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

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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% of faculty with Ph.D.
   - (ii.) Faculty with minimum of 12 years teaching experience.
   - (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. Honours Degree.
4. Curriculum
   - (i.) Research and industry oriented adaptive curriculum.
   - (ii.) Curriculum with integrated courses.
5. Alumni
   - (i.) Alumni works 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.

Programme Outcomes

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

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

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

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

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

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

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

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

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

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

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

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

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 embeddedsystems
3. Demonstrate the conceptual knowledge with respect to architecture, design analysis and simulationof 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

Proposed Curriculum Framework for BE Program
(For the Students admitted to first year from 2024-2025 onwards and to 2nd year lateral entry from 2025-2026 onwards)

S.No.	Category	VTU	AICTE	BEC Present	BEC Revised
1.	**HSMC:** HSS (English:2, Kannada:1, UHV,: 1 Constitution:1, EV:1), HRM:3 (Offered by Dept) = 9 AEC (Scientific foundations of Health: 1, Innovation and design Thinking: 1, SS:2, IKS: 1, MOOCS: 3) = 08	**14+8 =22**	**15**	**9+10 =19**	**9+8 =17**
2.	**BSC:** Basic Science Courses (Physics, Chemistry and Mathematics)	**22**	**23**	**22**	**22**
3.	**ESC/ETC:** Engineering Science Courses (Basic Elect/Electronics/Computer/Mechanics/Workshop/Drawing etc.)	**18**	**17**	**18**	**18**
4.	**PCC:** Professional Core Courses	**57**	**61**	**56**	**61**
5.	**PEC:** Professional Elective Courses relevant to the branch with at least one course either fully or partially supported by industry	**12**	**12**	**12**	**12**
6.	**OEC**: Open Electives Courses/ Subjects from other technical/Arts/Commerce (3 MOOCS + 6)	**9**	**12**	**09**	**09**
7.	Mini (2) and Major projects (9)/Industrial Internships (10)	**20**	**20**	**24**	**21**
8.	Mandatory Course: PE, Yoga, NSS, Bridge course Maths 1 and 2 (lateral Entry)	**00**	**00**	**00**	**00**
Total		**160**	**160**	**160**	**160**

Suggestive Break-up of Credits for B.E (Common to all Branches)
(For the Students admitted to first year from 2024-2025 onwards and to 2nd year lateral entry from 2025-2026 onwards)

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**

Scheme of 2024-25 batch

Basaveshwar Engineering College, Bagalkote
B.E. in Electronics and Communication Engineering
Scheme of Teaching and Examinations
AY: 2024-25
I SEMESTER (Physics Cycle)

Sl. No.	Course and Course Code		Course Title	Teaching / Paper setting Dept.	Teaching hrs./week				Examination				Credits
					Lecture	Tutorial	Practical/ Drawing	Self-Study Component	Duration in hrs.	CIE Marks	SEE Marks	Total Marks	
					L	T	P	S					
1	ASC (IC)	BMAE101C	Mathematics-I	Maths Dept.	3	0	2	0	3	50	50	100	4
2	ASC (IC)	BPHE102C	Physics for Electrical Sciences	Physics Dept.	3	0	2	0	3	50	50	100	4
3	ESC	BECA103C	Basic Electronics	Dept.	3	0	0	0	3	50	50	100	3
4	ESC-I	BCSA104N	Engineering Science Course-I	Dept.	2/3	0/0	2/0	0	3	50	50	100	3
5	ETC-I	BECB105B	Emerging Technology Course-I	Dept.	3	0	0	0	3	50	50	100	3
7	HSMC	BHSA106C	Communicative English	HSS Dept.	1	0	0	0	1	50	50	100	1
8	HSMC	BHSA107C	Indian Constitution	HSS Dept.	1	0	0	0	1	50	50	100	1
9	AEC	BHSA108C	Scientific Foundations of Health	Dept.	1	0	0	0	1	50	50	100	1
				Total	17	0	6	0	18	**400**	**400**	**800**	**20**

Sl. No.	Emerging Technology Course-I ETC-I	Engineering Science Course-I ESC-I	Engineering Science Course ESC
1.	Introduction to Embedded System- BECB105B/ BECB205B	Introduction to C Programming - BCSA104N/ BCSA204N	Basic Electronics- BECA103C/ BECA203C
2.	Smart Materials and Systems- BMEA105B/ BMEA205B	Introduction to Electronics & Communication- BECA104N/ BECA204N	
3.	Introduction to Nano Technology- BECA105B/ BECA205B		
4.	Introduction to Sustainable Engineering- BMEB105B/ BMEB205B		
5.	Introduction to Internet of Things (IOT)- BISA105B/ BISA205B		

Note: Department is offering Subject: Introduction to Electronics & Communication (22UEC114N/214N) to other department students

Basaveshwar Engineering College, Bagalkote
B.E. in Electronics and Communication Engineering
Scheme of Teaching and Examinations
AY: 2024-25
II SEMESTER (Chemistry Cycle)

