



BVVS

Basaveshwar Engineering College, Bagalkote

Department of Electronics and Communication Engineering

Vision, Mission Statements and Values Vision

To achieve excellence in electronics and communication engineering through quality education and research for developing competent professionals.

Mission

1. Foster a dynamic teaching and learning process.
2. Encourage research through innovation and collaboration.
3. Imbibe moral, ethical values and social responsibilities.

Values

The values of the department are

1. Work is Worship
2. Ethics and Integrity
3. Empathy and Compassion
4. Indian Ethos
5. Mutual Respect

SWOC Analysis

S:Strength:

1. Infrastructure
 - (i.) ICT enabled classrooms/seminar hall with good ambience.
 - (ii.) Well equipped laboratories to cater curriculum requirements.
 - (iii.) Department library with good number of titles and volumes.
 - (iv.) Scope for academic extension programmes.
2. Faculty
 - (i.) 75% offaculty with Ph.D.
 - (ii.) Facultywithminimumof12yearsteachingexperience.
 - (iii.) Faculty retention ratio is 100 %.
3. Students
 - (i.) Students with academic and competitive bent of mind.
 - (ii.) 75% of the students are placed in reputed industries.
 - (iii.) 10% to 15% of the students are registering for B.E. Honors Degree.
4. Curriculum
 - (i.) Research and industry oriented adaptive Curriculum.
 - (ii.) Curriculum with integrated courses.
5. Alumni
 - (i.) Alumni work in reputed organizations across the world.
 - (ii.) Alumni interactions with students and faculty to bridge the gap between campus and corporate.

W:Weakness:

1. IPR competencies are inadequate.
2. Relatively less number of memberships in professional bodies.
3. Limited collaborative activities.
4. Less number of inter-disciplinary courses and projects.
5. Less number of industry supported laboratories/courses.
6. Inadequate number of funded projects.
7. Less scope for co-curricular and cultural activities.

O:Opportunities:

1. Establishment of Distant Learning Center (DLC) using existing resources.
2. Participation in collaborative projects/research work with allied institutions.
3. Fostering alumni participation in academics and placement activities.
4. Establishment of Skilling Centers for students.
5. Faculty exchange programs with academia and industry.
6. Organizing conferences.
7. Facilitating incubation centers for alumni.
8. Scope for academic extension programmes
9. Training on computer usage/programming languages for general public.
10. Enhancing consultancy activities.

C:Challenges:

1. To incorporate experiential teaching learning process.
2. Adapting curriculum to future industry needs.
3. Fostering collaboration to enhance research, innovation and entrepreneurship activities.
4. Attracting diversified students.
5. Strategies to strengthen the placement activities for higher packages and core companies.
6. Secure additional research grants and consultancy opportunities.
7. Enhance quality publications and file patents.

Knowledge and Attitude Profile (WK)

WK1: A systematic, theory-based understanding of the natural sciences applicable to the discipline and awareness of relevant social sciences.

WK2: Conceptually-based mathematics, numerical analysis, data analysis, statistics and formal aspects of computer and information science to support detailed analysis and modelling applicable to the discipline.

WK3: A systematic, theory-based formulation of engineering fundamentals required in the engineering discipline.

WK4: Engineering specialist knowledge that provides theoretical frameworks and bodies of knowledge for the accepted practice areas in the engineering discipline; much is at the forefront of the discipline.

WK5: Knowledge, including efficient resource use, environmental impacts, whole-life cost, re-use of resources, net zero carbon, and similar concepts, that supports engineering design and operations in a practice area.

WK6: Knowledge of engineering practice (technology) in the practice areas in the engineering discipline.

WK7: Knowledge of the role of engineering in society and identified issues in engineering practice in the discipline, such as the professional responsibility of an engineer to public safety and sustainable development.

WK8: Engagement with selected knowledge in the current research literature of the discipline, awareness of the power of critical thinking and creative approaches to evaluate emerging issues.

WK9: Ethics, inclusive behavior and conduct. Knowledge of professional ethics, responsibilities, and norms of engineering practice. Awareness of the need for diversity by reason of ethnicity, gender, age, physical ability etc. with mutual understanding and respect, and of inclusive attitudes.

Program Outcomes (POs)

PO1: Engineering Knowledge: Apply knowledge of mathematics, natural science, computing, engineering fundamentals and an engineering specialization as specified in WK1 to WK4 respectively to develop to the solution of complex engineering problems.

PO2: Problem Analysis: Identify, formulate, review research literature and analyze complex engineering problems reaching substantiated conclusions with consideration for sustainable development. (WK1 to WK4)

PO3: Design/Development of Solutions: Design creative solutions for complex engineering problems and design/develop systems/components/processes to meet identified needs with consideration for the public health and safety, whole-life cost, net zero carbon, culture, society and environment as required. (WK5)

PO4: Conduct Investigations of Complex Problems: Conduct investigations of complex engineering problems using research-based knowledge including design of experiments, modelling, analysis & interpretation of data to provide valid conclusions. (WK8).

PO5: Engineering Tool Usage: Create, select and apply appropriate techniques, resources and modern engineering & IT tools, including prediction and modelling recognizing their limitations to solve complex engineering problems. (WK2 and WK6)

PO6: The Engineer and The World: Analyze and evaluate societal and environmental aspects while solving complex engineering problems for its impact on sustainability with reference to economy, health, safety, legal framework, culture and environment. (WK1, WK5, and WK7).

PO7: Ethics: Apply ethical principles and commit to professional ethics, human values, diversity and inclusion; adhere to national & international laws. (WK9)

PO8: Individual and Collaborative Team work: Function effectively as an individual, and as a member or leader in diverse/multi-disciplinary teams.

PO9: Communication: Communicate effectively and inclusively within the engineering community and society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations considering cultural, language, and learning differences

PO10: Project Management and Finance: Apply knowledge and understanding of engineering management principles and economic decision-making and apply these to one's own work, as a member and leader in a team, and to manage projects and in multidisciplinary environments.

PO11: Life-Long Learning: Recognize the need for, and have the preparation and ability for i) independent and life-long learning ii) adaptability to new and emerging technologies and iii) critical thinking in the broadest context of technological change. (WK8)

Programme Specific Outcomes (PSOs)

1. Analyze and design systems for electronics, communication, and signal processing applications.
2. Use domain specific tools for design, analysis, synthesis, and validation of VLSI and embedded systems
3. Demonstrate the conceptual knowledge with respect to architecture, design analysis and simulation of computer networking and applications

Programme Educational Objectives(PEOs)

PEO1: Our graduates will be able to lead a successful career by solving complex Engineering Problems of society/industry

PEO2: Enable graduates to excel in academia, industry, entrepreneurship and engage in research and lifelong learning

PEO3: Graduates will be able to work effectively as individuals in multidisciplinary environments with high integrity, ethics, human values and societal responsibilities

PEO4: Graduates will be able to exhibit strong leadership, communication, and teamwork skills to succeed in dynamic professional environments and contribute to the global challenges

Suggestive Break-up of Credits for B.E (Common to all Branches)
(For the Students Admitted to First Year from 2025-26)

Sem.	BSC	ESC/ETC	HSMC	AEC	PCC	PEC	OEC	Proj.	Int.	Total
1.	08	09	02	1(SFH)						20
2.	08	09	02	1(IDT)						20
3.	03				17					20
4.	03		01		16					20
5.			01	2 (SS)	09	03	03	02		20
6.				1(IKS)	13	03	03			20
7.			03		06	06		09		24
8.				3 (MOOCS)			3 (MOOCS)		10	16
Tot.	22	18	09	08	61	12	09	11	10	160

Applied Mathematics-I					Applied Chemistry				
Code	Title	L	T	P	Code	Title	L	T	P
1BMAC101C	Differential Calculus and Linear Algebra: CV Stream	3	2	0	1BCHC102C	Applied Chemistry for (CV stream)	3	0	2
1BMAM101C	Differential Calculus and Linear Algebra: ME Stream	3	2	0	1BCHM102 C	Applied Chemistry for (ME stream)	3	0	2
1BMAE101C	Differential Calculus and Linear Algebra: EEE Stream	3	2	0	1BCHE102C	Applied Chemistry for (EEE, ECE stream)	3	0	2
1BMAS101C	Calculus And Linear Algebra :CSE Stream	3	2	0	1BCHS102C	Applied Chemistry for (CSE stream)	3	0	2
Engineering Science Courses -I(ESC-I)					Programming Language Courses (PLC)				
Code	Title	L	T	P	Code	Title	L	T	P
1BCVA104N	Introduction to Civil Engineering	3	0	0	1BCSA105D	Introduction to C Programming (For non IT programmes)	3	0	2
1BEEA104N	Introduction to Electrical Engineering	3	0	0	1BCSB105D	Python Programming (for CSE and allied programmes)	3	0	2
1BECA104N	Introduction to Electronics and Communication Engineering	3	0	0					
1BMEA104N	Introduction to Mechanical Engineering	3	0	0					
1BISA104N	Essentials of Information Technology	3	0	0					

I SEM BE. Scheme of Teaching and Evaluation for 2025-26 Admitted Batch (Physics Cycle)

Sl. No	Course Type	Course Code	Course Title	Teaching-Learning Scheme				Exam Duration (Hrs)		Total Duration (Hrs) /sem	Exam Scheme and Evaluation			Credits
				Lecture Hrs/Week (Hrs/Sem.)	Tutorials Hrs/Week (Hrs/Sem.)	Practical's Hrs/Week (Hrs/Sem.)	Term Work (TW) & Self Learning(SL), (TW+SL) Hrs/Sem.	CIE	SEE		CIE Marks	SEE Marks	Total Marks	
				L	T	P								
1	ASC	1BMAx101C	Applied Mathematics-I (Stream Specific)	03/42	02/28	0	44	03	03	120	50	50	100	04
2	ASC(IC)	1BPHx102C	Applied Physics(Stream Specific)	03/42	0	02/28	44	03	03	120	50	50	100	04
3	ETC	1BMEx103C	Computer-Aided Engineering Drawing(Stream Specific)	02/28	0	02/26	28	05	03	90	50	50	100	03
4	ESC-I	1Byyx104N	Engineering Science Course I	03/42	0	0	42	03	03	90	50	50	100	03
5	PSC	1BxxA105C	Programme Specific Course	03/42	0	0	42	03	03	90	50	50	100	03
6	AEC (NCMC)	1BHSA106M	Soft Skills	01/14	0	0	13	02	01	30	50	50	100	PP
7	HSMS	1BHSA107C/ 1BHSB107C	Samskrutika Kannada/ Balake Kannada	01/14	0	0	13	02	01	30	50	50	100	01
8	AEC/SDC	1BxxA108P	Innovation and Design Thinking Lab(Project-Based learning)	0	0	02/26	0	02	02	30	50	50	100	01
9	PSC	1BxxA109L	Program-Specific Course Lab	0	0	02/26	0	02	02	30	50	50	100	01
			TOTAL	16/224	02/28	08/106	226	25	21	630	400	400	800	20
10	AICTE Activity Points(studentshavetoeearn100 activity points between 01 to 08 semesters)			Compulsory requirement for the award of degree										

Applied Mathematics-I					Applied Physics				
Code	Title	L	T	P	Code	Title	L	T	P
1BMAC101C	Differential Calculus And Linear Algebra: CV stream	3	2	0	1BPHC102C	Physics for Sustainable Structural Systems (CV stream)	3	0	2
1BMAM101C	Differential Calculus and Linear Algebra: ME stream	3	2	0	1BPHM102C	Physics of Materials (ME stream)	3	0	2
1BMAE101C	Differential Calculus And Linear Algebra: EEE stream	3	2	0	1BPHE102C	Quantum Physics and Engineering Materials (EEE stream)	3	0	2
1BMAS101C	Calculus and Linear Algebra: CSE Stream	3	2	0	1BPHS102C	Quantum Physics and Quantum Computing (CSE stream)	3	0	2
Computer-Aided Engineering Drawing					Engineering Science Courses-I(ESC-I)				
1BMEC103C	Computer-Aided Engineering Drawing for CV stream	2	0	2	1BCVA104N	Introduction to Civil Engineering	3	0	0
1BMEM103C	Computer-Aided Engineering Drawing for ME stream	2	0	2	1BEEA104N	Introduction to Electrical Engineering	3	0	0
1BMEE103C	Computer-Aided Engineering Drawing for EEE stream	2	0	2	1BECA104N	Introduction to Electronics & Communication Engineering	3	0	0
1BMES103C	Computer-Aided Engineering Drawing for CSE stream	2	0	2	1BMEA104N	Introduction to Mechanical Engineering	3	0	0
					1BISA104N	Essentials of Information Technology	3	0	0
Programme Specific Courses (PSC)					Program-Specific Course Lab(PSCL)				
1BCVA105C	Engineering Mechanics	3	0	0	1BCVA109L	Engineering Mechanics Laboratory	0	0	2
1BEEA105C	Basic Electrical Engineering	3	0	0	1BEEA109L	Basic Electrical Engineering Lab	0	0	2
1BECA105C	Fundamentals of Electronics & Communication Engineering	3	0	0	1BCEA109L	Fundamentals of Electronics & Communication Lab	0	0	2
1BMEA105C	Elements of Mechanical Engineering	3	0	0	1BMEA109L	Basic Mechanical Engineering Lab	0	0	2
1BCSA105C	Programming in C	3	0	0	1BCSA109L	C Programming Lab	0	0	2
1BBTA105C	Elements of Biotechnology	3	0	0	1BBTA109L	Elements of Biotechnology Lab	0	0	2

