.

Program Outcomes Relevant to the Course:

PO1	Apply knowledge of computing fundamentals, mathematics and domain knowledge appropriate for computing models from defined problems and requirements.
PO2	Design and develop applications to analyze and solve all computer science related problems.
PO3	Design applications for any desired needs with appropriate considerations for any specific need on societal and environmental aspects.
PO5	Integrate and apply efficiently the contemporary IT tools to all computer applications.
PO7	Function effectively both as a team leader and team member on multi disciplinary projects to demonstrate computing and management skills.
PO10	Appreciate the importance of goal setting and to recognize the need for life-long learning.

Mapping of COs to POs and PSOs (1: Low, 2: Medium, 3: High)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	2	2	1		2						2	2	2
CO2	2	2	2		3						2		2
CO3	3	1	2		3		1			1	2	1	2
CO4	2	2	2		3		1			2	2		2
CO5	2	1	2		3		1			2	3		1

Category	Code	Computer Programming - II	L-T-P	Credits	Marks
PCR	CS1008		3-0-0	3	100

Objectives	The objectives of this course is to study problem-solving using advanced concepts of the C programming language like pointers, structures, and file processing.
Pre-Requisites	Knowledge of basic C programming previously completed and analytical, logical, and problem solving skills is required for this course.
Teaching Scheme	Regular classroom lectures with the use of ICT as and when required; sessions are planned to be interactive with problem-solving and programming activities.

Evaluation Scheme

Attendance	Teacher's Assessment	Mid-Term	End-Term	Total
10	20	20	50	100

Detailed Syllabus

Module-#	Topics	Hours
Module-1	**Arrays and Strings**: Review of 1-D and 2-D arrays, Character arrays and strings – Declaration and Initialization, Manipulation, Handling input & output of strings, Operations on strings, Array of strings, Built-in string handling functions in C.	**9 Hours**
Module-2	**User-defined Data Types**: Enumeration (enum) and its use, Structures – Declaration and initialization, Creating structure variables, Size of a structure, Slack bytes, Accessing members of a structure, Copying and comparing structure variables, Nested structures, Array of structure, Arrays within structures, Bit-fields in a structure, taking input for bit-fields, Union, Difference between structure and union, typedef.	**8 Hours**
Module-3	**Pointers in C**: Concepts of pointer, Declaration and initialization of pointer variable, Accessing variable through a pointer, Pointer arithmetic, Pointer expression, Chain of pointers, Using pointer with arrays and strings, Array of pointers, Pointer to an array, Pointer to structure, Accessing structure members through pointer, Self-referential structures, Idea on linked lists.	**8 Hours**
Module-4	**Pointers & Functions**: Parameter passing using call by reference, Passing an array to function, Passing structure to function, Function returning pointer, Pointer to function; Command-line arguments – Passing parameters from the command line, Pre-processor directives, Macros, File inclusion.	**8 Hours**
Module-5	**DMA & File Handling**: Dynamic memory allocation using the malloc(), calloc(), and realloc() functions, Need of type-casting, Releasing memory using free() function; File Handling – Concept of files, text vs binary file, File opening and closing, Standard and formatted input/output operation on text files, Random access on files using ftell(), fseek(), and rewind() functions, Binary data reading & writing using fread() and fwrite() functions.	**9 Hours**
	Total	42 Hours

Text Books:
T1. E. Balagurusamy, ***Programming in ANSI C***, 7th *Ed.*, McGraw-Hill Education, 2017.
T2. Y. Kanetker, ***Let Us C***, 16th *Ed.*, BPB Publications, 2018.

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Reference Books:

R1. R. Thareja, *Programming in C*, 2nd *Ed.*, Oxford University Press, 2006.

R2. B. W. Kernighan and D. M. Ritchie, *The C Programming Language*, 2nd *Ed.*, Pearson Education, 2015.

R3. H. Schildt, *C: The Complete Reference*, 4th *Ed.*, McGraw-Hill, 2017.