Sl. No.	Course and Course Code		Course Title	Teaching / Paper setting Dept.	Teaching hrs./week				Examination				Credits
					Lecture	Tutorial	Practical/ Drawing	Self-Study Component	Duration in hrs.	CIE Marks	SEE Marks	Total Marks	
					L	T	P	S					
1	ASC (IC)	BMAE201C	Mathematics-II	Maths Dept.	3	0	2	0	3	50	50	100	4
2	ASC (IC)	BCHE202C	Applied Chemistry for EEE Stream	Chemistry Dept.	3	0	2	0	3	50	50	100	4
3	ESC	BMEB203C	Computer Aided Engineering & Drawing	Civil / Mechanical Dept.	2	0	2	0	3	50	50	100	3
4	ESC-II		Engineering Science Course-II	EEE Dept.	3	0	0	0	3	50	50	100	3
5	PLC-II		Programming Language Course-II	Dept.	2	0	2	0	3	50	50	100	3
6	AEC		Professional Writing Skills in English	HSS Dept.	1	0	0	0	1	50	50	100	1
7	HSMC		Sanskritika Kannada	HSS Dept.	1	0	0	0	1	50	50	100	1
8			Balake Kannada										
9	SDC		Innovation and Design Thinking	Dept.	1	0	0	0	1	50	50	100	1
				Total	16	0	8	0	24	**400**	**400**	**800**	**20**

Sl. No.	Programming Language Course-II PLC-II	Engineering Science Course-II ESC-II	Engineering Science Course ESC
1.	Introduction to C++ Programming- BCSD105D/ BCSD205D	Introduction to Electrical Engineering- BEEA104N/ BEEA204N	CAED- BMEB103C/ BMEB203C
2.	Introduction to Python Programming- BCSB105D/ BCSB205D	Introduction to Electronics & Communication- BECA104N/ BECA204N	
3.	Basics of JAVA programming- BCSC105D/ BCSC205D		

III SEMESTER													
Sl. No	Course	Course Code	Course Title	Teaching Department and Question Paper Setting Board	Teaching Hours/Week				Examination				Credits
					Lecture	Tutorial	Practical	SDA	Duration In hours	CIE Marks	SEE Marks	Total Marks	
					L	T	P	S					
1.	BSC	BMAE301C	Mathematics – III for Electrical Science Stream	MATHEMATICS	3	0	0		03	50	50	100	3
2.	PCC	BECA301C	Digital System Design using Verilog	ECE DEPT.	3	0	0		03	50	50	100	3
3.	PCC	BECA302C	Electronic Circuits	ECE DEPT.	3	0	0		03	50	50	100	3
4.	PCC	BECA303C	Network Analysis	ECE DEPT.	3	0	0		03	50	50	100	3
5.	PCC	BECA304C	Data Structures using C++	ECE DEPT.	3	0	0		03	50	50	100	3
6.	PCC	BECA305C	Basics of AI&ML	ECE Dept	3	0	0		03	50	50	100	3
7.	PCCL	BECA306L	Digital System Design using Verilog Laboratory	ECE Dept	0	0	2		03	50	50	100	1
8.	PCCL	BEC307L	Electronic Devices and Circuits Laboratory	ECE DEPT.	0	0	2		03	50	50	100	1
9.	MC	BHSA360M	Yoga	Yoga Teacher	0	0	2			100	---	100	0
		BHSB360M	National Service Scheme (NSS)	NSS Coordinator									
		BHSC360M	Physical Education (PE) (Sport sand Athletics)	Physical Education Director									
				Total	**18**	**0**	**6**		**24**	**425**	**400**	**825**	**20**

PCC: Professional Core Course, **PCCL**: Professional Core Course Laboratory, **MC**: Mandatory Course (Non-credit), **AEC**: Ability Enhancement Course, **L:** Lecture, **T**: Tutorial, **P**: Practical, **CIE**: Continuous Internal Evaluation, **SEE**: Semester End Examination, **SDA**: Self Study

IVSEMESTER													
Sl. No	Course	Course Code	Course Title	Teaching Department and Question Paper Setting Board	Teaching Hours/Week				Examination				Credits
					Lecture	Tutorial	Practical	SDA	Duration In hours	CIE Marks	SEE Marks	Total Marks	
					L	T	P	S					
1.	PCC	BECA401C	Signals and Systems	ECE DEPT.	3	0	0	0	03	50	50	100	3
2.	PCC	BECA402C	Analog and Digital Communication	ECE DEPT.	3	0	0	0	03	50	50	100	3
3.	PCC	BECA403C	Linear Integrated Circuits	ECE DEPT.	3	0	0	0	03	50	50	100	3
4.	PCC	BECA404C	ARM Microcontrollers	ECE DEPT.	3	0	0	0	03	50	50	100	3
5.	BSC	BBTA405C	Biology for Engineers	BT DEPT.	3	0	0	0	03	50	50	100	3
6.	HSMC	BHSA424C	Universal human values	ECE DEPT.	1	0	0	0	01	50	50	100	1
7.	PCCL	BECA405L	Communication Engineering Laboratory	ECE DEPT.	0	0	3	0	03	50	50	100	1.5
8.	PCCL	BECA406L	Linear Integrated Circuits Laboratory	ECE DEPT.	0	0	3	0	03	50	50	100	1.5
9.	PCCL	BECA407L	ARM Microcontroller Laboratory	ECE DEPT	00	0	2	0	03	50	50	100	1
10.	MC	BHSA460M	Yoga	Yoga Teacher	0	0	2			100	---	100	0
		BHSB460M	National Service Scheme (NSS)	NSS COORDINATOR									
		BHSC460M	Physical Education (PE) (Sport sand Athletics)	PHYSICAL EDUCATION DIRECTOR									
				Total	**16**	**0**	**08**	00	**25**	**475**	**450**	**925**	**20**