II SEM BE. Scheme of Teaching and Evaluation for 2025-26 Admitted Batch (Physics Cycle)

Sl. No	Course Type	Course Code	Course Title	Teaching-Learning Scheme				Exam Duration (Hrs)		Total Duration (Hrs)/ sem	Exam Scheme and Evaluation			Credits
				Hrs/Week (Hrs/Sem.)	Hrs/Week (Hrs/Sem.)	Hrs/Week (Hrs/Sem.)	Term Work (TW) & Self Learning(SL), (TW+SL) Hrs/Sem.	CIE	SEE		CIE Marks	SEE Marks	Total Marks	
				L	T	P								
1	ASC	1BMAx201C	Applied Mathematics-II (Stream Specific)	03/42	02/28	0	44	03	03	120	50	50	100	04
2	ASC(IC)	1BCHx202C	Applied Chemistry (Stream Specific)	03/42	0	02/28	44	03	03	120	50	50	100	04
3	ETC	1BAIA203C	Introduction to AI and Applications	03/42	0	0	42	03	03	90	50	50	100	03
4	ESCII	1Byyx204N	Engineering Science Course-II	03/42	0	0	42	03	03	90	50	50	100	03
5	PLC(IC)	1BCSx205D	Programming Language Course	03/42	0	02/28	44	03	03	120	50	50	100	04
6	AEC	1BHSB206C	Communication Skills	01/14	0	0	13	02	01	30	50	50	100	01
7	AEC (NCMC)	1BHSC207M	Indian Constitution & Engineering Ethics	01/14	0	0	13	02	01	30	50	50	100	PP
8	AEC/SDC	1BxxA208P	Interdisciplinary Project Work (Project Based Learning)	0	0	02/26	0	02	02	30	50	50	100	01
			TOTAL	17/238	02/28	06/82	242	21	19	630	400	400	800	20
9	AICTE Activity Points (students have to earn 100 activity points between 01 to 08 semesters)			Compulsory requirement for the award of degree										
Science Course, IC – Integrated Course (Practical Course Integrated with Theory Course), ESC- Engineering Science Courses, PLC(IC)- Programming Language Course (Integrated Course), AEC- Ability Enhancement Course, NCMC: Non Credit Mandatory Course, HSMC- Humanity, Social Science and management Course, AEC/SDC: Ability Enhancement Course/Skill Development course, CIE–Continuous Internal Evaluation, SEE-Semester End Examination, PP: (Pass/Pass) is assigned to a non-credit														

Applied Mathematics-II					Applied Chemistry				
Code	Title	L	T	P	Code	Title	L	T	P
1BMAC201C	Calculus and Numerical Methods: CV stream	3	2	0	1BCHC202C	Applied Chemistry for CV stream	3	0	2
1BMAM201C	Multivariable Calculus and Numerical Methods: ME stream	3	2	0	1BCHM202C	Applied Chemistry for ME stream	3	0	2
1BMAE201C	Calculus, Laplace Transform And Numerical Techniques: EEE stream	3	2	0	1BCHE202C	Applied Chemistry for EEE stream	3	0	2
1BMAS201C	Differential Equations and Numerical Methods: CSE stream	3	2	0	1BCHS202C	Applied Chemistry CS stream	3	0	2
Engineering Sciences Courses II(ESC-II)					Programming Language Courses (PLC) Integrated				
1BCVA204N	Introduction to Civil Engineering	3	0	0	1BCSA205D	Introduction to C Programming (for non-IT programmes)	3	0	2
1BEEA204N	Introduction to Electrical Engineering	3	0	0	1BCSB205D	Python Programming (For CSE and allied programmes)	3	0	2
1BECA204N	Introduction to Electronics & Communication Engineering	3	0	0					
1BMEA204N	Introduction to Mechanical Engineering	3	0	0					
1BISA204N	Essentials of Information Technology	3	0	0					

Applied Mathematics-II					Applied Physics				
Code	Title	L	T	P	Code	Title	L	T	P
1BMAC201C	Differential Calculus and Numerical Methods: CV stream	3	2	0	1BPHC202C	Physics for Sustainable Structural Systems (CV stream)	3	0	2
1BMAM201C	Differential Calculus and Numerical Methods: ME stream	3	2	0	1BPHM202C	Physics of Materials (ME stream)	3	0	2
1BMAE201C	Differential Calculus and Numerical Methods: EEE stream	3	2	0	1BPHE202C	Quantum Physics and Engineering Materials (EEE stream)	3	0	2
1BMAS201C	Differential equations and Numerical Methods: CSE Stream	3	2	0	1BPHS202C	Quantum Physics and Quantum Computing (CSE stream)	3	0	2
Programme Specific Courses(PSC)					Programme Specific Courses Lab (PSCL)				
1BCVA205C	Engineering Mechanics	3	0	0	1BCVA209L	Engineering Mechanics Lab	0	0	2
1BMEA205C	Elements of Mechanical Engineering	3	0	0	1BMEA209L	Basic Mechanical Engineering Lab	0	0	2
1BEEA205C	Basic Electrical Engineering	3	0	0	1BEEA209L	Basic Electrical Engineering Lab	0	0	2
1BCEA205C	Fundamentals of Electronics & Communication Engineering	3	0	0	1BCEA209L	Fundamentals of Electronics & Communication Lab	0	0	2
1BCSA205C	Programming in C	3	0	0	1BCSA209L	C Programming Lab	0	0	2
1BBTA205C	Elements of Biotechnology	3	0	0	1BBTA209L	Elements of Biotechnology Lab	0	0	2
Engineering Science Courses-II (ESC-II)					Computer-Aided Engineering Drawing				
Code	Title	L	T	P	Code	Title	L	T	P
1BVCA204N	Introduction to Civil Engineering	3	0	0	1BMEC203C	Computer-Aided Engineering Drawing for CV stream	2	0	2
1BEEA204N	Introduction to Electrical Engineering	3	0	0	1BMEM203C	Computer-Aided Engineering Drawing for ME stream Engineering	2	0	2
1BECA204N	Introduction to Electronics & Communication Engineering	3	0	0	1BMEE203C	Computer-Aided Engineering Drawing for EEE stream	2	0	2
1BCSA204N	Introduction to Mechanical Engineering	3	0	0	1BMES203C	Computer-Aided Engineering Drawing for CSE stream	2	0	2
1BISA204N	Essentials of Information Technology	3	0	0					

III SEM BE. Scheme of Teaching and Evaluation for 2025-26 Admitted Batch

Sl. No.	Course Category	Course Code	Course Title	Teaching-Learning Scheme				Examination Duration (Hrs/Sem.)		Total Hours	Examination Scheme and Evaluation			Credits (C) =Total Hours/30
				L Hrs/Week (Hrs/Sem.)	T Hrs/Week (Hrs/Sem.)	P Hrs/Week (Hrs/Sem.)	Term Work (TW) and Self Learning (SL) (TW+SL) Hrs/Sem.	CIE	SEE		CIE Marks	SEE Marks	Total Marks	
1.	BSC	1BECA301C	Mathematical Methods for Signals and Systems	3 (42)	0	0	42	03	03	90	50	50	100	03
2.	PCC	1BECA302C	Network Analysis	3 (42)	0	0	42	03	03	90	50	50	100	03
3.	PCC	1BECA303C	Electronics Devices and Circuits	3 (42)	0	0	42	03	03	90	50	50	100	03
4.	PCC	1BECA304C	Digital System Design using Verilog	3 (42)	0	0	42	03	03	90	50	50	100	03
5.	PCC	1BECA305C	Liner Integrated Circuits	3 (42)	0	0	42	03	03	90	50	50	100	03
6.	PCC	1BECA306C	Data Structures using C++	3 (42)	0	0	42	03	03	90	50	50	100	03
	PCCL	1BECA307L	Electronic Devices and Circuits Laboratory	0	0	26	00	02	02	30	50	50	100	01
7.	PCCL	1BECA308L	Digital System Design Using Verilog Laboratory	0	0	26	00	02	02	30	50	50	100	01
8	MC	1BHSA460M	Yoga	0	0	2	00	01	--	03	100	0	0	0
		1BHSB460M	National Service Scheme (NSS)	0	0	2	00	01	--	03	100	0	0	0
		1BHSC460M	Physical Education (PE) (Sport sand Athletics)	0	0	2	00	01	--	03	100	0	0	0
	Total			18(252)	0	58	252	25	22	609	700	400	800	20

IV SEM BE. Scheme of Teaching and Evaluation for 2025-26 Admitted Batch

Sl. No.	Course Category	Course Code	Course Title	Teaching-Learning Scheme				Examination Duration (Hrs/Sem.)		Total Hours	Examination Scheme and Evaluation			Credits (C) =Total Hours/30
				L Hrs/Week (Hrs/Sem.)	T Hrs/Week (Hrs/Sem.)	P Hrs/Week (Hrs/Sem.)	Term Work (TW) and Self Learning (SL) (TW+SL) Hrs/Sem.	CIE	SEE		CIE Marks	SEE Marks	Total Marks	
1.	PCC	1BECA401C	Digital Signal Processing	3 (42)	0	0	42	03	03	90	50	50	100	03
2.	PCC	1BECA402C	Analog and Digital Communication	3 (42)	0	0	42	03	03	90	50	50	100	03
3.	PCC	1BECA403C	Embedded Systems and ARM Microcontrollers	2 (28)	0	0	26	03	03	60	50	50	100	02
4.	PCC	1BECA404C	Electromagnetic Engineering	3 (42)	0	0	42	03	03	90	50	50	100	03
5.	PCC	1BECA405C	Basics of Artificial Intelligence and Machine Learning	2 (28)	0	0	26	03	03	60	50	50	100	02
6.	HSMC	1BHSA424C	Universal Human Values	1 (14)	0	0	13	02	01	30	50	50	100	01
7.	BSC	1BBTA405C	Biology for Engineers	3 (42)	0	0	42	03	03	90	50	50	100	03
8.	PCCL	1BECA406L	Communication Engineering Laboratory	0	0	26	00	02	02	30	50	50	100	01
9.	PCCL	1BECA407L	Digital Signal Processing Laboratory	0	0	26	00	02	02	30	50	50	100	01
10.	PCCL	1BECA408L	ARM Microcontroller Laboratory	0	0	26	00	02	02	30	50	50	100	01
11.	MC	1BHSA460M	Yoga	0	0	2	00	02	--	04	100	0	0	0
		1BHSB460M	National Service Scheme (NSS)	0	0	2	00	02	--	04	100	0	0	0
		1BHSC460M	Physical Education (PE) (Sport sand Athletics)	0	0	2	00	02	--	04	100	0	0	0
	Total			17(238)	0	84	233	30	23	612	800	500	1000	20

V SEM BE. Scheme of Teaching and Evaluation for 2025-26 Admitted Batch

Sl. No.	Course Category	Course Code	Course Title	Teaching-Learning Scheme				Examination Duration (Hrs/Sem.)		Total Hours	Examination Scheme and Evaluation			Credits (C) =Total Hours/30
				L Hrs/Week (Hrs/Sem.)	T Hrs/Week (Hrs/Sem.)	P Hrs/Week (Hrs/Sem.)	Term Work (TW) and Self Learning (SL) (TW+SL) Hrs/Sem.				CIE Marks	SEE Marks	Total Marks	
								CIE	SEE					
1.	PCC	1BECA501C	Computer Networks	3 (42)	0	0	42	03	03	90	50	50	100	03
2.	PCC	1BECA502C	Control Systems	3 (42)	0	0	42	03	03	90	50	50	100	03
3.	PEC	1BECX503E	Professional Elective – I	3 (42)	0	0	42	03	03	90	50	50	100	03
4.	OEC	1BECXXX	Open elective – I	3 (42)	0	0	42	03	03	90	50	50	100	03
5.	HSMC	1BBTA523C	Environmental Studies	1 (14)	0	0	13	02	01	30	50	50	100	01
6.	AEC	1BHSA522C	Quantitative Aptitude and Soft Skills	2 (28)	0	0	26	03	03	60	50	50	100	02
7	Project	1BECA503P	Mini Project	Four Contact Hours/week				03	03	60	50	50	100	02
	PCCL	1BECA504L	Computer Networks Laboratory	0	0	26	00	02	02	30	50	50	100	01
7.	PCCL	1BECA505L	Robotics Laboratory	0	0	26	00	02	02	30	50	50	100	01
8.	PCCL	1BECA506L	Linear Integrated Circuits Laboratory	0	0	26	00	02	02	30	50	50	100	01
9.	MC	1BHSA560M	Yoga	0	0	2	00	02	--	04	100	0	0	0
		1BHSB560M	National Service Scheme (NSS)	0	0	2	00	02	--	04	100	0	0	0
		1BHSC506M	Physical Education (Sports and Athletics)	0	0	2	00	02	--	04	100	0	0	0
	Total			15(210)	0	84	207	32	26	612	800	500	1000	20