R4. B. Gottfried, *Schaum's Outline of Programming with C*, 3rd *Ed.*, McGraw-Hill, 2017.

Online Resources:

1. https://nptel.ac.in/courses/106105171/: by Prof. A. Basu, IIT Kharagpur
2. https://nptel.ac.in/courses/106102066/: by Prof. S. A. Kumar, IIT Delhi
3. https://nptel.ac.in/courses/106104074/: by Prof. D. Gupta, IIT Kanpur
4. https://www.cs.uic.edu/~jbell/CourseNotes/C_Programming/
5. http://www.stat.cmu.edu/~hseltman/c/CTips.html
6. https://www.learn-c.org/
7. https://c-faq.com/

Course Outcomes: *At the end of this course, the students will be able to:*

CO1	Perform various operations on character arrays and strings in C programs.
CO2	Create user-defined data types to handle heterogeneous data items.
CO3	Write efficient C programs using the concepts of pointers in multiple ways.
CO4	Develop programs using command-line arguments, pre-processor directives, and macros.
CO5	Apply run-time memory management and develop C programs to create and manipulate files.

Program Outcomes Relevant to the Course:

PO1	Apply knowledge of computing fundamentals, mathematics and domain knowledge appropriate for computing models from defined problems and requirements.
PO2	Design and develop applications to analyze and solve all computer science related problems.
PO3	Design applications for any desired needs with appropriate considerations for any specific need on societal and environmental aspects.
PO4	Analyze and review literature to invoke the research skills to design, interpret and make inferences from the resulting data.
PO5	Integrate and apply efficiently the contemporary IT tools to all computer applications.
PO7	Function effectively both as a team leader and team member on multi disciplinary projects to demonstrate computing and management skills.
PO10	Appreciate the importance of goal setting and to recognize the need for life-long learning.

Mapping of COs to POs and PSOs (1: Low, 2: Medium, 3: High)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	3	3	3	2	2		2			2	3	3	2
CO2	3	3	3	2	2		2			2	3	3	2
CO3	3	3	3	2	2		2			2	3	3	2
CO4	3	3	3	2	2		2			2	2	2	1
CO5	3	3	3	2	2		2			2	3	3	2

Category	Code	Web Design with HTML & CSS	L-T-P	Credits	Marks
PCR	CS1009		3-0-0	3	100

Objectives	The objectives of this course is to learn designing and creating static web pages using HTML, styling them using CSS, and creating responsive layouts to make attractive websites that are accessible from various devices.
Pre-Requisites	Basic computer skills and idea of internet and websites is adequate for this course.
Teaching Scheme	Regular classroom lectures with the use of ICT as and when required; sessions are planned to be interactive with focus on designing and programming activities.

Evaluation Scheme

Attendance	Teacher's Assessment	Mid-Term	End-Term	Total
10	20	20	50	100

Detailed Syllabus

Module-#	Topics	Hours
Module-1	**Introduction**: History of Internet, TCP/IP, IP Address - IPv4 & IPv6, DNS, Structure of URL, World Wide Web, Web page, Website, Web server, Web browser, MIME types, Web hosting, Client-server Model, The HTTP Request-Response Model, Request & response headers, Response codes, Structure of a website, Planning & designing a website, Static vs. dynamic websites.	7 Hours
Module-2	**HTML**: Structure of a web page, HTML tags, attributes, and elements, Basic HTML tags, Text formatting, HTML entities, Fonts & colors, Lists & nested lists, Hyperlinks, Bookmarks, Tables, merging of cells, nested tables, Images & image maps, Forms & form elements, Boolean attributes.	10 Hours
Module-3	**Audio & Video**: Embedding audio and video content, attributes, and MIME types, Embedding external content using iframe, Embedding multimedia content (YouTube videos, Google Maps, etc.); The div & span tags, Semantic tags - header, footer, section, article, aside, nav; Metadata & SEO: The meta tag, Character set, Keywords, Description, Author, Viewport.	8 Hours
Module-4	**CSS**: Overview of CSS, Inline, internal, and external CSS, Syntax of CSS rules, Selectors, Order and specificity, Style properties, Fonts, Colors, Alignment, CSS Box Model - margin, border, padding, and content, Positioning elements - static, relative, absolute, and fixed, Styling tables and forms, Background colors and images, Adding shadow and gradients, CSS tips & tricks.	9 Hours
Module-5	**Responsive Layout**: Flex containers and flex items, Responsive layouts with Flexbox, Grid layout - container, rows, columns and items, Transitions & animations - Introduction, Transitioning properties, Creating keyframe animations, Adding animation delays & timing functions, Responsive web design - viewport and breakpoints, Syntax & usage of media queries, Creating responsive layouts for different screen sizes, Introduction to CSS frameworks.	8 Hours
	Total	42 Hours