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V SEMESTER

Sl. No	Course	Course Code	Course Title	Teaching Department and Question Paper Setting Board	Teaching Hours/Week				Examination				Credits
					Lecture	Tutorial	Practical	SDA	DurationIn hours	CIE Marks	SEE Marks	Total Marks	
					L	T	P	S					
1.	PCC	BECA501C	Digital Signal Processing	ECE DEPT.	3	0	0	0	03	50	50	100	3
2.	PCC	BECA502C	Computer Networks	ECE DEPT.	3	0	0	0	03	50	50	100	3
3.	PEC	BECX503E	Professional Elective Course	ECE DEPT.	3	0	0	0	03	50	50	100	3
4.	OEC	BECXXXXN	Open Elective Course	Other Dept	3	0	0	0	03	50	50	100	3
5.	AC	BHSXXXXC	Qualitative Aptitude and Soft Skills	TPC	1	3	0	0	02	50	50	100	2
6.	PROJ	BECA504P	Mini Project	ECE DEPT.	0	0	4	0	03	100	00	100	2
7.	HSMC	BBTAXXXC	Environmental Studies	BT DEPT.	1	0	0	0	03	50	50	100	1
8.	PCCL	BECA505L	Computer Networks Laboratory	ECE DEPT.	0	0	3	0	03	50	50	100	1
9.	PCCL	BECA506L	Digital Signal Processing Laboratory	ECE DEPT.	0	0	3	0	03	50	50	100	1
10.	PCCL	BECA507L	Data Structures Using C++ Laboratory	ECE DEPT.	0	0	3	0	03	50	50	100	1
11.	MC	BHSA560M	Yoga	Yoga Teacher	0	0	2	0	0	25	0	25	0
		BHSB560M	National Service Scheme (NSS)	NSS Coordinator									
		BHSC506M	Physical Education (Sports and Athletics)	PE Director									
				Total	**14**	**03**	**12**	00	**26**	**525**	**400**	**925**	**20**

Professional Elective Course (PEC)			Open Elective Course (OEC)	
1	Java Programming	BECA503E	Communication Systems	
2	Mobile Communication	BECB503E	Fuzzy Logic	
3	Speech Processing	BECC503E	Micro Electro Mechanical Systems	
4	CMOS Analog VLSI Design	BECD503E		
5	Advanced Python Programming	BECE503E		

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VI SEMESTER

Sl. No	Course and Course Code		Course Title	Teaching Department (TD) and Question Paper Setting Board (PSB)	Teaching Hours/Week				Examination				Credits
					Theory Lecture	Tutorial	Practical/ Drawing	SDA	Duration in hours	CIE Marks	SEE Marks	Total Marks	
					L	T	P	S					
1.	PCC	BECA601C	Electromagnetic Theory	ECE DEPT	3	0	0	0	03	50	50	100	3
2.	PCC	BECA602C	Control Systems	ECE Dept	3	0	0	0	03	50	50	100	3
3.	PCC	BECA603C	CMOS Digital VLSI Design	ECE DEPT	3	0	0	0	03	50	50	100	3
4.	PCC	BECA604C	Multimedia Communication	ECE Dept	2	0	0	0	03	50	50	100	2
5.	PEC	BECX605E	Professional Elective Course	ECE DEPT	3	0	0	0	03	50	50	100	3
6.	OEC	BECXXXXN	Open Elective Course	RESPECTIVEDEPT	3	0	0	0	03	50	50	100	3
7.	AEC	BECA606C	Indian Knowledge System	ECE DEPT	1	0	0	0	03	50	50	100	1
8.	PCCL	BECA607L	Robotics Laboratory		0	0	2	0	03	50	50	100	1
9.	PCCL	BECA608L	CMOS VLSI Design Laboratory	ECE DEPT	0	0	2	0	03	50	50	100	1
10.	MC	BHSA660M	Yoga	YOGATEACHER	0	0	2			25	---	25	0
		BHSB660M	National Service Scheme(NSS)	NSSCOORDINATOR									
		BHSC660M	Physical Education(PE) (Sports and Athletics)	PHYSICALEDUCATION DIRECTOR									
Total					**18**	**0**	**06**	**00**	**27**	**525**	**400**	**925**	**20**

Sl. No.	Professional Elective Course (PEC)	Subject Code	Open Elective Course (OE)	Subject Code
1.	Robotics and Automation	BECA605E	Sensor Technology	
2.	Digital Image Processing	BECB605E	Wireless Networks and Mobile Architecture	
3.	Nanotechnology	BECC605E		
4.	Embedded System Design using Embedded C	BECD605E		
5.	Micro Electro Mechanical Systems	BECE605E		

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VII SEMESTER (Swappable VII and VIII SEMESTER)

Sl. No	Course and Course Code		Course Title	Teaching Department(TD) and Question Paper Setting Board (PSB)	Teaching Hours/Week				Examination				Credits
					Theory Lecture	Tutorial	Practical/ Drawing	SDA	Duration in hours	CIE Marks	SEE Marks	Total Marks	
					L	T	P	S					
1.	PCC	BECA701C	Microwave Engineering and Antenna Theory	ECEDEPT	3	0	0	0	03	50	50	100	3
2.	PCC	BECA702C	Information Theory and Coding	ECEDEPT	3	0	0	0	03	50	50	100	3
3.	HSMC	BHSXXXXC	Research Methodology & IPR	ECEDEPT	2	0	0	0	03	50	50	100	2
4.	PEC	BECX703E	**Professional Elective Course – I**	RESPTIVEDEPT	3	0	0	0	03	50	50	100	3
5.	OEC	BECX704E	**Professional Elective Course - II**	ECEDEPT	3	0	0	0	03	50	50	100	3
6.	PCCL	BECA705L	Advanced Communication Laboratory	ECE DEPT	0	0	2	0	03	50	50	100	1
7.	PROJ	BECA706P	**Major Project**	ECEDEPT	0	0	18	0	03	100	100	200	9
					14	0	20	0	21	**400**	**400**	**800**	**24**