VI SEM BE. Scheme of Teaching and Evaluation for 2025-26 Admitted Batch

Sl. No.	Course Category	Course Code	Course Title	Teaching-Learning Scheme				Examination Duration (Hrs/Sem.)		Total Hours	Examination Scheme and Evaluation			Credits (C) =Total Hours/30
				L Hrs/Week (Hrs/Sem.)	T Hrs/Week (Hrs/Sem.)	P Hrs/Week (Hrs/Sem.)	Term Work (TW) and Self Learning (SL) (TW+SL) Hrs/Sem.	CIE	SEE		CIE Marks	SEE Marks	Total Marks	
1.	PCC	1BECA601C	Microwave and Antenna Theory	3 (42)	0	0	42	03	03	90	50	50	100	03
2.	PCC	1BECA602C	Information Theory and Coding	3 (42)	0	0	42	03	03	90	50	50	100	03
3.	PCC	1BECA603C	CMOS Digital VLSI Design	3 (42)	0	0	42	03	03	90	50	50	100	03
4.	PCC	1BECA604C	Optical Fiber Communication	2 (28)	0	0	26	03	03	60	50	50	100	02
5.	AEC	1BHSA600C	Indian Knowledge System	1 (14)	0	0	13	02	01	30	50	50	100	01
6.	PEC	1BECX605E	Professional Elective – II	3 (42)	0	0	42	03	03	90	50	50	100	03
	OEC	1BECXXXN	Open Elective – II	3 (42)	0	0	42	03	03	90	50	50	100	03
7.	PCCL	1BECA605L	CMOS VLSI Design Laboratory	0	0	26	00	02	02	30	50	50	100	01
8	PCCL	1BECA606L	Advanced Communication Laboratory	0	0	26	00	02	02	30	50	50	100	01
9	MC	1BHSA660M	Yoga	0	0	2	00	02	--	04	100	0	0	0
		1BHSB660M	National Service Scheme(NSS)	0	0	2	00	02	--	04	100	0	0	0
		1BHSC660M	Physical Education(PE) (Sports and Athletics)	0	0	2	00	02	--	04	100	0	0	0
	Total			18 (252)	0	58	249	30	23	612	750	450	900	20

VII SEM BE. Scheme of Teaching and Evaluation for 2025-26 Admitted Batch

Sl. No.	Course Category	Course Code	Course Title	Teaching-Learning Scheme				Examination Duration (Hrs/Sem.)		Total Hours	Examination Scheme and Evaluation			Credits (C) =Total Hours/30
				L Hrs/Week (Hrs/Sem.)	T Hrs/Week (Hrs/Sem.)	P Hrs/Week (Hrs/Sem.)	Term Work (TW) and Self Learning (SL) (TW+SL) Hrs/Sem.	CIE	SEE		CIE Marks	SEE Marks	Total Marks	
1.	PCC	1BECA701C	Satellite Communication	3 (42)	0	0	42	03	03	90	50	50	100	03
2.	PCC	1BECA702C	Multimedia Communication	3 (42)	0	0	42	03	03	90	50	50	100	03
3.	HSMC	1BECAXXC	Startup and Innovation Ecosystem	3 (42)	0	0	42	03	03	90	50	50	100	03
4.	PEC	1BECX704E	Professional Elective – III	3 (42)	0	0	42	03	03	90	50	50	100	03
5.	PEC	1BECX705E	Professional Elective - IV	3 (42)	0	0	42	03	03	90	50	50	100	03
6.	Project	1BECA706P	Mini Project	Eighteen Contact Hours/week				03	03	60	50	50	100	09
Total				15(210)	0	0	210	18	18	510	300	300	600	24

VIII SEM BE. Scheme of Teaching and Evaluation for 2025-26 Admitted Batch

Sl. No.	Course Category	Course Code	Course Title	Teaching-Learning Scheme				Examination Duration (Hrs/Sem.)		Total Hours	Examination Scheme and Evaluation			Credits (C) =Total Hours/30
				L Hrs/Week (Hrs/Sem.)	T Hrs/Week (Hrs/Sem.)	P Hrs/Week (Hrs/Sem.)	Term Work (TW) and Self Learning (SL) (TW+SL) Hrs/Sem.	CIE	SEE		CIE Marks	SEE Marks	Total Marks	
1.	AEC	1BECXXXXX	MOOCs	3 (42)	0	0	42	03	03	90	50	50	100	03
2.	OEC	1BECXXXXX	MOOCs	3 (42)	0	0	42	03	03	90	50	50	100	03
3.	INT	1BECA803I	Internship	0	0	0	42	03	03	90	50	50	100	10
	Total			06 (84)	0	0	126	09	09	270	150	150	300	16

Professional Elective Courses

Sl. No.	Professional Elective – I		Professional Elective – II		Professional Elective – III		Professional Elective – IV	
	Name of the Course	Course Code	Name of the Course	Course Code	Name of the Course	Course Code	Name of the Course	Course Code
1	Internet of Things and Applications	1BECA503E	Wireless Networks	1BECA605E	Cyber Security	1BECA704E	Industrial IoT	1BECA705E
2	AI for Communication Engineering	1BECB503E	ASIC Design Fundamentals	1BECB605E	Image Processing	1BECB704E	Next Generation Internet Architectures	1BECB705E
3	Robotics and Autonomous Systems	1BECC503E	Edge Computing	1BECC605E	Optical Networks	1BECC704E	Embedded AI Systems	1BECC706E

Open Elective Courses

Sl. No.	Open Elective – I		Open Elective – II	
	Name of the Course	Course Code	Name of the Course	Course Code
1	Automotive Electronics		Real Time Embedded Systems	
2	Micro Electro Mechanical Systems		Wireless Networks and Mobile Architecture	

I/II Year Syllabus



BVV Sangha's
BASAVESHWAR ENGINEERING COLLEGE, BAGALKOTE
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

Course Code		:	1BECA104/204N	Introduction to Electronics & Communication Engineering	Semester	:	I/II
L:T:P		:	3:0:0		Course Type	:	Theory ESC-I
Hours/Sem.	Teaching	:	42 Hrs		CIE Marks	:	50
	Learning (TW+SL)	:	42 Hrs		SEE Marks	:	50
	Exam	:	6 Hrs		Total Marks	:	100
	Total Hrs.	:	90Hrs		Credits	:	03

Professional Competency:

Apply foundational concepts of electronic components, analog and digital circuits, and communication systems to design, analyze, and troubleshoot basic electronic and communication devices.

Course Outcomes:

After completion of the course, student will be able to:

CO1: Differentiate and analyze the applications of electronic devices and circuits.

CO2: Analyze the operation of oscillators, op amps and its applications.

CO3: Analyze different number systems, logic circuits and embedded systems.

CO4: Describe communication system and modulation techniques.

UNIT-I

11Hrs.

Power Supplies: Block diagram, PN junction diode characteristics, half-wave rectifier, full-wave rectifiers and filters, voltage regulators, voltage multipliers. **BJT Characteristics:** Introduction, Common base and common emitter Characteristics. **Self-study component:** Switched mode power supply.

UNIT-II

11Hrs.

Amplifier and Oscillators: Single stage CE amplifier, Barkhausen criterion, sinusoidal and non-sinusoidal oscillators, Ladder network oscillator, Wein bridge oscillator, (Only Concepts, working, and waveforms. No mathematical derivations). **Operational amplifiers:** Ideal op-amp; characteristics of ideal and practical op-amp; Practical op-amp circuits: Inverting and non-inverting amplifiers, voltage follower, summer, integrator, and differentiator. **Self-study component:** Op-amp as zero crossing detectors.

UNIT-III

10Hrs.

Boolean Algebra and Logic Circuits: Binary numbers, number base conversion, octal & hexa decimal numbers, complements, basic definitions, axiomatic definition of Boolean algebra, basic theorems and properties of Boolean algebra, digital logic gates. **Combinational logic:** Introduction, design procedure, Adders- Half adder, Full adder, Parallel adder. **Embedded**

Systems: Definition, Embedded systems vs general computing systems, Classification of Embedded Systems, Major application areas of Embedded Systems, Elements of an Embedded System, Core of the Embedded System, Microprocessor vs Microcontroller, RISC vs CISC. **Self-study component:** Half subtractor and full subtractor.

UNIT-IV

10Hrs.

Communication System: Modern communication system, types of communication systems.

Analog Modulation Schemes: Amplitude Modulation, Frequency Modulation (only concepts). **Digital Modulation Schemes:** Advantages of digital communication over analog communication, ASK, FSK, PSK, radio signal transmission multiple access techniques.

Self-study component: Opto-couplers.

Text Books:

1. Mike Tooley, "Electronic Circuits, Fundamentals & Applications", Elsevier, 4th Edition, 2015
2. M. Morris Mano, "Digital Logic and Computer Design", PHI Learning, 2008 ISBN-978-81-203-0417-84
3. D. P. Kothari, I. J. Nagrath, "Basic Electronics", McGraw Hill Education (India), 2nd edition, 2018
4. K V Shibu, "Introduction to Embedded Systems", McGraw Hill Education (India), Private Limited, 2nd Edition, 2016
5. S L Kakani and Priyanka Punglia, "Communication Systems", New Age International Publisher, 2017.

Reference Books:

1. Robert L. Boylestad, Louis Nashelsky, "Electronic Devices and Circuit Theory", Prentice Hall, 2006.
2. Floyd and Jain, "Digital fundamentals", Pearson, 8th edition, 2006.
3. Jacob Milliman, Christos C. Halkies, "Electronics Devices and Circuits", TMH, 2001

Course Articulation Matrix

Course Outcomes (COs)	Programme Outcomes (POs) and Wks											Program Specific Outcomes (PSOs)		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
CO1	3 (WK1, WK2, WK3, and WK4)	3 (WK1, WK2, WK3, and WK4)	2 (WK5)	-	2 (WK2, and WK6)	2 (WK1)	-	-	-	-	-	3	-	-
CO2	3 (WK1, WK2, WK3, WK4)	2 (WK1, WK2, WK3, and WK4)	3 (WK5)	-	2 (WK6)	1 (WK1)	-	-	-	-	-	3	-	-
CO3	3 (WK1, WK2, WK3 and WK4)	2 (WK2, WK3, and WK4)	3 (WK5)	-	3 (WK2)	-	-	-	1	-	-	3	-	-
CO4	3 (WK1, WK2, and WK3)	1 (WK3, and WK4)	1 (WK1)	-	2 (WK1)	1 (WK1)	-	-	1	-	1	3	-	-

Course Code		:	1BECA105C/205C	Fundamentals of Electronics and Communication Engineering	Semester	:	II
L:T:P		:	3:0:0		Course Type	:	Theory PSC
Hours/Sem.	Teaching	:	42 Hrs		CIE Marks	:	50
	Learning (TW+SL)	:	42 Hrs		SEE Marks	:	50
	Exam	:	6 Hrs		Total Marks	:	100
	Total Hrs.	:	90Hrs		Credits	:	03

Professional Competency:

Demonstrate the ability to apply foundational concepts of electronic components, analog and digital circuits, and communication systems to design, analyze, and troubleshoot basic electronic and communication systems.

Course Outcomes:

After completion of the course, student will be able to:

CO1: Apply the working principles, fundamental characteristics of various semiconductor diodes in basic electronic circuits.

CO2: Analyze the working principles and characteristics of BJT, FET.

CO3: Illustrate the fundamental concepts of operational amplifiers their configurations.

CO4: Design basic combinational circuits using the fundamental principles of digital systems and Analyze the fundamental concepts of communication systems.

UNIT-I

11 Hrs.

Construction, operation and characteristics of PN junction diode, Zener diode, Applications of diodes: Half wave rectifier, Full wave rectifier, Bridge rectifier, rectifier parameters and derivation, Rectifier with capacitor filter, voltage multipliers, Zener diode voltage regulator, and DC power supply.

UNIT-II

11 Hrs.

Bipolar Junction Transistors: Introduction, BJT Voltages & Currents, Common Base Characteristics, Common Emitter Characteristics, Single stage amplifier, RC phase shift oscillator. **Field Effect Transistor:** Junction Field Effect Transistor (N-Channel), JFET Characteristics, MOSFETs: Enhancement MOSFETs, Depletion Enhancement MOSFETs.

UNIT-III

10 Hrs.

Operational Amplifiers: Introduction, The Operational Amplifier, Block Diagram Representation of Typical Op-Amp, Schematic Symbol. Op-Amp Parameters: Gain, Input Resistance, Output Resistance, CMRR, Slew Rate, Bandwidth, and Input Offset Voltage, Input Bias Current and Input Offset Current, The Ideal Op-Amp, Open Loop Op-Amp Configurations: Differential, Inverting & Non Inverting Amplifier. Closed Loop Op-Amp Configurations: Differential, Inverting & Non Inverting Amplifier, Voltage Follower, Summing amplifier, Integrator, Differentiator.

UNIT-IV

10 Hrs.

Number Systems: Introduction, Decimal, Binary, Octal and Hexadecimal Number Systems, Conversion between number systems, Addition and subtraction. Digital Logic: Basic Theorems and Properties of Boolean Algebra, Logic Gates, Universal Gates implementation, Half and Full Adder, Parallel Adder.

Fundamentals of Communication: Elements of a Communication System, Modulation: Need for Modulation, Amplitude Modulation, Frequency Modulation, Waveforms. (Excluding

Derivation and Spectral Diagrams).

Text Books:

1. David A. Bell, "Electronic Devices and Circuits", 5th edition, Oxford University Press, 30th Impression, 2025.
2. Ramakanth A Gayakwad, Op-amps and Linear Integrated Circuits, 4th Edition, Pearson Education, 2015.
3. M. Morris Mano, "Digital Logic and Computer Design", Pearson Education India, 2017
4. Albert Paul Malvino, David J. Bates, Patrick E. Hoppe, "Electronic Principles", TMH, 9th Edition 2021.