Text Books:
T1. T. A. Powell, ***HTML & CSS: The Complete Reference***, 5th *Ed.*, McGraw-Hill Education, 2017.
T2. J. Duckett, ***HTML & CSS: Design and Build Webs***, 1st *Ed.*, Wiley India, 2011.

Reference Books:

R1. B. Frain, T. Firdaus, and B. LaGrone, *HTML5 and CSS3: Building Responsive Websites*, 1st *Ed.*, Packt Publishing, 2016.

R2. P. Kumar, *Web Design With HTML & CSS : HTML & CSS Complete Beginner's Guide*, 1st *Ed.*, Notion Press, 2021.

Online Resources:

1. https://nptel.ac.in/courses/106/105/106105084/: by Prof. I. Sengupta, IIT Kharagpur
2. https://www.w3schools.com/html/
3. https://www.w3schools.com/css/

Course Outcomes: *At the end of this course, the students will be able to:*

CO1	Explain the basics and working of Internet and the World Wide Web.
CO2	Develop structured web pages using HTML, display data and collect user data through forms.
CO3	Create multimedia enriched web pages, understand semantic elements and use of metadata.
CO4	Design visually appealing websites using the power of CSS and test for browser compatibility.
CO5	Develop responsive websites accessible from various devices and explore advanced frameworks.

Program Outcomes Relevant to the Course:

PO1	Apply knowledge of computing fundamentals, mathematics and domain knowledge appropriate for computing models from defined problems and requirements.
PO2	Design and develop applications to analyze and solve all computer science related problems.
PO3	Design applications for any desired needs with appropriate considerations for any specific need on societal and environmental aspects.
PO4	Analyze and review literature to invoke the research skills to design, interpret and make inferences from the resulting data.
PO5	Integrate and apply efficiently the contemporary IT tools to all computer applications.
PO6	Solve and work with a professional context pertaining to ethics, social, cultural and cyber regulations.
PO10	Appreciate the importance of goal setting and to recognize the need for life-long learning.

Mapping of COs to POs and PSOs (1: Low, 2: Medium, 3: High)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	2	3	2	1	3	1				2	1		
CO2	2	3	3	1	3	1				3	2	1	
CO3	2	3	3	1	3	1				3	3	2	1
CO4	2	3	3	1	3	1				3	3	2	2
CO5	2	3	3	1	3	1				3	3	3	3

Category	Code	Microprocessors & Microcontrollers Lab	L-T-P	Credits	Marks
PCR	CS1010		0-0-2	1	100

Objectives	The objective of the course is to provide hands-on practice on programming of microprocessors and microcontrollers and their interfacing with external devices.
Pre-Requisites	Basic analytical skills including basic knowledge of digital electronics is required.
Teaching Scheme	Regular laboratory experiments to be conducted under the supervision of the teacher; the experiments shall consist of programming assignments.