Sl. No.	Professional Elective Course (PEC)	Subject Code	Professional Elective Course (PEC)	Subject Code
1.	Application Specific Integrated Circuit	BECA703E	Automotive Electronics	BECA704E
2.	Wireless AdHoc Networks (AVS)	BECB703E	Sensors and Actuators	BECB704E
3.	Cyber Security	BECC703E	Satellite Communication	BECB703E
4.	Fiber Optics and Networks	BECD703E	Wireless Sensor Networks (AVS)	
	Digital Verification	BECE703E		

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VIII SEMESTER (Swappable VII and VIII SEMESTER)														
Sl. No	Course and Course Code		Course Title	Teaching Department(TD) and Question Paper Setting Board(PSB)	Teaching Hours/Week				Examination				Credits
					Theory Lecture	Tutorial	Practical/ Drawing	SDA	Duration in hours	CIE Marks	SEE Marks	Total Marks	
					L	T	P	S					
1	PEC		**Professional Elective (Online Courses) MOOCS**		3	0	0	0	03	50	50	100	3
2	OEC		**Open Elective (Online Courses) MOOCS**		3	0	0	0	01	50	50	100	3
3	INT		**Internship (Industry/Research) (14-20weeks)**		0	0	12	0	03	100	100	200	10
			Total		6	0	14	0	10	**300**	**200**	**600**	**16**
Professional Elective Course													
	BOS Recommended Course				BOS Recommended Course								
	BOS Recommended Course				BOS Recommended Course								
Open Elective Courses													
	BOS Recommended Course				BOS Recommended Course								
	BOS Recommended Course				BOS Recommended Course								

PCC: Professional Core Course, **PCCL**: Professional Core Course Laboratory, **UHV**: Universal Human Value, **MC**: Mandatory Course (Non-credit), **L:** Lecture, **T**: Tutorial, P: Practical **S= SDA**: Skill Development Activity, AC: Audit Course

3rd Semester Syllabus

SUBJECT CODE: BMAE301C	MATHEMATICS – III FOR Electrical Science Stream (EE,EC,ECS)	Credits: 03
L:T:P - 3 : 0: 0		CIEMarks:50
Total Hours/Week: 03		SEEMarks:50

UNIT-I	10 Hrs.

Curve fitting, Correlation and Regressions: Principles of least squares, Curve fitting by the method of least squares in the form $y = a + bx$, $y = a + bx + cx^2$, $y = ab^x$. Correlation, Regression and rank correlation.

(RBT Levels: L1, L2 and L3)

UNIT-II	10 Hrs.

Fourier series and practical harmonic analysis: Periodic functions, Dirichlet's condition. Fourier series expansion of functions with period 2π and with arbitrary period: periodic rectangular wave, Half-wave rectifier, rectangular pulse, Saw tooth wave. Half-range Fourier series. Half range expansions, Practical harmonic analysis, and variation of periodic current.

(RBT Levels: L1, L2 and L3)

UNIT–III	10 Hrs.

Infinite Fourier Transforms: Infinite Fourier transforms, Fourier cosine and sine transforms, Inverse Fourier transforms, Inverse Fourier cosine and sine transforms, discrete Fourier transform (DFT). Z-transforms

(RBT Levels: L1, L2 and L3)

UNIT–IV	10 Hrs.

Ordinary Differential Equations of Higher Order: Higher-order linear ODEs with constant coefficients - Inverse differential operator, problems. Linear differential equations with variable Coefficients-Cauchy's and Legendre's differential equations – Problems. Application of linear differential equations to L-C circuit and L-C-R circuit.

(RBT Levels: L1, L2 and L3)

Reference Books

Reference Books :(Name of the author/Title of the Book/Name of the publisher/Edition & Year)

1. **Erwin Kreyszig**, "Advanced Engineering Mathematics", John Wiley & Sons,9th Edition , 2006.

2. **B. S. Grewal** "Higher Engineering Mathematics" ,Khanna publishers, 44th Ed.,2021.

3. **G Haribaskaran** "Probability, Queuing Theory and Reliability Engineering", Laxmi Publication,Latest Edition, 2006

4. **Irwin Miller & Marylees Miller,** JohnE. Freund's "Mathematical Statistics with Applications "Pearson. Dorling Kindersley Pvt.Ltd.India,8th edition, 2014.

5. **SCGuptaandVKKapoor**,"FundamentalsofMathematicalStatistics",SChandand Company , Latest edition.

6. **Robert V. Hogg, Joseph W. McKean & Allen T. Craig**."Introduction to Mathematical Statistics", Pearson Education 7thedition, 2013.

7. **JimPitman**.Probability,Springer-Verlag,1993.

8. **Sheldon M. Ross,**"Introduction to Probability Models"11th edition. Elsevier,2014.

9. **A. M. Yaglom and I. M. Yaglom**, "Probability and Information" .D.Reidel Publishing Company.

Distributed by Hindustan Publishing Corporation (India) Delhi,1983.

10. P. G. Hoel, S.C. PortandC. J. Stone, "Introduction to Probability Theory", Universal Book Stall, (Reprint), 2003.

11. S.Ross,"A First Course in Probability", Pearson Education India, 6th Ed.,2002.

12. W. Feller, "An Introduction to Probability Theory and its Applications", Vol. 1,Wiley, 3rd Ed., 1968.

13. **N. P. Baliand Manish Goyal**, A Text book of Engineering Mathematics, Laxmi Publications, Reprint, 2010.