Reference Books:

1. Robert L. Boylestad, Louis Nashelsky, "Electronic Devices and Circuit Theory", 10th Edition Prentice Hall, 2013.
2. Thomas L. Floyd, "Digital fundamentals", 11th edition, Pearson Education India.
3. Jacob Milliman, Christos C. Halkias, "Electronics Devices and Circuits", TMH, 2010

Course Articulation Matrix

Course Outcomes	Programme Outcomes (POs) and Wks											Program Specific Outcomes (PSOs)		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
CO1	3 (WK1, WK2, WK3 and WK4)	1	2 (WK5)	3 (WK8)	2 (WK2 and WK6)	1	-	-	-	-	-	3	-	-
CO2	3 (WK1, WK2, WK3 and, WK4)	2 (WK1, WK2, WK3 and WK4)	1 (WK1)	3 (WK8)	2 (WK2 and WK6)	1	-	-	-	-	-	3	-	-
CO3	3 (WK1, WK2 WK3 and, WK4)	1 (WK1)	-	2 (WK8)	-	-	-	-	-	-	-	3	-	-
CO4	3 (WK1, WK2 WK3 and, WK4)	2 (WK1, WK2, WK3 and WK4)	3 (WK5)	2 (WK8)	2 (WK2 and WK6)	1	-	-	-	-	-	3	-	-

Course Code		:	1BECA209L	Fundamentals of Electronics and Communication Engineering Lab	Semester	:	II
L:T:P		:	0:0:2		Course Type	:	Practical (PCCL)
Hours/Sem.	Teaching	:	26 Hrs		CIE Marks	:	50
	Learning (TW+SL)	:	00 Hrs		SEE Marks	:	50
	Exam	:	4Hrs		Total Marks	:	100
	Total Hrs.	:	30Hrs		Credits	:	01

Professional Competency:

Effectively conduct the Fundamentals of Electronics and Communication Engineering Laboratory by guiding students in performing, analyzing, and interpreting experiments on semiconductor devices, rectifiers, transistors and basic digital logic circuits with proper safety and instrumentation practices.

Course Outcomes:

After completion of the course, student will be able to:

CO1: Demonstrate the ability to construct and analyze the V-I characteristics of diodes and BJT.

CO2: Analyze diode-based and transistor-based circuits and measure output parameters.

CO3: Verify the truth tables of logic gates.

CO4: Design and implement the adder circuits.

List of Experiments

1. Measurement of cut in and reverse breakdown voltage of a PN junction diode.
2. Analysis of a diode as half-wave and full-wave rectifier (with and without capacitor filter).
3. Measurement of cut in and reverse breakdown voltage of Zener diode.
4. Zener diode as voltage regulator.
5. Study of input and output characteristics of BJT in CE configuration.
6. Transistor as a switch.
7. V-I characteristics and analysis of UJT.
8. Truth table verification of logic gates.
9. Implementation of boolean expression using logic gates.
10. Implementation of half adder and full adder.

Course Articulation Matrix

Course Outcomes (COs)	Programme Outcomes (POs) and Wks											Program Specific Outcomes (PSOs)		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
CO1	3 (WK1, WK2, WK3, WK4)	2 (WK1, WK2, WK3, WK4)	1 (WK1)	2 (WK1, WK2, WK3, WK4)	1 (WK1)	-	-	-	-	-	2 (WK8)	-	-	-
CO2	3 (WK1, WK2, WK3, WK4)	2 (WK1, WK2, WK3, WK4)	3 (WK5)	2 (WK1, WK2, WK3, WK4)	2 (WK6)	-	-	-	-	-	2 (WK8)	-	-	-
CO3	3 (WK1, WK2, WK3, WK4)	2 (WK1, WK2, WK3, WK4)	3 (WK5)	2 (WK1, WK2, WK3, WK4)	2 (WK6)	-	-	-	-	-	1	-	-	-
CO4	3 (WK1, WK2, WK3, WK4)	2 (WK1, WK2, WK3, WK4)	3 (WK5)	2 (WK1, WK2, WK3, WK4)	1 (WK6)	-	-	-	-	-	2 (WK8)	-	-	-

III/IV Year Syllabus

3rd Semester

Course Code		:	1BECA301C	Mathematical Methods for Signals and Systems	Semester	:	III
L:T:P		:	3:0:0		Course Type	:	BSC/ ASC
Hours/Sem.	Teaching	:	42 Hrs		CIE Marks	:	50
	Learning (TW+SL)	:	42 Hrs		SEE Marks	:	50
	Exam	:	06 Hrs		Total Marks	:	100
	Total Hrs.	:	90 Hrs		Credits	:	03

Professional Competency:

After completing this course, the student will acquire the **professional competency to classify, characterize and analyze continuous-time and discrete-time signals and systems** using time-domain and transform-domain techniques.

Course Outcomes:

After completion of the course, student will be able to:

CO1: Classify, characterize and perform mathematical operations on continuous-time and discrete-time signals and systems.

CO2: Characterize different classes of signals and systems in the time domain and transform domain.

CO3: Compute and interpret the response of linear time-invariant (LTI) systems to arbitrary inputs using time-domain and frequency-domain analysis tools.

CO4: Analyze discrete-time systems in the transform domain using Z-transform techniques to determine system behavior, stability, causality, and solutions of difference equations.

UNIT-I

11 Hrs.

Introduction to Continuous-time and Discrete-time Signals and Systems: Definition of signals and systems, sampling, classification of signals, elementary signals, basic operations on signals, interconnection of systems and operations, classification of systems and properties of systems

UNIT-II

10 Hrs.

Time domain representation of LTI systems: Convolution sum, convolution integral, impulse response representation of systems, properties of impulse response.

UNIT-III

11 Hrs.

Fourier and inverse Fourier transformation of signals: Introduction to complex sinusoidal signals and their use in Fourier representation of periodic signals, continuous time Fourier series (CTFS), discrete time Fourier series (DTFS), continuous time Fourier transform (CTFT), discrete time Fourier transform (DTFT), inverse discrete Fourier transformation (IDTFT), properties of DTFT,

UNIT-IV

10 Hrs.

Z -Transforms: Introduction, properties of ROC, properties of Z-transform, relation between Z - transform and Fourier transform. Inverse Z-transform, transform domain analysis of LTI systems, transfer function, stability and causality, solution of difference equations using Z-transform.

Text Books:

1. Simon Haykin and Barry VanVeen, “Signals and systems”, Edition2, John Wiley Indian Ed, 2008.
Reference Books:
1. Alan V. Oppenheim, Alan S. Willsky and Syed Hamid Nawab, “Signals and Systems”, Edition2, PHI, 2014.
2. Lathi, B. P. and Green, R., Signal Processing and Linear Systems, 2nd Edition, Oxford University Press, 2021, ISBN: 978-0190299040.
Web Links and Video Lectures:
• https://nptel.ac.in/courses/117101055 • https://www.digimat.in/nptel/courses/video/108104100/L02.html • https://nptel.ac.in/courses/117104074

Course Articulation Matrix

Course Outcomes (COs)	Programme Outcomes (POs) and Wks											Program Specific Outcomes (PSOs)		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
CO1	3 (WK1,WK2, WK3, WK4)	2 (WK1,WK2, WK3, WK4)	1 (WK4)	2 (WK8)	3 (WK6)	-	-	-	-	-	-	3 (WK1,WK2, WK3, WK4)	2 (WK2)	1 (WK9)
CO2	3 (WK1,WK2, WK3, WK4)	2 (WK1,WK2, WK3, WK4)	1 (WK4)	3 (WK8)	3 (WK6)	-	-	-	-	-	-	3 (WK1,WK2, WK3, WK4)	2 (WK2)	1 (WK9)
CO3	3 (WK1,WK2, WK3, WK4)	2 (WK1,WK2, WK3, WK4)	1 (WK4)	2 (WK8)	3 (WK6)	-	-	-	-	-	-	3 (WK1,WK2, WK3, WK4)	2 (WK2)	1 (WK9)
CO4	3 (WK1,WK2, WK3, WK4)	2 (WK1,WK2, WK3, WK4)	1 (WK4)	3 (WK8)	3 (WK6)	-	-	-	-	-	-	3 (WK1,WK2, WK3, WK4)	2 (WK2)	1 (WK9)

Course Code		:	1BECA302C	Network Analysis	Semester	:	III
L:T:P		:	3:0:0		Course Type	:	Theory (PCC)
Hours/Sem.	Teaching	:	42 Hrs		CIE Marks	:	50
	Learning (TW+SL)	:	42 Hrs		SEE Marks	:	50
	Exam	:	06 Hrs		Total Marks	:	100
	Total Hrs.	:	90 Hrs		Credits	:	03

Professional Competency:

Demonstrate the ability to analyze, model, and solve electrical and communication network problems using network theorems, transient analysis, two-port network parameters, attenuators, and equalizers for the design, testing, and maintenance of engineering systems in professional practice.

Course Outcomes:

After completion of the course, student will be able to:

CO1: Analyze DC and AC networks using source transformations, network reduction, loop and node analysis.

CO2: Apply network theorems to simplify and solve electrical circuits.

CO3: Use Laplace transforms and transient analysis techniques to evaluate switching responses of RL, RC, and RLC circuits.

CO4: Determine two-port network parameters and design attenuators and equalizers for communication networks.

UNIT-I

11 Hrs

Basic Concepts: Practical sources, source transformations, network reduction using Star - Delta transformation, loop and node analysis with linearly dependent and independent sources for DC and AC networks.

UNIT-II

10 Hrs

Network Theorems: Superposition, Millman's, Thevenin's, Norton's theorem, Maximum Power transfer theorems.

UNIT-III

11 Hrs

Laplace Transformation: Basic theorems, Laplace transform of Step, Ramp and Impulse functions, waveform synthesis.

Transient behavior and initial conditions: Behavior of circuit elements under switching condition and their representation, evaluation of initial and final conditions in RL, RC and RLC circuits for DC excitations.

UNIT-IV

10 Hrs

Two port network parameters: Definition of Z, Y, h and Transmission parameters, relationship between parameters sets.

Principles of Attenuators and equalizers: Design of Symmetrical T-type, π -type, Lattice and Bridged-T attenuator, Asymmetrical T, L, and PI attenuators. Design of two terminal series and shunt equalizers.

Text Books:

1. Roy Choudhary, "Networks and systems", New Age International Publications 3rd edition, 2010
2. Hayt, Kemmerly and Durbin, "Engineering Circuit Analysis", TMH Publications, 8th edition, 2012

Reference Books:

1. Van Valkenburg M. E., "Network Analysis", Prentice Hall of India Publishers, 3rd edition, 2011.
2. Mithal G. K., "Network Analysis", Khanna Publishers, 2022

Web links and Video Lectures (e-Resources):

- <https://nptel.ac.in/courses/108105159>
- <https://nptel.ac.in/courses/108102042>
- <https://psim.software.informer.com/11.1/>
- <https://www.ni.com/multisim>

Course Articulation Matrix

Course Outcomes (COs)	Program Outcomes (POs) and Wks											Program Specific Outcomes (PSOs)		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
CO1	3 (WK1,WK2,WK3,WK4)	2 (WK1,WK2,WK3)	1 (WK5)	1 (WK8)	1 (WK2,WK6)	--	--	1 (WK8)	--	--	--	3	--	--
CO2	3 (WK1,WK2,WK3,WK4)	3 (WK1,WK2,WK3,WK4)	1 (WK5)	1 (WK8)	1 (WK2,WK6)	--	--	1 (WK8)	--	--	--	3	--	--
CO3	3 (WK1,WK2,WK3,WK4)	2 (WK1,WK2,WK3)	2 (WK5)	1 (WK8)	2 (WK2,WK6)	--	--	1 (WK8)	--	--	--	3	--	--
CO4	3 (WK1,WK2,WK3,WK4)	3 (WK1,WK2,WK3,WK4)	1 (WK5)	1 (WK8)	1 (WK2,WK6)	--	--	1 (WK8)	--	--	--	3	--	--

Course Code		:	1BECA303C	Electronic Devices and Circuits	Semester	:	III
L:T:P		:	3:0:0		Course Type	:	Theory (PCC)
Hours/Sem.	Teaching	:	42 Hrs		CIE Marks	:	50
	Learning (TW+SL)	:	42 Hrs		SEE Marks	:	50
	Exam	:	06 Hrs		Total Marks	:	100
	Total Hrs.	:	90 Hrs		Credits	:	03

Professional Competency:

Design, analyze, and troubleshoot analog electronic circuits involving diodes, transistors, FET's, amplifiers, feedback networks, oscillators, and power supply systems for industrial and communication applications.

Course Outcomes:

After completion of the course, student will be able to:

CO1: Analyze and apply diode circuits, rectifiers, filters, voltage regulators, clippers, clampers, and voltage multiplier circuits used in electronic power supply applications.

CO2: Design and analyze BJT and FET biasing circuits to establish stable operating points for transistor-based electronic systems.

CO3: Analyze the performance of BJT and FET amplifier circuits, including single-stage, multistage, and feedback amplifier configurations.

CO4: Evaluate the operation and characteristics of power amplifiers, feedback amplifiers, and oscillator circuits used in analog electronic systems.