Evaluation Scheme

Attendance	Daily Performance	Lab Record	Lab Test / Project	Viva-voce	Total
10	30	15	30	15	100

Detailed Syllabus

Experiment-#	Assignment/Experiment
1	Program for arithmetic operations using 8085.
2	Program for finding the largest and smallest from a set of numbers using 8085.
3	Program for arranging numbers in ascending and descending order using 8085.
4	Programs for 16 bit arithmetic operations using 8086.
5	Programs for Sorting and Searching (using 8086).
6	Programs for String manipulation operations (using 8086).
7	Interfacing ADC and DAC.
8	Parallel Communication between two MP Kits using Mode-1 and Mode-2 of 8255.
9	Programming using Arithmetic, Logical and Bit Manipulation instructions of 8051 microcontroller.
10	Programming and verifying Timer, Interrupts and UART operations in 8051 microcontroller.
11	Interfacing and Programming of Stepper Motor and DC Motor Speed control.
12	Programming and verifying Timer, Interrupts and UART operations in 8051 microcontroller.
13	Communication between 8051 Microcontroller kit and PC.
14	A design problem using 8051 (such as multi-parameter data acquisition system, voltmeter, power meter, frequency counter, traffic simulation, digital clock etc.)

Text Books:

T1. R. S. Gaonkar, *Microprocessor Architecture, Programming and Applications with the 8085*, 6th *Ed.*, Penram International Publishing, 2013.

T2. A. K. Ray and K. M. Bhurchandani, *Advanced Microprocessors and Peripherals*, 2nd *Ed.*, McGraw Hill Education, 2006.

T3. M. A. Mazidi, J. G. Mazidi, R. McKinlay, *The 8051 Microcontroller and Embedded Systems: Using Assembly and C*, 2nd *Ed.*, Pearson Education, 2011.

Reference Books:

R1. K. Kant, *Microprocessors and Microcontrollers: Architecture, Programming and System Design 8085, 8086, 8051, 8096*, 2nd *Ed.*, Prentice Hall India, 2013.

R2. D. Hall, *Microprocessors and Interfacing*, 3rd *Ed.*, McGraw-Hill Education, 2017.

R3. K. J. Ayala, *The 8051 Microcontrollers*, 3rd Edition, Cengage Learning, 2004.

Online Resources:
1. https://nptel.ac.in/courses/108105102/7
2. https://nptel.ac.in/courses/108107029/
3. https://nptel.ac.in/courses/108105102/38

Course Outcomes: *At the end of this course, the students will be able to:*

CO1	Describe the assembly language programming & instruction sets of 8086 microprocessor.
CO2	Write assembly language programs using various arithmetic, logical, and string operations.
CO3	Develop assembly level programs for finding largest/smallest numbers, existence of data, etc.
CO4	Explore assembly level programming of 8051 microcontroller & its applications in real world.
CO5	Interface microprocessors and microcontrollers with external peripheral devices.

Program Outcomes Relevant to the Course:

PO1	Apply knowledge of computing fundamentals, mathematics and domain knowledge appropriate for computing models from defined problems and requirements.
PO2	Design and develop applications to analyze and solve all computer science related problems.
PO3	Design applications for any desired needs with appropriate considerations for any specific need on societal and environmental aspects.
PO5	Integrate and apply efficiently the contemporary IT tools to all computer applications.
PO10	Appreciate the importance of goal setting and to recognize the need for life-long learning.

Mapping of COs to POs and PSOs (1: Low, 2: Medium, 3: High)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	2	2	3		2						2	3	2
CO2	2	2	2		3						2		2
CO3	2	2	3		3					3	3	2	2
CO4	2	2	1		3					2	2		2
CO5	2	2	3		3						3		2

Category	Code	Computer Programming - II Lab	L-T-P	Credits	Marks
PCR	CS1011		0-0-2	1	100

Objectives	The objectives of this course is to provide hands-on practice on programming and problem-solving using advanced features of the C programming language like pointers, structures, command-line arguments, and file processing.
Pre-Requisites	Knowledge of basic C programming and topics taught in the class is required.
Teaching Scheme	Regular laboratory classes are conducted under the supervision of the teacher. The experiments shall comprise of programming assignments.