14. Veerarajan T, Engineering Mathematics(for semester III),Tata McGraw-Hill, New Delhi

Activity-Based Learning(Suggested Activities in Class)/Practical-Based Learning

- Quizzes
- Assignment
- Seminars

Course Outcomes

At the end of the course, the student will be able to:

1. Make use of correlation and regression analysis to fit a suitable mathematical model for Statistical data
2. Demonstrate the Fourier series to study the behavior of periodic functions and their applications in system communications, digital signal processing, and field theory.
3. To use Fourier transforms and Z-Transform to analyze problems involving continuous-time signals and solve difference equations
4. Understand that physical systems can be described by differential equations and solve such equations

Course Outcomes	**Program Specific Outcomes (PSOs)**													
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**1**	**2**	**3**
CO1	3	2	-	-	-	-	-	-	-	-	-			
CO2	3	2	-	-	-	-	-	-	-	-	-			
CO3	3	2	-	-	-	-	-	-	-	-	-			
CO4	3	2	-	-	-	-	-	-	-	-	-			

Course Code: BECA301C	Digital System design using Verilog	Credits: 03
L:T:P – 03:0:0		CIE Marks:50
Total Hours/Week: 40		SEE Marks:50

UNIT-I	xx Hrs.

Principles of Combinational Logic: Definition of combinational logic, Canonical forms, Generation of switching equations from truth tables, Karnaugh maps upto 4variables, Quine-McCluskey Minimization Technique. Quine-McCluskey using Don't Care Terms. (Section 3.1 to 3.5 of Text1).

Logic Design with MSI Components and Programmable Logic Devices: Binary Adders and Subtractors, Comparators, Decoders, Encoders, Multiplexers, Programmable Logic Devices (PLDs) (Section 5.1 to 5.7 of Text 2)

UNIT–II	xx Hrs.

Flip-Flops and its Applications: The Master-Slave Flip-flops (Pulse-Triggered flip-flops): SRflip- 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. (Section 6.4, 6.6 to 6.9 (Excluding 6.9.3) of Text 2), State diagrams.

UNIT–III	xx Hrs.

Introduction to Verilog: Structure of Verilog module, Operators, Data Types, Styleso Description. (Section 1.1 to1.6.2, 1.6.4 (only Verilog), 2 of Text 3)

Verilog Data flow description: Highlights of Data flow description, Structure of Data flow description. (Section 2.1 to 2.2 (only Verilog) of Text 3)

UNIT–IV	xx Hrs.

Verilog Behavioral description: Structure, Variable Assignment Statement, Sequential Statements, Loop Statements, Verilog Behavioral Description of Multiplexers (2:1, 4:1, 8:1). (Section 3.1 to 3.4 (only Verilog) of Text 3)

Verilog Structural description: Highlights of Structural description, Organization of structural description, Structural description of ripple carry adder.(Section4.1to 4.2ofText3)

Reference Books *

Textbooks:

1. *Digital Logic Applications and Design* by John M. Yarbrough, Thomson Learning, 2001.
2. *Digital Principles and Design* by Donald D. Givone, McGraw Hill, 2002.
3. *HDL Programming: VHDL and Verilog* byNazeihM. Botros, 2009 reprint, Dreamtech 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 Outcomes**

After completion of the course student will be able to

1) Simplify Boolean functions using K-map and the Quine-McCluskey minimization technique.
2) Analyze and design combinational logic circuits.
3) Analyze the concepts off lip-flops (SR, D, T, and JK) and design synchronous ssequential

circuits using flip-flops.

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

Course Articulation Matrix:

Course Outcomes	POs												PSOs		
	A	b	c	d	e	f	g	h	i	j	k	l	m	n	O
CO1:	2	3	1	2	0	0	0	0	0	0	0	0	0	3	0
CO2:	2	3	1	2	0	0	0	0	0	0	0	0	0	3	0
CO3:	2	3	1	2	0	0	0	0	0	0	0	0	0	3	0
CO4:	2	2	1	2	3	0	0	0	0	0	0	0	0	3	0

Course Code: BECA302C	Electronic Circuits	Credits: 03
L:T:P - 3: 0: 0		CIEMarks:50
Total Hours/Week: 03		SEEMarks:50

UNIT-I	10 Hrs.

Diode Circuits: Introduction, Load- line Analysis, Series Diode Configurations, Parallel and Series – Parallel configurations, AND/OR Gates, Clippers, Clampers, Zener Diodes, Voltage-Multiplier Circuits. **Power Supplies:** Introduction, General Filter Considerations, Capacitor Filter, RC Filter, Discrete Transistor Voltage Regulation.

Self Study Component: Basics of IC voltage regulators.

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, Special Case of V_{GSQ}=0V, Depletion-Type MOSFETs, Enhancement-Type MOSFETs, p- Channel FETs, Universal JFET Bias Curve.

Self Study Component: Principles of bias stabilization

UNIT–III	10 Hrs.

BJT Amplifier Circuits: Single-Stage Common- Emitter Amplifier, Single-Stage Common-Source Amplifier, Series Voltage Negative Feedback, Two-Stage CE Amplifier with Series Voltage Negative Feedback.

FET Amplifier Circuits- Introduction, JFET Small Signal Model, Fixed Bias Configuration, Self-Bias Configuration, and Voltage-Divider Configuration.

Self Study Component: Basics ofTunedAmplifiers.

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,

Self Study Component: Principles of unijunction oscillator.