UNIT-I		11 Hrs
Diode Circuits: Introduction, Load- line Analysis, Series Diode Configurations, Parallel and Series – Parallel configurations, AND/OR Gates using diodes, Clippers, Clampers, Voltage-Multiplier Circuits. Power Supplies: Introduction, General Filter Considerations, Capacitor Filter, RC Filter, Discrete Transistor Voltage Regulation.		
UNIT-II		10 Hrs
Transistor Biasing: BJT Biasing-Voltage-Divider Bias, Accurate VDB Analysis, VDB Load Line and Q point, Two Supply Emitter Bias. FET Biasing: Introduction, Fixed- Bias Configuration, Self- Bias Configuration, Voltage- Divider Biasing, Common- Gate Configuration, Depletion-Type MOSFETs, Enhancement-Type MOSFETs, p- Channel FETs, Universal JFET Bias Curve.		
UNIT-III		11 Hrs
BJT Amplifiers: Single-Stage Common- Emitter Amplifier, Single-Stage Common-Source Amplifier, Series Voltage Negative Feedback, Two-Stage CE Amplifier with Series Voltage Negative Feedback. FET Amplifiers: Introduction, JFET Small Signal Model, Fixed Bias Configuration, Self-Bias Configuration and Voltage-Divider Configuration.		
UNIT-IV		10 Hrs

Power Amplifier: Introduction-Definitions and Amplifier Types, Series-Fed Class A Amplifier, Transformer-Coupled Class A Amplifier, Class B Amplifier Operation, Class B Amplifier Circuits, Class C and Class D Amplifiers. **Feedback and Oscillator Circuits:** Feedback Concepts, Feedback Connection Types, Feedback Amplifier-Phase and Frequency Considerations, Oscillator Operation, Phase-Shift Oscillator, Wien Bridge Oscillator

Text Books:

1. Robert L. Boylestad and Louis Nashelsky, "Electronic Devices and Circuit Theory" Pearson Education, 10th edition, 2009.
2. David A. BELL, "Electronic Devices and Circuits", Oxford University Press, , 5th Edition, 2008.

Reference Books:

1. Albert Malvino and David J Bates, "Electronic Principles" TMH Publications, 7th edition, 2008

Course Articulation Matrix

Course Outcomes (COs)	Program Outcomes (POs) and Wks											Program Specific Outcomes (PSOs)		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
CO1	3 (WK1,WK2,WK3, WK4)	2 (WK1,WK2,WK3)	1 (WK5)	1 (WK8)	1 (WK2, WK6)	--	--	1 (WK8)	--	--	--	3	--	--
CO2	3 (WK1,WK2,WK3, WK4)	3 (WK1, WK2, WK3, WK4)	1 (WK5)	1 (WK8)	1 (WK2, WK6)	--	--	1 (WK8)	--	--	--	3	--	--
CO3	3 (WK1,WK2,WK3, WK4)	2 (WK1,WK2,WK3)	2 (WK5)	1 (WK8)	2 (WK2, WK6)	--	--	1 (WK8)	--	--	--	3	--	--
CO4	3 (WK1,WK2,WK3, WK4)	3 (WK1, WK2, WK3, WK4)	1 (WK5)	1 (WK8)	1 (WK2, WK6)	--	--	1 (WK8)	--	--	--	3	--	--

Course Code :		1BECA304C	Digital System design using Verilog	Semester :	III
L:T:P :		3:0:0		Course Type :	Theory (PCC)
Hours/Sem.	Teaching :	42Hrs		CIE Marks :	50
	Learning (TW+SL) :	42Hrs		SEE Marks :	50
	Exam :	06 Hrs		Total Marks :	100
	Total Hrs. :	90Hrs		Credits :	03

Professional Competency:

Ability to simplify Boolean functions, analyze and design combinational and sequential digital circuits, and model digital systems using Verilog HDL for hardware implementation

Course Outcomes:

After completion of the course, student will be able to:

CO1: Simplify Boolean functions using K-map and the Quine-McCluskey minimization technique.

CO2: Analyze and design combinational logic circuits.

CO3: Analyze the concept of flip-flops (SR, D, T, and JK) and design synchronous sequential circuits using flip-flops.

CO4: Model combinational circuits (adders, subtractors, multiplexers) and sequential circuits using Verilog descriptions.

UNIT-I

12Hrs

Principles of Combinational Logic: Definition of combinational logic, Canonical forms, Generation of switching equations from truth tables, Karnaugh maps up to 4 variables, Quine-McCluskey Minimization Technique. Quine-McCluskey using Don't Care Terms.

Logic Design with MSI Components and Programmable Logic Devices: Binary Adders and Subtractors, Comparators, Decoders, Encoders, Multiplexers, Programmable Logic Devices (PLDs).

UNIT-II

10Hrs

Introduction to Verilog: Structure of Verilog module, Operators, Data Types, Styles of Description.

Verilog Data flow description: Highlights of Data flow description, Structure of Dataflow description.

UNIT-III

10Hrs

Flip-Flops and its Applications: The Master-Slave Flip-flops (Pulse-Triggered flip-flops): SR flip-flops, JK flip-flops, Characteristic equations, Registers, Binary Ripple Counters, Synchronous Binary Counters, Counters based on Shift Registers, Design of Synchronous mod-n Counter using clocked T, J K, D and SR flip-flops, State diagrams.

UNIT-IV

10Hrs

Verilog Behavioral description: Structure, Variable Assignment Statement, Sequential Statements, Loop Statements, Verilog Behavioral Description of Multiplexers.

Verilog Structural description: Highlights of Structural description, Organization of structural description, Structural description of ripple carry adder.

Text Books:

1. Digital Logic Applications and Design by John M. Yarbrough, Thomson Learning, 2001.
2. Digital Principles and Design by Donald D. Givone, McGrawHill, 2002.
3. HDL Programming: VHDL and Verilog by Nazeih M. Botros, 2009 reprint, Dream tech Press.

Reference Books:

1. Fundamentals of Logic Design by Charles H. Roth Jr., Cengage Learning.

2. Logic Design by Sudhakar Samuel, Pearson/Sanguine, 2007.
3. Fundamentals of HDL by Cyril P.R., Pearson/Sanguine, 2010.

Course Articulation Matrix

Course Outcomes (COs)	Program Outcomes (POs) and WKs											Program Specific Outcomes (PSOs)		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
CO1	3 (WK1, WK2)	3 (WK1, WK2, WK3)	1 (WK3)	–	–	–	–	–	–	–	–	2	1	–
CO2	3 (WK1, WK2)	3 (WK1, WK2, WK3)	3 (WK3, WK4)	1 (WK4)	1 (WK5)	–	–	–	–	–	–	3	2	–
CO3	3 (WK1, WK2)	3 (WK1, WK2, WK3)	3 (WK3, WK4)	2 (WK4)	1 (WK5)	–	–	–	–	–	–	3	3	–
CO4	2 (WK1, WK2)	2 (WK1, WK2)	3 (WK3, WK4)	1 (WK4)	3 (WK5)	–	–	–	–	–	–	3	3	1

Course Code		:	1BECA305C	Linear Integrated Circuits	Semester	:	III
L:T:P*		:	3:0:0		Course Type	:	Theory (PCC)
Hours/Sem.	Teaching	:	42Hrs.		CIE Marks	:	50
	Learning (TW+SL)	:	42 Hrs.		SEE Marks	:	50
	Exam	:	06 Hrs.		Total Marks	:	100
	Total Hrs.	:	90 Hrs.		Credits	:	03

Professional Competency:

Apply the principles of linear integrated circuits to analyze, design, and develop analog signal processing and conditioning circuits for engineering applications.

Course Outcomes:

After completion of the course student will be able to

CO1: Identify and analyze the different configurations of differential amplifier.

CO2: Analyze the different feedback amplifiers and various parameters of practical op-amp.

CO3: Design the op amp circuits to perform mathematical operations and active filters.

CO4: Design different types of waveform generators, data converters, precision rectifier, comparators and converters.

UNIT-I

11 Hrs.

Differential Amplifiers: Introduction, differential amplifier, differential amplifier circuit configurations, dual- input balanced output differential amplifier, dual- input unbalanced output differential amplifier, single input balanced output differential amplifier, single input unbalanced output differential amplifier, constant current bias, current mirror, cascaded differential amplifier stages, level translator.

Introduction to operational amplifiers: Introduction, block diagram representation of a typical op-amp, the ideal op-amp, equivalent circuit of an op-amp, ideal voltage transfer curve, open loop op-amp configurations.

UNIT-II

10 Hrs.

An op-amp with negative feedback: Block diagram representation of feedback configuration, voltage series feedback amplifier, voltage shunt feedback amplifier, differential amplifier.

The practical op-amp: Input offset voltage, input bias current, input offset current, total output offset voltage, common mode configuration and common mode rejection ratio.

UNIT-III

11 Hrs.

General applications: The peaking amplifier, summing, scaling and averaging amplifiers, integrator, differentiator.

Active filters: First order and second order low pass butter worth filter, first order and second order high pass butter worth filter, higher order filters, band pass filter, band reject filters, all pass filters.

UNIT-IV

10 Hrs.

Oscillators and waveform generator: Introduction, phase shift oscillator, Wien bridge oscillator, square wave generator, triangular wave generator, voltage-controlled oscillator.

Comparators and converters: Basic comparator, zero crossing detector, Schmitt trigger, DAC

with R-2R ladder network, ADC using successive approximation type, peak detector, sample and hold circuit.

Text Books:

1. Ramakanth A. Gayakwad, "Operational Amplifiers and Linear Integrated Circuits", 3rd & 4th Edition, PHI Learning Pvt. Ltd., New Delhi.
2. D. Roy Choudhury and Shail B. Jain, "Linear Integrated Circuits", 4th Edition, New Age International Publishers.

Reference Books:

1. James M. Fiore, "Op-Amps and Linear Integrated Circuits: Concepts and Applications", Cengage Learning, 2009.
2. Sergio Franco, "Design with Operational Amplifiers and Analog Integrated Circuits", 4th Edition, McGraw-Hill Education.
3. David A. Bell, "Operational Amplifiers and Linear Integrated Circuits: Theory and Applications", Oxford University Press.

Web Links and Video Lectures (e-Resources):

Integrated Circuits and Applications:

- Instructor: Prof. Hardik Jeetendra Pandya (IISc Bangalore)
- Course Type: Swayam-NPTEL Course
- Topics: Internal configurations of ICs, operational amplifiers (Op-Amps), filters, and data converters used in instrumentation and communication

Linear Integrated Circuits:

- Instructor: Dr. Yedukondala Rao Veeranki (NIT Puducherry)
- Course Type: Swayam-NPTEL Course
- Topics: Op-amp fabrication, characteristics, linear/nonlinear applications, phase-locked loops (PLLs), waveform generators, and specialized ICs (like 555 timers)

Course Articulation Matrix

Course Outcomes (COs)	Program Outcomes (POs) and Wks											Program Specific Outcomes (PSOs)		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
CO1	3 (WK1, WK2, WK3, WK4)	2 (WK1, WK2, WK3, WK4)	-	-	-	-	-	1	-	-	1 (WK8)	-	2	-
CO2	2 (WK1, WK2, WK3)	3 (WK2, WK3, WK4)	2 (WK5)	1 (WK4)	2 (WK6)	1 (WK1, WK5, WK7)	1 (WK9)	1	1	-	1 (WK8)	-	2	-
CO3	2 (WK1, WK2, WK3)	3 (WK4)	3 (WK5)	2 (WK4)	3 (WK6)	1 (WK1, WK5, WK7)	-	1	1	-	1 (WK8)	-	2	-
CO4	2 (WK1, WK2)	2 (WK3, WK4)	3 (WK5)	2 (WK4)	3 (WK6)	1 (WK1, WK5, WK7)	1 (WK9)	1	1	-	1 (WK8)	-	2	-

Course Code		:	1BECA306C	Data Structures using C++	Semester	:	III
L:T:P*		:	3:0 :0		Course Type	:	Theory (PCC)
Hours/Sem.	Teaching	:	42 Hrs.		CIE Marks	:	50
	Learning (TW+SL)	:	42 Hrs.		SEE Marks	:	50
	Exam	:	06 Hrs.		Total Marks	:	100
	Total Hrs.	:	90 Hrs.		Credits	:	03

Professional Competency:

Proficient in designing, implementing, and optimizing fundamental data structures such as arrays, linked lists, stacks, queues, trees, using C++. Adept at applying these structures to solve problems efficiently with a strong understanding of memory management and performance trade-offs.

Course Outcomes:

After completion of the course, student will be able to:

CO1: Demonstrate the ability to implement C++ programs using functions, recursion, exception handling, and dynamic memory allocation.

CO1: Apply stack data structures and templates in C++ to solve problems such as expression conversion, evaluation, and parenthesis checking.

CO3: Design and implement queue structures circular, priority, and Deque using templates and analyze their applications.

CO4: Develop and manipulate dynamic data structures such as linked lists and binary trees

To represent hierarchical data and perform tree traversals.