Evaluation Scheme

Attendance	Daily Performance	Lab Record	Lab Test / Project	Viva-voce	Total
10	30	15	30	15	100

Detailed Syllabus

Experiment-#	Assignment/Experiment
1	Programs on input/output of strings and simple operations on strings.
2	Programs on strings using built-in string handling functions.
3	Programs on creating and using simple and nested structures.
4	Programs on bit-fields, array of structures, union, and enum.
5	Programs on use of pointers with variables of different data-types.
6	Programs on array operations using pointers.
7	Programs on string manipulation using pointers.
8	Programs on pointers to structures.
9	Programs on functions using call by reference.
10	Programs on passing arrays (1D and 2D) and structures to functions.
11	Programs on designing user-defined functions for string manipulation.
12	Programs on command-line arguments, pre-processor directives, and macros.
13	Programs on various operations on text files.
14	Programs on various operations on binary files.

Text Books:
T1. E. Balagurusamy, *Programming in ANSI C*, 7th *Ed.*, McGraw-Hill Education, 2017.
T2. M. Sprankle and J. Hubbard, *Problem Solving and Programming Concepts*, 9th *Ed.*, Pearson Education, 2011.

Reference Books:
R1. B. W. Kernighan and D. M. Ritchie, *The C Programming Language*, 2nd *Ed.*, PHI, 2012.
R2. H. M. Deitel and P. J. Deitel, *C How to Program*, 3rd *Ed.*, Pearson Education Asia,2001.
R3. H. Schildt, *C: The Complete Reference*, 4th *Ed.*, McGraw-Hill Education, 2017.

Online Resources:
1. https://nptel.ac.in/courses/106105171/: by Prof. A. Basu, IIT Kharagpur
2. https://nptel.ac.in/courses/106102066/: by Prof. S. A. Kumar, IIT Delhi
3. https://nptel.ac.in/courses/106104074/: by Prof. D. Gupta, IIT Kanpur
4. https://www.cs.uic.edu/~jbell/CourseNotes/C_Programming/

5. http://www.stat.cmu.edu/~hseltman/c/CTips.html
6. https://www.learn-c.org/
7. https://c-faq.com/

Course Outcomes: *At the end of this course, the students will be able to:*

CO1	Develop C programs for manipulation of character arrays and strings.
CO2	Manipulate heterogeneous data items using structure, bit-fields, and union.
CO3	Develop efficient C programs using pointers and call by reference.
CO4	Construct C programs using command line arguments, pre-processor directives, and macros.
CO5	Manage memory at run-time as required and manipulate data stored in text or binary files.

Program Outcomes Relevant to the Course:

PO1	Apply knowledge of computing fundamentals, mathematics and domain knowledge appropriate for computing models from defined problems and requirements.
PO2	Design and develop applications to analyze and solve all computer science related problems.
PO3	Design applications for any desired needs with appropriate considerations for any specific need on societal and environmental aspects.
PO4	Analyze and review literature to invoke the research skills to design, interpret and make inferences from the resulting data.
PO5	Integrate and apply efficiently the contemporary IT tools to all computer applications.
PO7	Function effectively both as a team leader and team member on multi disciplinary projects to demonstrate computing and management skills.
PO10	Appreciate the importance of goal setting and to recognize the need for life-long learning.

Mapping of COs to POs and PSOs (1: Low, 2: Medium, 3: High)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	3	3	3	2	2		2			2	3	3	2
CO2	3	3	3	2	2		2			2	3	3	2
CO3	3	3	3	2	2		2			2	3	3	2
CO4	3	3	3	2	2		2			2	3	2	1
CO5	3	3	3	2	2		2			2	3	3	2

Category	Code	Web Design with HTML & CSS Lab	L-T-P	Credits	Marks
PCR	CS1012		0-0-2	1	100

Objectives	The objective of this laboratory course is to provide hands-on exercises on designing attractive and multimedia enriched semantic web pages using HTML and CSS including creating user-friendly responsive layouts.
Pre-Requisites	Familiarity with internet browsing and basic skills on text editors is required.
Teaching Scheme	Regular laboratory classes are conducted under the supervision of the teacher. The experiments shall comprise of coding assignments.