Reference Books *

1. Robert L. Boylestad and Louis Nashelsky (2009), ELECTRONIC DEVICES and CIRCUIT THEORY (10th Edition), Pearson Education, Inc.
2. David A. BELL (2008), Electronic Devices and Circuits (5th Edition), Oxford University Press.
3. Albert Malvino and David J Bates (2008), Electronic Principles (7th Edition), TATA McGRAW HILL

Course Outcomes

After completion of the course students will be able to design and analyze

1. Basic electronic circuits using semiconductor diodes.
2. BJT and FET biasing circuits using analytical and graphical methods.
3. BJT and FET amplifier circuits to meet the given specifications.
4. Oscillator circuits to meet the given specifications.

Course Articulation Matrix

Course Outcomes	Programme Outcomes (POs)											Program Specific Outcomes (PSOs)		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**1**	**2**	**3**
CO1. Basic electronic circuits using semiconductor diodes.	3	2	2	1	1	0	0	0	0	0	1	3	1	0
CO2. BJT and FET biasing circuits using analytical and graphical methods.	3	2	2	1	1	0	0	0	0	0	1	3	1	0
CO3. BJT and FET amplifier circuits to meet the given specifications.	3	2	2	1	1	0	0	0	0	0	1	3	1	0
CO4. Oscillator circuits to meet the given specifications.	3	2	2	1	1	0	0	0	0	0	1	3	1	0
Course Contribution to POs and PSOs	**3**	**2**	**2**	**1**	**1**	**0**	**0**	**0**	**0**	**0**	**1**	**3**	**1**	**0**

BECA303C	Network Analysis	Credits: 03
L:T:P - 3 : 0: 0		CIEMarks:50
Total Hours/Week: 40		SEEMarks:50

UNIT-I	10 Hrs.

Basic Concepts: Practical sources, source transformations, network reduction using Star - Delta transformation, loop and node analysis with linearly dependent and independentsources 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	10 Hrs.

Laplace Transformation: Basic theorems, laplace transform of periodic functions 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 AC and DC excitations.

UNIT–IV	10 Hrs.

Resonance Circuits: Series and parallel resonance circuits, frequency of resonance, frequency responses, Q-factor, bandwidth.

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

Reference Books

1. Roy Choudhary (2006), "Networks and systems" (2), New Age International Publications
2. Hayt, Kemmerly and Durbin (2010), "Engineering Circuit Analysis" (7), TMH
3. Van Valkenburg M. E. (2000), "Network Analysis" (3), Prentice Hall of India
4. Mithal G. K. (1997), "Network Analysis", Khanna Publishers

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

Activity Based Learning (Suggested Activities in Class)/ Practical Based learning

1. Demonstrate the operation of the following circuits using suitable simulation software (Open source such as Psim, Pspice, Proteus, Simulink, eSim)
   - Determination of current through each branch of a given network using mesh analysis
   - Determination of current through each branch of a given network using nodal analysis
   - Simplification of given network using source transformation and finding the current in load
2. Practical based learning to verify mesh analysis, node analysis and Superposition, Millman's, Thevenin's & Maximum Power transfer theorems

Course Outcomes

After completion of the course student will be able to

1. Apply source transformation, mesh analysis, and nodal analysis techniques to compute currents and voltages in electrical networks, and simplify circuits using star-delta transformation.
2. Analyze complex electrical networks by applying network theorems to determine node voltages and branch currents.
3. Evaluate the transient behavior of circuit elements during switching operations using Laplace transformation methods.
4. Analyze the frequency response of series and parallel resonant circuits, and determine two- port network parameters using standard electrical network models.

Course Articulation Matrix:

Course Outcomes	Programme Outcomes (POs)											Program Specific Outcomes (PSOs)		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
CO1	3	3	0	1	1	0	0	0	0	0	1	3	0	0
CO2	3	3	0	1	1	0	0	0	0	0	1	3	0	0
CO3	3	3	0	1	1	0	0	0	0	0	1	3	0	0
CO4	3	3	0	1	1	1	0	0	0	0	1	3	0	0

Course Code: BECA304C	Data Structures using C++	Credits: 3
L:T:P - 3 : 0 : 0		CIEMarks:50
Total Hours/Week: 03		SEEMarks:50

Course objectives:

This course will enable students to:

1. Develop proficiency in implementing recursive functions, exception handling, classes, and dynamic memory management using core C++ programming constructs.
2. Construct stack-based solutions for expression conversion, evaluation, and recursion implementation using C++ templates.
3. Design and implement various queue structure circular, Deque, and priority queue to solve data organization problems efficiently.
4. Develop and manipulate dynamic data structures such as linked lists and binary trees to efficiently represent and process hierarchical data.

UNIT-I	10 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	10 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	10 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	10 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.

(Section6.1to 6.7, 7.1-7.3,7.5, and 7.7 (7.7.1-7.7.3) ofText book 2)

Reference Books *

Books:

4. *Data Structures, Algorithms and Applications in C++ by Sartaj Sahni, Universities Press, Second Edition.*
5. *Data Structures Using C++ by Varsha H. Patil, Oxford University Press, 2012*

Reference Books:

1. *Data Structures and Algorithm Analysis in C++ by Mark Allen Weiss, Pearson, 4th Edition, 2013*
2. *Data Structures and Algorithms in C++ by Michael T. Goodrich, Roberto Tamassia, David M. Mount, Wiley India, 2nd Edition, 2011*
3. *Data Structures Using C++ by D.S. Malik, Cengage Learning, 2nd Edition, 2010*

Course Outcomes**

After completion of the course student will be able to

1. Demonstrate the ability to implement C++ programs using functions, recursion, exception handling, and dynamic memory allocation.
2. Apply stack data structures and templates in C++ to solve problems such as expression conversion, evaluation, and parenthesis checking.
3. Design and implement queue structures circular, priority, and Deque using templates and analyze their applications.
4. Develop and manipulate dynamic data structures such as linked lists and binary trees to represent hierarchical data and perform tree traversals.