Unit-I	Hrs.
C++ Review: Introduction, Functions and parameters, Exceptions, Dynamic memory allocation, Your very own data type, Recursion. (Section 1.1 to 1.5 and 1.7 of Text book 1)	
Unit-II	Hrs.
Stacks: Concept of stacks, Stacks, Stack Abstract Data Type, Representation of stacks using sequential organization (arrays), Stacks using template, Applications of stack: Converting infix	

expression to postfix and prefix expressions, Evaluating the postfix expression, Checking well-formed (nested) parenthesis, Reversing a string. Recursion: Introduction, Recurrence, use of stack in recursion. (Section 3.1 to 3.5, and 3.7 (First four applications), 4.1 to 4.3 of Text book 2)	
Unit-III	Hrs.
Recursion: Variants of recursion, Execution of recursive calls, Recursive functions, Examples. Queues: Concept of queues, Queue as abstract data type, Realization of queues using arrays, Circular queue, Multi-queues, Deque, Priority queue, Applications of queues, Queues using template. (Section 4.4 to 4.6, and 5.1 to 5.9 of Text book 2)	
Unit-IV	Hrs.
Linked Lists: Introduction, Linked List, Realization of linked lists, Linked list abstract data type, Dynamic memory management, Linked list variants, Doubly linked list, Examples. Trees: Introduction, Types of trees, Binary tree, Realization of a binary tree, Binary tree traversal: Preorder, Inorder, Postorder, Examples. (Section 6.1 to 6.7, 7.1-7.3,7.5, and 7.7 (7.7.1-7.7.3) of Text book 2)	
Text Books:	
1. <i>Data Structures, Algorithms and Applications in C++ by Sartaj Sahni, Universities Press, Second Edition.</i> 2. <i>Data Structures Using C++ by Varsha H. Patil, Oxford University Press, 2012</i>	
Reference Books:	
1. <i>Data Structures and Algorithm Analysis in C++ by Mark Allen Weiss, Pearson, 4th Edition, 2013</i> 2. <i>Data Structures and Algorithms in C++ by Michael T. Goodrich, Roberto Tamassia, David M. Mount, Wiley India, 2nd Edition, 2011</i> 3. <i>Data Structures Using C++ by D.S. Malik, Cengage Learning, 2nd Edition, 2010</i>	
Web Links and Video Lectures (e-Resources):	
• LearnCpp-Comprehensive Modern C++ Tutorial • GeeksforGeeks-Data Structures and Algorithms E-Learning Links • NPTEL-Programming in C++ • SWAYAM-online Courses in C++ and Data Structures • MIT open Course Ware-Introduction to Algorithms	

Matrix to describe the mapping of COs with POs (considering Wks) and PSOs

Course Outcomes (COs)	Program Outcomes and (Wks)											Program Specific Outcomes (PSOs)		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
CO1	3 (WK1, WK2, WK3, WK4)	2 (WK1, WK2, WK3, WK4)	-	-	-	-	-	1	-	-	1 (WK8)	-	2	2
CO2	2 (WK1, WK2, WK3)	3 (WK2, WK3, WK4)	2 (WK5)	1 (WK5)	2 (WK6)	1 (WK1, WK5, WK7)	1 (WK 9)	1	1	-	1 (WK8)	-	2	2
CO3	2 (WK1, WK2, WK3)	3 (WK4)	3 (WK5)	2 (WK4)	3 (WK6)	1 (WK1, WK5, WK7)	-	1	1	-	1 (WK8)	-	2	1
CO4	2 (WK1, WK2)	2 (WK3, WK4)	3 (WK5)	2 (WK4)	3 (WK6)	1 (WK1, WK5, WK7)	1 (WK 9)	1	1	-	1 (WK8)	-	2	1

Laboratory Courses Syllabus

Course Code		:	1BECA307L	Electronic Devices and Circuits Laboratory	Semester	:	III
L:T:P*		:	0:0:2		Course Type	:	Practical (PCCL)
Hours/Sem.	Teaching	:	26 Hrs.		CIE Marks	:	50
	Learning (TW+SL)	:	00 Hrs		SEE Marks	:	50
	Exam	:	04 Hrs.		Total Marks	:	100
	Total Hrs.	:	30 Hrs.		Credits	:	01

Professional Competency:

Design, analyze, implement, and simulate analog electronic circuits and systems using semiconductor devices, laboratory instruments, and modern software tools for electronic engineering applications.

Course Outcomes:

After completion of the course, student will be able to:

- CO1:** Design and realize diode-based circuits such as clippers, clampers, rectifiers, and voltage regulators.
- CO2:** Analyze the characteristics and applications of semiconductor devices including PN junction diodes, FETs, and MOSFETs.
- CO3:** Design and implement transistor-based amplifiers, power amplifiers, oscillators, and feedback amplifiers.
- CO4:** Simulate and analyze rectifier, regulators, clipper, clamper and amplifier circuits using simulation tools.

List of Experiments or Programs List

1. Design and verification of clipper circuits
2. Design and verification of clamper circuits
3. Verification of V-I characteristics of FET and MOSFET
4. Design and analysis of common emitter amplifier circuit
5. Design and analysis of series voltage feedback amplifier circuit
6. Design and analysis of common source amplifier circuit
7. Design and analysis of series fed class-A power amplifier circuit
8. Design and analysis of RC phase shift oscillator
9. Design and analysis of 5V regulated power supply
10. Design and analysis of UJT relaxation oscillator
11. Simulation and analysis of V-I characteristics of a PN Junction Diode
12. Simulation of half wave and full wave rectifier
13. Simulation of zener diode as voltage regulator
14. Simulation and frequency response analysis of a Common Emitter Amplifier
15. Simulation of clipper and clamper circuits

Course Articulation Matrix

Course Outcomes (COs)	Program Outcomes (POs) and WKs											Program Specific Outcomes (PSOs)		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
CO1	3 (WK1, WK3, WK4)	2 (WK1, WK3)	-	1 (WK8)	1 (WK6)	-	-	1 (WK9)	1 (WK9)	1 (WK9)	-	3	1	-
CO2	3 (WK2, WK3, WK4)	3 (WK2, WK3, WK4)	1 (WK5)	2 (WK8)	2 (WK6)	-	-	1 (WK9)	1 (WK9)	1 (WK9)	-	3	1	-
CO3	2 (WK3, WK4)	2 (WK3, WK4)	2 (WK5)	1 (WK8)	3 (WK2, WK6)	-	-	1 (WK9)	1 (WK9)	1 (WK9)	-	3	1	-
CO4	1 (WK3)	1 (WK3)	1 (WK5)	1 (WK8)	3 (WK2, WK6)	-	-	1 (WK9)	1 (WK9)	1 (WK9)	-	3	1	-

Course Code		:	1BECA308L	Digital System Design Using Verilog Laboratory	Semester	:	III
L:T:P*		:	0:0:2		Course Type	:	Practical PCCL
Hours/Sem.	Teaching	:	26 Hrs.		CIE Marks	:	50
	Learning (TW+SL)	:	00 Hrs.		SEE Marks	:	50
	Exam	:	4 Hrs.		Total Marks	:	100
	Total Hrs.	:	30 Hrs.		Credits	:	01

Professional Competency:

Professional Competency: Ability to design, simulate, and verify digital circuits using Verilog HDL, synthesize designs, and implement them on programmable logic devices.

Course Outcomes:

After completion of the course, student will be able to:

CO1: To develop skills in designing, simulating, and verifying combinational and sequential digital circuits using Verilog HDL.

CO2: To provide hands-on experience in synthesizing Verilog designs and implementing them on programmable logic devices.

List of Experiments or Programs List

1. To simplify the given Boolean expressions and realize using Verilog program.
2. To realize Adder/Subtractor (Full/half) circuits using Verilog data flow description.
3. To realize 4-bit ALU using Verilog program.
4. To realize the following Code converters using Verilog Behavioral description
 - a) Gray to binary and vice versa
 - b) Binary to excess3 and vice versa
5. To realize using Verilog Behavioral description 8:1 mux, 8:3 encoder, and Priority encoder
6. To realize using Verilog Behavioral description: 1:8 De-mux, 3:8 decoder, 2-bit Comparator
7. To realize using Verilog Behavioral description: Flip-flops: a) JK type b) SR type c) T type and d) D-type
8. To realize Counters-up/down (BCD and binary) using Verilog Behavioral description.
9. Write Verilog code for the given sequential circuit problem statement or state diagram.

Demonstration Experiments (For CIE only—not to be included for SEE)

Use FPGA/CPLD kits for downloading Verilog codes and check the output for interfacing experiments.

10. Verilog Program to interface a Stepper motor to the FPGA/CPLD and rotate the motor in the specified direction (by N steps).

Open ended Experiments

1. To realize 4-bit Barrel shifter using Verilog program
2. To realize Booth algorithm for multiplication using Verilog program
3. To realize 4-bit parallel adder using 1 bit adder as component using Verilog program
4. To realize 4-bit ring counter using D-flip-flop as a component using Verilog program

To realize 4-bit up counter using T-flip-flop as component using Verilog program

4th SEMESTER

Course Code		:	1BECA401C	Digital Signal Processing	Semester	:	IV
L:T:P*		:	3:0:0		Course Type	:	Theory (PCC)
Hours/Sem.	Teaching	:	42 Hrs.		CIE Marks	:	50
	Learning (TW+SL)	:	42 Hrs.		SEE Marks	:	50
	Exam	:	06 Hrs.		Total Marks	:	100
	Total Hrs.	:	90 Hrs.		Credits	:	03

Professional Competency:

Highly skilled in the design, analysis, and implementation of Digital Signal Processing algorithms for real-time systems. Adept at transforming complex mathematical concepts into optimized software and hardware architectures, specializing in noise reduction, filtering, and spectral analysis for audio, wireless communications, or sensor systems.

Course Outcomes:

After completion of the course student will be able to

CO1: Compute and analyze DFT and IDFT of given functions.

CO2: Calculate DFT and IDFT of given signals using FFT algorithms.

CO3: Design and realize IIR digital filters using Butterworth and Chebyshev approximations.

CO4: Design and realize FIR digital filters using windowing and frequency sampling techniques.

UNIT-I

11 Hrs.

Discrete Fourier Transform: Frequency domain sampling and reconstruction of discrete time signals, DFT as a linear transformation, DFT relationship with other transforms, properties of DFT, multiplication of two DFTs, circular convolution and additional properties of DFT. Application of DFT in linear filtering: overlap add and overlap save method.

UNIT-II

10 Hrs.

Fast Fourier Transform (FFT) Algorithms: Need for efficient computation of DFT, Radix 2 FFT algorithms for computation of DFT and IDFT: Decimation in time and decimation in frequency algorithms. Goertzel algorithm and chirp-Z transform algorithm.

UNIT-III

11 Hrs.

IIR filter design: Characteristics of analog filters – Butterworth and Chebyshev filters. Design of IIR filters from analog filters (i.e. Butterworth and Chebyshev), Transformation techniques: Impulse invariance method, Approximation of derivative (Backward difference and Forward difference) method. Bilinear transformation method.

UNIT-IV

10 Hrs.

FIR filter design: Introduction to FIR filters, Design of FIR filters using windowing (Rectangular, Hamming, Hanning and Bartlet) method, FIR filter design using frequency sampling method. Implementation of discrete time systems - Structures for IIR and FIR systems: Direct form I, Direct form II, cascade and parallel realization.

Reference Books:

1. John G. Proakis and Manolakis, "Digital Signal Processing-Principles Algorithms and

Applications” PHI Publication, III Edition, 1997.

2. Oppenheim and Schaffer, “Discrete Time Signal Processing” PHI Publication, III Edition, 2003.

Course Articulation Matrix

Course Outcomes (COs)	Program Outcomes (POs) and WKs											Program Specific Outcomes (PSOs)	
	1	2	3	4	5	6	7	8	9	10	11	1	2
CO1	3 (WK1,WK2,WK3,WK4)	2 (WK1,WK2,WK3)	1 (WK5)	1 (WK8)	1 (WK2,WK6)	--	--	1 (WK8)	--	--	--	3	--
CO2	3 (WK1,WK2,WK3,WK4)	3 (WK1, WK2, WK3, WK4)	1 (WK5)	1 (WK8)	1 (WK2, WK6)	--	--	1 (WK8)	--	--	--	3	--
CO3	3 (WK1,WK2,WK3,WK4)	2 (WK1,WK2,WK3)	2 (WK5)	1 (WK8)	2 (WK2, WK6)	--	--	1 (WK8)	--	--	--	3	--
CO4	3 (WK1,WK2,WK3,WK4)	3 (WK1, WK2, WK3, WK4)	1 (WK5)	1 (WK8)	1 (WK2, WK6)	--	--	1 (WK8)	--	--	--	3	--

Course Code		:	1BECA402C	Analog and Digital Communication	Semester	:	04
L:T:P		:	3:0:0		Course Type	:	Theory (PCC)
Hours/Sem.	Teaching	:	42 Hrs		CIE Marks	:	50
	Learning (TW+SL)	:	42 Hrs		SEE Marks	:	50
	Exam	:	06 Hrs		Total Marks	:	100
	Total Hrs.	:	90 Hrs		Credits	:	03

Professional Competency:

Apply the principles of analog and digital communication systems to analyze, design, and evaluate modulation, coding, and data transmission techniques used in modern communication networks

Course Outcomes:

After completion of the course, student will be able to:

CO1: Analyze analog modulation and demodulation techniques.

CO2: Apply sampling and waveform coding techniques for signal transmission.

CO3: Analyze baseband transmission and coherent digital modulation schemes.

CO4: Evaluate non coherent and spread spectrum communication systems.

UNIT-I

11 Hrs

Amplitude Modulation (AM) Fundamentals: AM concepts, time domain and frequency domain description, power relations, square law modulator, envelope detector, ring modulator, synchronous detector, single side band and vestigial side bands.

Angle Modulation: Concept of angle modulation, relation between frequency and phase modulation, FM generation using direct and indirect method, demodulation of FM using PLL, FM radio.

UNIT-II

10 Hrs

Sampling Process: Sampling theorem, quadrature sampling of band pass signals, reconstruction of message from its samples, signal distortion in sampling

Waveform Coding Techniques: Pulse code modulation, channel noise and error probability, quantization noise and SNR, robust quantization, differential pulse code modulation, delta modulation and adaptive delta modulation.

UNIT-III

11 Hrs

Baseband Data Transmission: Discrete PAM signals, Power Spectral Density (PSD) of Line codes (Power Spectrum of Discrete PAM signals). Baseband transmission of binary data, Inter Symbol Interference (ISI), Nyquist criterion for distortion less baseband binary transmission (or Zero ISI), Nyquist solution for zero ISI, eye diagram and performance analysis.