Evaluation Scheme

Attendance	Daily Performance	Lab Record	Lab Test / Project	Viva-voce	Total
10	30	15	30	15	100

Detailed Syllabus

Experiment-#	Assignment/Experiment
1	Find out IP Address, DNS query, Capture HTTP Request & Response.
2	Create a basic HTML web page with headings, paragraphs, and images.
3	Navigation using hyperlinks and bookmarks.
4	Create different types of lists and nested lists.
5	Design forms with different input types and form elements.
6	Utilize semantic HTML elements and meta data.
7	Create an image gallery application with iframe.
8	Embed audio, video, and other external resources on a web page.
9	Style text content using basic CSS properties for font, color, and alignment.
10	Use of CSS selectors to target specific elements on a web page.
11	Apply CSS box model properties to create spacing and borders around elements.
12	Styling tables and form elements using CSS.
13	Create multi-column layout using CSS flexbox & grid and organize content in cells.
14	Apply CSS transitions to animate changes in element properties.

Text Books:

T1. T. A. Powell, **HTML & CSS: The Complete Reference**, 5th *Ed.*, McGraw-Hill Education, 2017.

T2. J. Duckett, **HTML & CSS: Design and Build Webs**, 1st *Ed.*, Wiley India, 2011.

Reference Books:

R1. B. Frain, T. Firdaus, and B. LaGrone, **HTML5 and CSS3: Building Responsive Websites**, 1st *Ed.*, Packt Publishing, 2016.

R2. P. Kumar, **Web Design With HTML & CSS : HTML & CSS Complete Beginner's Guide**, 1st *Ed.*, Notion Press, 2021.

Online Resources:

1. https://nptel.ac.in/courses/106/105/106105084/: by Prof. I. Sengupta, IIT Kharagpur
2. https://www.w3schools.com/html/
3. https://www.w3schools.com/css/

Course Outcomes: *At the end of this course, the students will be able to:*

CO1	Develop structured & semantically meaningful web pages using HTML.
CO2	Display data on the website in an organized manner and design forms to collect user data.
CO3	Create multimedia enriched web pages, understand semantic elements and use of metadata.
CO4	Design visually appealing websites using the power of CSS and test for browser compatibility.
CO5	Develop a responsive website from a given design using appropriate tools and frameworks.

Program Outcomes Relevant to the Course:

PO1	Apply knowledge of computing fundamentals, mathematics and domain knowledge appropriate for computing models from defined problems and requirements.
PO2	Design and develop applications to analyze and solve all computer science related problems.
PO3	Design applications for any desired needs with appropriate considerations for any specific need on societal and environmental aspects.
PO4	Analyze and review literature to invoke the research skills to design, interpret and make inferences from the resulting data.
PO5	Integrate and apply efficiently the contemporary IT tools to all computer applications.
PO6	Solve and work with a professional context pertaining to ethics, social, cultural and cyber regulations.
PO10	Appreciate the importance of goal setting and to recognize the need for life-long learning.

Mapping of COs to POs and PSOs (1: Low, 2: Medium, 3: High)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	2	3	3	1	3	1				2	1		
CO2	2	3	3	1	3	1				3	2	1	
CO3	2	3	3	1	3	1				3	3	2	1
CO4	2	3	3	1	3	1				3	3	2	2
CO5	2	3	3	1	3	1				3	3	3	3

Category	Code	Corporate Communication Skills	L-T-P	Credits	Marks
UCR	HS1002		0-0-4	2	100

Objectives	The objective of this laboratory course is to give students adequate practice in a simulated professional environment with focus on communication skills with professionalism in a typical corporate set up.
Pre-Requisites	Knowledge of communicative and technical English is required.
Teaching Scheme	Regular laboratory classes with various tasks designed to facilitate communication and soft skills through pair and/or team activities with regular assessments, presentations, discussions, role-playing, audio-visual supplements, writing activities, business writing practices and vocabulary enhancement.