*Books to be listed as per the format with decreasing level of coverage of syllabus

** Each CO to be written with proper action word and should be assessable and quantifiable

CourseArticulation Matrix:

Course Outcomes	POs											PSOs		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
CO1: Demonstrate the ability to implement C++ programs using functions, recursion, exception handling, and dynamic memory allocation.	2	3	1	1	0	0	0	0	0	0	0	0	3	0
CO2: Apply stack data structures and templates in C++ to solve problems such as expression conversion, evaluation, and parenthesis checking.	2	3	1	2	0	0	0	0	0	0	0	0	3	0
CO3: Design and implement various queue structures including circular, priority, and Deque using templates and analyze their applications.	2	3	2	2	0	0	0	0	0	0	0	0	3	0
CO4: Develop and manipulate dynamic data structures such as linked lists and binary trees to represent hierarchical data and perform tree traversals.	2	3	1	2	3	0	0	0	0	0	0	0	3	0

Course Title: Basics of AI and ML			Course Code: BECA305C
Credits: 03	L-T-P: 3-0-0	Contact Hours / Week: 03	Total Teaching Hours: 40
CIE Marks: 50		SEE Marks: 50	Total Marks: 100

Department: Electronics and Communication Engineering.
Course Type: PCC

Course Objectives:

1. To introduce the concept and significance of Artificial Intelligence.
2. To explore intelligent agent design, environment interaction, and rationality.
3. To learn problem-solving approaches using search algorithms.
4. To apply AI and ML techniques in electronics and communication domains.

Course Outcomes:

A student who successfully completes this course should be able to

1. Define and explain fundamental AI concepts and agent-based design.
2. Analyze different types of environments and rational behavior of intelligent agents.
3. Formulate problems and apply suitable AI search strategies.
4. Implement supervised and unsupervised ML algorithms for real-world applications.

The topics that enable to meet the above objectives and course outcomes are given below

Unit I

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 to AI.

AI versus human intelligence: Turing test and Total Turing Test. Components of AI: knowledge representation, reasoning, learning, perception, and action. Introduction to intelligent agents: definition, structure of agents, and the agent-environment interaction. Characteristics of intelligent agents; concept of rationality. PEAS framework (Performance measure, Environment, Actuators, Sensors); types of agents – simple reflex agents, model-based agents, goal-based agents, utility-based agents and learning agents.

Unit II

Problem Solving in AI: Problem formulation, initial state, goal state, and operators. Examples of Search space and search tree. Uninformed search strategies: Breadth-First Search (BFS), Depth-First Search (DFS), Uniform Cost Search – their working principles, advantages, and limitations. Informed search strategies: Greedy Best-First Search and A* Search algorithm. Heuristic evaluation functions. Criteria for search algorithm performance – completeness, optimality, time complexity, and space complexity. Real-world applications of AI search strategies in robotics pathfinding, circuit diagnosis, and smart system optimization.

Unit III

Introduction to Machine Learning: Definition and components of machine learning, types of learning – supervised and unsupervised. Supervised learning: concept of classification and regression, model representation and learning process. Algorithms for supervised learning: k-nearest neighbors, linear regression, logistic regression, decision trees. Training and testing phases, performance metrics – accuracy, precision, recall, F1-score. Bias-variance trade-off, overfitting and underfitting. Solved examples using classification and regression.

Unit IV

Unsupervised learning: concept and importance, clustering and dimensionality reduction. Clustering algorithms: k-means clustering, hierarchical clustering – working, distance measures and cluster evaluation. Dimensionality reduction techniques: principal component analysis (PCA), applications in feature extraction. Introduction to anomaly detection, ensemble learning and real-world applications of unsupervised learning. Implementation examples and interpretation of outputs.

CO/PO Mapping:

Cos/POs	PO1	PO3	PO5	PO6	PO7	PO8	PO9	PO10	PO11	Pso3
CO1	3	2	2	2	3	2	2	2	1	1
CO2	3	2	2	2	3	2	2	2	1	1
CO3	3	2	2	2	3	2	2	2	1	1
CO4	3	2	2	2	3	2	2	2	1	1
CO5	3	2	2	2	3	2	2	2	1	1

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.

SUBJECT CODE: BECA306L	Digital System Design Using Verilog Laboratory	Credits: 01
L:T:P – 0-0-3		CIE Marks: 50
Total Hours/Week: 03		SEE Marks: 50

Sl. No.	Experiments
1	Design and implement (a) Half Adder & Full Adder using basic gates (b) 4-variable Boolean function using IC74151(8:1MUX).
2	Realize Master-Slave i) JK Flip-Flop, ii) D Flip-Flop and iii) T Flip-Flop b) using 7476
3	Design and implement a) 3-bit up/down asynchronous counter 7476 JK Flip Flops
4	To simplify the given Boolean expressions and realize using Verilog program
5	To realize Adder/Subtract or (Full/half) circuits using Verilog data flow description.
6	To realize 4-bit ALU using Verilog program.
7	To realize the following Code converters using Verilog Behavioral description a) Gray to binary and vice versa b) Binary to excess3 and vice versa
8	To realize using Verilog Behavioral description: 8:1 mux, 8:3 encoder, and Priority encoder
9	To realize using Verilog Behavioral description: 1:8 De-mux, 3:8 decoder, 2–bit Comparator
10	To realize using Verilog Behavioral description: Flip-flops: a) JK type b) SR type c) T type and d) D-type
11	To realize Counters-up/down (BCD and binary) using Verilog Behavioral description.
12	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 down loading Verilog codes and check the output for inter facing experiments.