Coherent Binary Modulation Techniques: Binary Phase Shift Keying techniques (BPSK), Binary Frequency Shift Keying techniques (BFSK): Generation, detection and error probability calculation. **Coherent Quadrature Modulation Techniques:** Quadrature Phase Shift Keying (QPSK) transmitter and receiver.

UNIT-IV

10 Hrs

Non Coherent Orthogonal Modulation Techniques: Binary Frequency shift keying techniques (BFSK), Differential Phase Shift Keying (DPSK) Transmitter and Receiver

M-Ary Modulation Techniques: M-ary PSK, M-ary QAM

Spread Spectrum Modulation: Pseudo noise sequence, a notion of spread spectrum, and Direct Sequence Spread Spectrum with Coherent Binary Shift Keying, frequency hopped spread spectrum, spread spectrum applications.

Text Books:

1. B. P. Lathi "Modern Digital and Analog Communication Systems", Oxford University, 3rd Edition, 2006
2. Simon Haykin "Digital Communications", John Wiley & Sons, 2013
3. Simon Haykin, "Digital Communication Systems", John Wiley & Sons, First Edition, 2014

Reference Books:

1. John G Proakis and Masoud Salehi, "Fundamentals of Communication Systems", Pearson Education, 2014
2. Bernard Sklar and Prabitra kumar Ray, "Digital Communication Fundamentals and Applications", Pearson Publications, 2010
3. Louis E Frenzel, "Principles of Electronic Communication Systems" Mc Graw Hill Education (India) Private Limited, 3rd Edition, 2016.

Web links and Video Lectures (e-Resources):

- Principles of Communication Systems <https://nptel.ac.in/courses/108104091>
- Communication Engineering <https://nptel.ac.in/courses/117102059>
- https://onlinecourses.nptel.ac.in/e-learning/preview/noc26_ee03

Course Articulation Matrix

Course Outcomes (COs)	Program Outcomes (POs) and Wks											Program Specific Outcomes (PSOs)		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
CO1	3 (WK1,WK2,WK3,WK4)	2 (WK1,WK2,WK3)	1 (WK5)	1 (WK8)	1 (WK2,WK6)	--	--	1 (WK2,WK6)	1 (WK2,WK6)	--	1 (WK8)	3	--	1
CO2	3 (WK1,WK2,WK3,WK4)	2 (WK1,WK2,WK3)	2 (WK5)	1 (WK8)	1 (WK2,WK6)	--	--	1 (WK2,WK6)	1 (WK2,WK6)	--	1 (WK8)	3	--	1
CO3	3 (WK1,WK2,WK3,WK4)	3 (WK1,WK2,WK3,WK4)	2 (WK5)	1 (WK8)	2 (WK2,WK6)	--	--	1 (WK2,WK6)	1 (WK2,WK6)	--	1 (WK8)	3	--	1
CO4	3 (WK1,WK2,WK3,WK4)	3 (WK1,WK2,WK3,WK4)	3 (WK5)	1 (WK8)	1 (WK2,WK6)	--	--	1 (WK2,WK6)	1 (WK2,WK6)	--	1 (WK8)	3	--	1

Course Code		:	1BECA403C	Embedded Systems and ARM Microcontrollers	Semester	:	IV
L:T:P		:	2:0:0		Course Type	:	Theory (PCC)
Hours/Sem.	Teaching	:	28Hrs		CIE Marks	:	50
	Learning (TW+SL)	:	26Hrs		SEE Marks	:	50
	Exam	:	06 Hrs		Total Marks	:	100
	Total Hrs.	:	60 Hrs		Credits	:	02

Professional Competency:

Ability to understand embedded systems and ARM architecture fundamentals, including registers and instruction set, and apply this knowledge to write and interpret simple ARM assembly programs for embedded applications.

Course Outcomes:

After completion of the course, student will be able to:

- CO1:** Compare embedded systems and general-purpose computing systems based on their architectural features, design constraints, performance requirements, and quality attributes.
- CO2:** Apply knowledge of ARM architecture, register organization, and memory mapping to develop, assemble, and debug basic ARM assembly language programs
- CO3:** Develop ARM assembly programs using arithmetic/logic instructions, the barrel shifter, and conditional loops or subroutines.
- CO4:** Apply ARM stack operations and indexed addressing modes to implement efficient memory access and data storage techniques in assembly language programs

UNIT-I

07Hrs

Introduction: Embedded systems and general purpose computer systems, classifications, applications and purpose of embedded systems. **Core of Embedded Systems:** Microprocessors vs. microcontrollers, RISC vs. CISC controllers, bigendian vs. little endian processors. **Characteristics and quality attributes of embedded systems:** Characteristics, operational and nonoperational quality attributes.

UNIT-II

07Hrs

ARM Architecture and Assembly Language Programming: The ARM Memory Map, Load and Store Instructions in ARM, ARM CPSR (Current Program Status Register), ARM Data Format and Directives Introduction to ARM Assembly Programming, Assembling an ARM Program, The Program Counter and Program ROM Space in the ARM, Some ARM Addressing Modes, RISC Architecture in ARM.

UNIT-III

07Hrs

Arithmetic and Logic Instructions and Programs: Arithmetic Instructions, Logic Instructions, Rotate and Barrel Shifter. **Branch, Call, and Looping in ARM:** Looping and Branch Instructions, Calling Subroutine with BL, ARM Time Delay and Instruction Pipeline, Conditional Execution

UNIT-IV

07Hrs

ARM Memory Map, Memory Access, and Stack: ARM Memory Map and Memory Access, Stack and Stack Usage in ARM, Advanced Indexed Addressing Mode.

Text Books:

1. Shibu K V, "Introduction to Embedded Systems", Second Edition, McGraw Hill Education.
2. Muhammad Ali Mazidi , Sarmad Naimi , Sepehr Naimi , Janice Mazidi Copyright © 2013 Mazidis and Naimis, All rights reserved (A portion of this book was taken from "The 80x86 IBM PC & Compatible Computers Vol 1 &2: 4th edition" and was previously published by Pearson Education, Inc.)

Reference Books:

1. William Hohl ,(2009), ARM Assembly Language(Fundamentals and Techniques (1st edition), Publisher CRC Press
2. Steve Furber (2000) , Arm System On chip Architecture , Edition 2 Pearson publication

Course Articulation Matrix

Course Outcomes (COs)	Program Outcomes (POs) and Wks											Program Specific Outcomes (PSOs)		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
CO1	3 (WK1, WK2, WK3, and WK4)	2 (WK1, WK2, WK3, and WK4)	2 (WK1, WK2, WK3, and WK4)	-	1 (WK4)	1 (WK4)	-	1	1	1		-	2	-
CO2	3 (WK1, WK2, WK3)	2 (WK1, WK2, WK3, and WK4)	3 (WK5)	-	3 (WK6)	1 (WK1, WK4 and WK7)	-	1	1		1 (WK8)	-	2	-
CO3	3 (WK1, WK2, WK3)	2 (WK1, WK2, WK3, and WK4)	3 (WK5)	-	3 (WK6)	1 (WK1, WK6 and WK7)	-	1	1		1 (WK8)	-	2	-
CO4	3 (WK1, WK2, WK3)	2 (WK1, WK2, WK3, and WK4)	2 (WK5)	-		1 (WK1, WK6 and WK7)	-	1	1		1 (WK8)	-	2	-

Course Code		:	1BECA404C	Electromagnetic Engineering	Semester	:	IV
L:T:P		:	3:0:0		Course Type	:	Theory PEC
Hours/Sem.	Teaching	:	42 Hrs		CIE Marks	:	50
	Learning (TW+SL)	:	42 Hrs		SEE Marks	:	50
	Exam	:	6 Hrs		Total Marks	:	100
	Total Hrs.	:	90Hrs		Credits	:	03

Professional Competency:

Apply the principles of electrostatics, magnetostatics, electromagnetic waves, and transmission lines to analyze and solve engineering problems related to electromagnetic fields and wave propagation in electrical, electronics, and communication systems

Course Outcomes:

After completion of the course, student will be able to:

CO1: Apply the concepts of vector calculus, Coulomb's law, Gauss's law, electric field intensity, and electric flux density to analyze electrostatic field problems.

CO2: Analyze electric potential, potential gradient, current continuity, boundary conditions, and capacitance in conductors and dielectric media.

CO3: Apply Poisson's and Laplace's equations, Biot-Savart law, Ampere's circuital law, magnetic potentials, and magnetic force relations to solve magnetostatic field problems.

CO4: Analyze magnetic materials, Maxwell's equations, electromagnetic wave propagation, Poynting theorem, reflection of plane waves, and Standing Wave Ratio (SWR) in time-varying electromagnetic fields.

UNIT-I

11 Hrs.

Coulomb's Law and electric field intensity: Introduction to coulomb's law, Electric field intensity, Field arising from a continuous volume charge distribution, Field of line charge, Field of sheet charge, **Electric flux density Gauss law and divergence:** Electric flux density, Gauss law, Application of Gauss law for symmetrical charge distribution (Point charge, Coaxial cable) and Differential volume element, Divergence, Maxwell's first equation, Vector operator del and Divergence theorem.

UNIT-II

11 Hrs.

Energy and potential: Energy expended in moving a point charge in an electric field, The line integral, Definition of potential difference and potential, The potential field of a point charge, Potential field of system of charges, Potential gradient, Energy density in the Electrostatics field. **Conductors, dielectrics and capacitance:** Current and current density, Continuity of current, Conductor properties and Boundary conditions, Boundary conditions for perfect dielectrics, Capacitance and examples (Parallel plate capacitor, Dielectric boundary normal to plates).

UNIT-III

10 Hrs.

Poisson's and Laplace's equations: Poisson's and Laplace's equations. Uniqueness theorem
The steady magnetic field: Biot-savart's law, Ampere's circuital law, Curl, Stokes theorem, Magnetic flux density, Scalar and vector magnetic potentials. **Magnetic forces:** Force on a moving charge and differential current element. Force between differential current elements.

Force and torque on a closed circuit, numerical.	
UNIT-IV	10 Hrs.
Magnetic Materials and Magnetism: Nature of magnetic materials, magnetisation and permeability. Magnetic boundary conditions. Magnetic circuit, inductance and mutual inductance-numerical. Time varying fields and Maxwell's equations: Faraday's law, Displacement current, Maxwell's equation in point and integral form, retarded potentials. Uniform plane wave: Wave propagation in free space and dielectrics, Poynting's theorem and wave power, Plane wave in boundaries and in dispersive media: Reflection of uniform plane waves at normal incidence, Standing Wave Ratio (SWR).	
Text Books:	
1. William H Hayt Jr, John A Buck, "Engineering Electronics", Tata McGraw-Hill, 7th edition, 2006 2. Matthew N. O. Sadiku "Principles of Electromagnetics" Oxford 6th Edition, 2015	
Reference Books:	
1. David K. Cheng, "Fundamentals of Engineering Electromagnetics" Pearson 2014 2. Ashutosh Pramanik, "Electromagnetism -Theory (Volume -1) -Applications (Volume-2)" PHI Learning 2014 3. Bhag Guru et al, "Electromagnetic Field Theory Fundamentals" Cambridge 2005 4. Rohit Khurana, "Electromagnetic Field Theory" Vikas Publishing 1st Edition, 2014 5. J. A. Edminister, "Electromagnetics" McGraw Hill 3rd Edition, 2010 6. Gottapu Sasibhushana Rao, "Electromagnetic Field Theory and Transmission Lines" Wiley 1st Edition, 2013	

Course Articulation Matrix

Course Outcomes (COs)	Programme Outcomes (POs) and Wks											Program Specific Outcomes (PSOs)		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
CO1	3 (WK1, WK2, WK3, WK4)	2 (WK2, WK4)	1	1 (WK8)	1 (WK6)	-	-	-	-	-	-	2	-	-
CO2	3 (WK1, WK2, WK3, WK4)	3 (WK2, WK3, WK4)	2 (WK5)	2 (WK8)	1 (WK6)	-	-	-	-	-	-	3	-	-
CO3	3 (WK1, WK2 WK3 and, WK4)	3 (WK2, WK4)	2 (WK5)	2 (WK8)	2 (WK6)	-	-	-	-	-	-	3	-	-
CO4	3 (WK1, WK2 WK3 and, WK4)	3 (WK2, WK4)	3 (WK5)	2 (WK8)	2 (WK6)	1 (WK7)	-	-	-	-	-	3	1	1

Course Code		:	1BECA305C	Basics of Artificial Intelligence and Machine Learning	Semester	:	IV
L:T:P*		:	2:0:0		Course Type	:	PCC
Hours/Sem.	Teaching	:	28Hrs.		CIE Marks	:	50
	Learning (TW+SL)	:	26 Hrs.		SEE Marks	:	50
	Exam	:	06 Hrs.		Total Marks	:	100
	Total Hrs.	:	60 Hrs.		Credits	:	02

Professional Competency:

Apply fundamental concepts of Artificial Intelligence and Machine Learning to model intelligent agents, solve problems using search techniques, and develop basic classification, regression, and clustering solutions for engineering applications.

Course Outcomes:

After completion of the course student will be able to:

CO1: Define and explain fundamental AI concepts and agent-based design.

CO2: Analyze different types of environments and rational behavior of intelligent agents.

CO3: Formulate problems and apply suitable AI search strategies.

CO4: Implement supervised and unsupervised ML algorithms for real-world applications.