Evaluation Scheme

Attendance	Daily Performance	Lab Record	Lab Test / Project	Viva-voce	Total
10	30	15	30	15	100

Detailed Syllabus

Experiment-#	Assignment/Experiment
1	Aspects of Inter-cultural communication and cultural conditioning.
2	Barriers to cross-cultural communication.
3	Personality test and personality development.
4	Team work and its stages.
5	Team work and leadership: Simulation.
6	Negotiation skills: Role-play.
7	Persuasive presentation I.
8	Persuasive presentation II.
9	Writing a blog.
10	Vlog making and presentation I.
11	Vlog making and presentation II.
12	Emotional Intelligence: its importance in the workplace.
13	Time management.
14	Social media etiquette.
15	Business etiquette.
16	Assertiveness at work: Role-play.
17	Power point presentation I.
18	Power point presentation II.
19	Power point presentation III.
20	Power point presentation IV.
21	Mind mapping.
22	Creative and critical thinking for problem solving.
23	Six thinking hats: Problem solving and decision making in meetings.
24	Verbal Ability I: synonyms and antonyms.

Experiment-#	Assignment/Experiment
25	Verbal Ability II: One word substitution.
26	Verbal Ability III: Error correction.
27	Verbal Ability IV: Odd one out.
28	Verbal Ability V: Analogy.

Text Books:

T1. S. B. Bachu, ***Corporate Communication Skills for Professionals***, 1st *Ed.*, White Falcon Publishing, 2021.

T2. M. A. Rizvi, ***Effective Technical Communication***, 2nd *Ed.*, Tata McGraw-Hill, 2017.

T3. M. Raman and S. Sharma, ***Technical Communication: Principles and Practice***, 3rd *Ed.*, Oxford University Press, 2015.

Reference Books:

R1. P. A. Argenti and J. Forman, ***The Power of Corporate Communication: Crafting the Voice and Image of Your Business***, 1st *Ed.*, Tata McGraw-Hill, 2003.

R2. J. Seely, ***The Oxford Guide to Writing and Speaking***, 3rd *Ed.*, Oxford University Press, 2013.

R3. B. K. Mitra, ***Effective Technical Communication - A Guide for Scientists and Engineers***, 1st *Ed.*, Oxford University Press, 2006.

Online Resources:

1. https://archive.nptel.ac.in/courses/109/105/109105144/: by Prof. S. Singh, IIT Kharagpur
2. https://archive.nptel.ac.in/courses/109/106/109106129/: by Dr. Ay. I. Viswamohan, IIT Madras
3. https://archive.nptel.ac.in/courses/109/104/109104030/: by Dr. T. Ravichandran, IIT Kanpur
4. https://www.ef.com/wwen/english-resources/
5. https://owl.purdue.edu/owl/purdue_owl.html
6. https://www.usingenglish.com/
7. http://www.english-test.net

Course Outcomes: *At the end of this course, the students will be able to:*

CO1	Understand aspects of communication at the workplace and check the barriers.
CO2	Hone persuasive communication skills.
CO3	Enhance interpersonal communication at the corporate workplace.
CO4	Make impactful group/solo presentations and communicate with clarity.
CO5	Enhance verbal ability for better communication.

Program Outcomes Relevant to the Course:

PO4	Analyze and review literature to invoke the research skills to design, interpret and make inferences from the resulting data.
PO6	Solve and work with a professional context pertaining to ethics, social, cultural and cyber regulations.
PO7	Function effectively both as a team leader and team member on multi disciplinary projects to demonstrate computing and management skills.
PO8	Communicate effectively and present technical information in oral and written reports.
PO9	Ability to understand the impact of system solutions in a contemporary, global, economical, environmental, and societal context for sustainable development.
PO10	Appreciate the importance of goal setting and to recognize the need for life-long learning.

Mapping of COs to POs and PSOs (1: Low, 2: Medium, 3: High)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1				2		2	3	3	2	3	1	1	1
CO2				2		2	3	3	3	3	1	1	1
CO3				2		3	3	3	3	3	1	1	1
CO4				2		3	3	3	3	3	1	1	1
CO5				2		2	3	3	2	3	1	1	1

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