UNIT-I

07 Hrs.

Introduction to Artificial Intelligence: Definition of AI, goals and scope of AI, applications of AI in ECE such as signal classification, embedded intelligence, and smart communication. History and evolution of AI; different approaches, AI versus human intelligence: Turing test and Total Turing Test. Components of AI, Introduction to intelligent agents. Characteristics of intelligent agents, types of agents

UNIT-II

07 Hrs.

Problem Solving in AI: Problem formulation, initial state, goal state, and operators. Uninformed search strategies: Breadth-First Search (BFS), Depth-First Search (DFS), Greedy Best-First Search and A* Search algorithm. Real-world applications of AI search strategies in robotics path finding, circuit diagnosis, and smart system optimization.

UNIT-III

07 Hrs.

Introduction to Machine Learning: Definition and components of machine learning, types of learning – supervised and unsupervised. Supervised learning: k-nearest neighbors, linear regression, logistic regression, decision trees. Training and testing phases, performance metrics – accuracy, precision, recall, F1-score.. Solved examples using classification and regression.

UNIT-IV

07 Hrs.

Unsupervised learning: concept and importance, clustering and dimensionality reduction. k-means clustering, hierarchical clustering, principal component analysis (PCA). Introduction to anomaly detection, ensemble learning and real-world applications of unsupervised learning. Implementation examples and interpretation of outputs.

Text Books:														
1. Stuart Russell and Peter Norvig, “Artificial Intelligence – A Modern Approach”, 3rd Edition, Pearson Education, 2010.														
2. Ethem Alpaydin, “Introduction to Machine Learning”, 2nd Edition, MIT Press, 2010.														
Reference Books:														
1. Tom M. Mitchell, Machine Learning, McGraw-Hill, 1997.														
2. Kevin P. Murphy, Machine Learning: A Probabilistic Perspective, MIT Press, 2012.														
3. Christopher M. Bishop, Pattern Recognition and Machine Learning, Springer, 2006.														

Course Articulation Matrix

Course Outcomes (COs)	Program Outcomes (POs) and Wks											Program Specific Outcomes (PSOs)		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
CO1	3 (WK1, WK2, WK3, WK4)	-	2 (WK4)	-	2 (WK2, WK6)	2 (WK1, WK7)	3 (WK9)	2	2		1 (WK8)	-	-	1
CO2	3 (WK1, WK2, WK3, WK4)	-	2 (WK5)	-	2 (WK6)	2 (WK1, WK7)	3 (WK9)	2	2		1 (WK8)	-	-	1
CO3	3 (WK1, WK2, WK3, WK4)	-	2 (WK5)	-	2 (WK2, WK6)	2 (WK1, WK7)	3 (WK9)	2	2		1 (WK8)	-	-	1
CO4	3 (WK1, WK2, WK3, WK4)	-	2 (WK5)	-	2 (WK2, WK6)	2 (WK1, WK5, WK7)	3 (WK9)	2	2		1 (WK8)	-	-	1

Laboratory Courses Syllabus

Course Code		:	1BECA406L	Communication Engineering Laboratory	Semester	:	IV
L:T:P		:	0:0:2		Course Type	:	Practical (PCCL)
Hours/Sem.	Teaching	:	26 Hrs		CIE Marks	:	50
	Learning (TW+SL)	:	00 Hrs		SEE Marks	:	50
	Exam	:	04 Hrs		Total Marks	:	100
	Total Hrs.	:	30 Hrs		Credits	:	01

Professional Competency:

Develop, analyze, and simulate analog and digital communication systems using modern laboratory equipment and software tools for communication engineering applications.

Course Outcomes:

After completion of the course, student will be able to:

- CO1:** Verify the Sampling Theorem and analyze the effects of different sampling frequencies on signal reconstruction.
- CO2:** Generate, detect and analyze analog communication techniques including AM, FM, PAM, PWM, PPM, and pre-emphasis/de-emphasis circuits.
- CO3:** Generate and detect digital modulation schemes such as ASK, FSK, and PSK for digital communication applications.
- CO4:** Simulate analog and digital modulation schemes using MATLAB and interpret the simulation results.

List of Experiments

Sl. No.	Title of the Experiment
1.	Verification of sampling theorem for $f_s = 2f_m$, $f_s > 2f_m$, and $f_s < 2f_m$
2.	Generation and detection of Amplitude Modulation (AM)
3.	Generation of Frequency Modulation (FM)
4.	Design and realize pre-emphasis and de-emphasis circuits
5.	Generation and detection of Pulse Amplitude Modulation (PAM)
6.	Design and verification of Pulse Width Modulation (PWM)
7.	Generation of Pulse Position Modulation (PPM)
8.	Generation and detection of Amplitude Shift Keying (ASK)
9.	Generation and detection of Frequency Shift Keying (FSK)
10.	Generation and detection of Phase Shift Keying (PSK)
11.	Simulation of AM in time domain using MATLAB

12.	Simulation of FM in time domain using MATLAB
13.	Simulation of ASK using MATLAB
14.	Simulation of FSK using MATLAB
15.	Simulation of PSK using MATLAB

Course Articulation Matrix

Course Outcomes (COs)	Program Outcomes (POs) and Wks											Program Specific Outcomes (PSOs)		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
CO1	3 (WK1,WK2, WK3,WK4)	3 (WK2,WK3,WK4)	--	--	1 (WK2)	1 (WK5, WK7)	--	1 (WK9)	1 (WK9)	1 (WK9)	--	3	--	--
CO2	3 (WK2,WK3, WK4)	2 (WK2,WK3,WK4)	3 (WK5)	2 (WK8)	3 (WK2, WK6)	1 (WK5, WK7)	--	1 (WK9)	1 (WK9)	1 (WK9)	--	3	--	--
CO3	3 (WK2,WK3, WK4)	3 (WK2,WK3,WK4)	1 (WK5)	2 (WK8)	2 (WK2, WK6)	1 (WK5, WK7)	--	1 (WK9)	1 (WK9)	1 (WK9)	--	3	--	--
CO4	2 (WK2,WK3, WK4)	3 (WK2,WK3,WK4)	1 (WK5)	2 (WK8)	3 (WK2, WK6)	1 (WK5, WK7)	--	1 (WK9)	1 (WK9)	1 (WK9)	--	3	--	--

Course Code		:	1BECA407L	Digital Signal Processing Laboratory	Semester	:	IV
L:T:P		:	0:0:2		Course Type	:	Practical (PCCL)
Hours/Sem.	Teaching	:	26 Hrs		CIE Marks	:	50
	Learning (TW+SL)	:	00 Hrs		SEE Marks	:	50
	Exam	:	04 Hrs		Total Marks	:	100
	Total Hrs.	:	30 Hrs		Credits	:	01

Professional Competency:

Competent in real-time hardware-in-the-loop implementation of digital filters and spectral analysis tools on embedded DSP targets; highly proficient in utilizing oscilloscopes and spectrum analyzers to measure latency and signal integrity."

Course Outcomes:

After completion of the course, student will be able to:

CO1: Analyze algorithms implemented to generate different functions of time and frequency.

CO2: Analyze algorithms implemented to perform various operations on signal.

CO3: Design, implement and analyze IIR and FIR filters to meet given specifications.

CO4: Implement and analyze convolution algorithms implemented using DSP processor.

List of Experiments

Sl. No.	Title of the Experiment
1.	Generation of different analog and digital signals (impulse, step, ramp, sine, cosine, square, rectangular and triangular) with given amplitude, frequency, phase and duration.
2.	Verification of sampling theorem.
3.	Implementation of amplitude scaling, time scaling, time reversal and time shift operations on given continuous time and discrete time signal.
4.	Response of continuous time and discrete time LTI systems to a given input.
5.	Fourier series of given continuous time and discrete time periodic signals.
6.	Fourier transform of given continuous time and discrete time aperiodic signals.
7.	N point DFT of a given sequence of length L when (a) $N < L$ (b) $N = L$ and (c) $N > L$, corresponding IDFT and analysis of the result.
8.	Verification of time shift, conjugate symmetry and convolution property of DFT.
9.	Implementation of linear convolution and circular convolution using DFT and IDFT.
10.	Design and frequency response analysis of IIR filter to meet given specifications using different $S \rightarrow Z$ transformation techniques.
11.	Design and frequency response analysis of FIR filter to meet given specifications

	using different windows.
12.	Implementation of linear and circular convolution using DSP processor.

Course Articulation Matrix

Course Outcomes (COs)	Program Outcomes (POs) and Wks											Program Specific Outcomes (PSOs)		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
CO1	3 (WK1,WK2,WK3,WK4)	3 (WK2,WK3,WK4)	--	--	1 (WK2)	1 (WK5,WK7)	--	1 (WK9)	1 (WK9)	1 (WK9)	--	3	--	--
CO2	3 (WK2,WK3,WK4)	2 (WK2,WK3,WK4)	3 (WK5)	2 (WK8)	3 (WK2,WK6)	1 (WK5,WK7)	--	1 (WK9)	1 (WK9)	1 (WK9)	--	3	--	--
CO3	3 (WK2,WK3,WK4)	3 (WK2,WK3,WK4)	1 (WK5)	2 (WK8)	2 (WK2,WK6)	1 (WK5,WK7)	--	1 (WK9)	1 (WK9)	1 (WK9)	--	3	--	--
CO4	2 (WK2,WK3,WK4)	3 (WK2,WK3,WK4)	1 (WK5)	2 (WK8)	3 (WK2,WK6)	1 (WK5,WK7)	--	1 (WK9)	1 (WK9)	1 (WK9)	--	3	--	--

Course Code		:	1BECA408L	ARM Microcontroller Laboratory	Semester	:	04
L:T:P*		:	0:0:2		Course Type	:	Practical (PCCL)
Hours/Sem.	Teaching	:	26 Hrs.		CIE Marks	:	50
	Learning (TW+SL)	:	00 Hrs.		SEE Marks	:	50
	Exam	:	4 Hrs.		Total Marks	:	100
	Total Hrs.	:	30 Hrs.		Credits	:	01

Professional Competency:

Ability to develop, tests, and debug ARM-based embedded system applications using assembly language programming and peripheral interfacing techniques to solve real-world engineering problems.

Course Outcomes:

After completion of the course, student will be able to:

CO1: Analyze the organization and operation of the ARM7TDMI/LPC2148 microcontroller and its peripheral interfaces from a practical point of view.

CO2: Develop the ability to write efficient programs using assembly-level language for the ARM7TDMI/LPC2148 microcontroller.

CO3: Carry out interfacing between the ARM7TDMI/LPC2148 microcontroller and peripheral devices to design and develop complete microcontroller-based systems (projects).

CO4: Use Embedded C language effectively to perform defined tasks on the ARM7TDMI/LPC2148 microcontroller.

Sl. No.	List of Programs	
1	a	ALP to multiply two 16 bit binary numbers.
	b	ALP to find the sum of first 10 integer numbers.
	c	ALP to find factorial of a number.
2	a	ALP to add an array of 16 bit numbers and store the 32bit result internal RAM.
	b	ALP to find the square of a number (1 to 10) using look-up table.
3	a	ALP to find the largest/smallest number in an array of 32 numbers.
	b	ALP to arrange a series of 32bit numbers in ascending/descending order.
4	a	ALP to count the number of ones and zeros in two consecutive memory locations.
	b	Execute a sample ARM ALP to add two numbers in registers and store the sum in a register
5	a	ALP to add first 5 natural numbers, store sum in register.
	b	ALP to add first 10 odd numbers, store sum in register.
6	a	ALP to compute sum of 5 terms of an arithmetic progression. First term is 3, common difference is 7, store sum in register.

	b	ALP to compute sum of squares of 5 numbers starting from 1. Write and use procedure SQU, store sum in register.
7	a	ALP to add the first n even numbers, store the result in a memory location
	b	ALP to generate a geometric progression with a limit. Display the results in memory.
8	a	ALP to find the arithmetic progression with a=3, d=7.
	b	ALP to find the sum of cubes of the first n natural numbers.
9	a	ALP to find the average of ten 16-bit numbers stored in memory.
	b	ALP to generate the Fibonacci numbers
10	a	ALP to find the sum of digits of a number.
	b	ALP to convert BCD number to binary.
		INTERFACING PROGRAMS
11	a	Write a C Program to interface LED
	b	Write a C Program to Buzzer.
12	a	Write a C program for Binary counter display
	b	Write a C program to rotate DC motor in clockwise and anticlockwise direction.
13	a	Write a C program for seven segment display.

Course Articulation Matrix

Courses Outcomes (COs)	Program Outcomes (POs) and Wks											Program Specific Outcomes (PSOs)		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
CO1	3 (WK1,WK2, WK3,WK4)	3 (WK1,WK2, WK3,WK4)	1 (WK6)	3 (WK8)	2 (WK2, WK6)	1 (WK1,WK6, WK7)	-	-	-	-	1 (WK8)	3	-	-
CO2	3 (WK1,WK2, WK3,WK4)	3 (WK1,WK2, WK3,WK4)	3 (WK5)	3 (WK8)	3 (WK8)	1 (WK1,WK5, WK7)	-	-	-	-	2 (WK6)	3	-	-
CO3	3 (WK1,WK2, WK3,WK4)	3 (WK1,WK2, WK3,WK4)	3 (WK5)	3 (WK6)	3 (WK8)	1 (WK1,WK6, WK7)	-	-	-	-	2 (WK6)	3	-	-
CO4	3 (WK1,WK2, WK3,WK4)	2 (WK1,WK2, WK3,WK4)	1 (WK5)	3 (WK6)	3 (WK6)	1 (WK1,WK6, WK7)	-	-	-	-	3 (WK6)	3	-	-