13	Verilog Program to interface a Stepper motor to the FPGA/CPLD and rotate the motor in the specified direction (by N steps).
14	Verilog program to interface 16x2 LCD to FPGA Board/CPLD Board

Open ended Experiments

UART or any other standard interface

- Write Verilog description
- Verify the Functionality using Test-bench
- Synthesize the design targeting suitable library and by setting area and timing constraints
- Tabulate the Area, Power and Delay for the Synthesized netlist, identify Critical path

Course Outcomes**

After completion of the course student will be able to

1. **Implement** and verify the operation of fundamental digital circuits—including combinational systems (adders, code converters) and sequential systems (flip-flops, counters)—using both discrete ICs and Hardware Description Language (Verilog) methodologies.
2. **Develop, simulate, and synthesize** digital systems using Verilog HDL (covering dataflow, behavioral, and structural modeling) and demonstrate their practical functionality by interfacing with peripheral devices on an FPGA/CPLD platform.

Course Outcomes	Programme Outcomes (POs)											Program Specific Outcomes (PSOs)		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**1**	**2**	**3**
CO1	1	0	2	0	3	0	0	0	0	0	0	0	3	0
CO2	1	0	2	0	3	0	0	0	0	0	0	0	3	0

Course Code: BECA307L	Electronic Devices and Circuits Laboratory	
L:T:P - 0 : 0 : 2		CIE Marks:50
Total Hours/Week: 02		SEE Marks:50

List of Experiments

Sl. No	Title of the Experiment
1	Design and verification of clipper circuits.
2	Design and verification of clamper circuits.
3	Design and verification of full wave rectifier circuit with capacitor filter.
4	Design and verification of voltage regulator circuit using Zener diode.
5	Verification of V-I characteristics of FET and MOSFET.
6	Design and analysis of common emitter amplifier circuit.
7	Design and analysis of series voltage feedback amplifier circuit.
8	Design and analysis of common source amplifier circuit.
9	Design and analysis of series fed class-A power amplifier circuit.
10	Design and analysis of RC phase shift oscillator.
11	Design and analysis of 5V regulated power supply.
12	Design and analysis of UJT relaxation oscillator.

Course Outcomes

After completion of the course students will be able to

1. Design and analyze clipper and clamper circuits.
2. Design and analyze amplifiers circuits using BJT and FET.
3. Design and analyze oscillator circuits.
4. Design and verify regulated power supply circuit.

Course Outcomes	Programme Outcomes (POs)											Program Specific Outcomes (PSOs)		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**1**	**2**	**3**
CO1. Design and analyze clipper and clamper circuits.	3	3	3	2	0	0	0	0	0	0	2	3	1	0
CO2. Design and analyze amplifiers circuits using BJT and FET.	3	3	3	2	0	0	0	0	0	0	2	3	1	0
CO3. Design and analyze oscillator circuits.	3	3	3	2	0	0	0	0	0	0	2	3	1	0
CO4. Design and verify regulated power supply circuit.	3	3	3	2	0	0	0	0	0	0	2	3	1	0
Course Contribution to POs and PSOs	**3**	**3**	**3**	**2**	**0**	**0**	**0**	**0**	**0**	**0**	**2**	**3**	**1**	**0**

Course Code: BHSA360M	**YOGA** **(Common to All Branches)**	Credit :	00
Hours/Week : (L:T:P:S) : 0:0:2:0		CIE Marks :	100
Total Hours Per Semester : 26hrs		SEE Marks :	00

Semester III	
Yoga, its origin, history and development. Yoga, its meaning, definitions.	
Different schools of yoga, Aim and Objectives of yoga, importance of prayer	
Yogic practices for common man to promote positive health	
Rules to be followed during yogic practices by practitioner	
Yoga its misconceptions,	
Difference between yogic and non yogic practices	
Suryanamaskar prayer and its meaning, Need, importance and benefits of Suryanamaskar12 count, 2 rounds	
Asana, Need, importance of Asana. Different types of asana. Asana its meaning by name, technique, precautionary measures and benefits of each asana	
Different types of Asanas	
Sitting	1.Padmasana 2.Vajrasana
Standing	1. Vrikshana 2. Trikonasana
Prone line	1.Bhujangasana 2.Shalabhasana
Supine line	1. Utthitadvipadasana 2. Ardhahalasana

Course Outcomes (Course Skill Set):

By the end of this course, students will be able to:

1	**Understand** the meaning, aims, and objectives of Yoga and explain its relevance in daily life.
2	**Perform and Teach Suryanamaskar**, demonstrating its correct sequence, technique, and explaining its physical and mental benefits.

3	**Identify, Demonstrate, and Teach Various Asanas** by name, including their significance, correct methods of practice, and associated benefits for overall well-being
4	**Instruct and Explain Kapalabhati**, including its purpose, technique, precautions, and health benefits
5	**Teach Different Types of Pranayama**, detailing their names, procedures, safety precautions, and therapeutic uses.
6	**Coach Various Yogic Kriyas**, explaining their methods, importance, and practical applications for maintaining internal cleansing and health

Assessment Details (both CIE and SEE)	
1.	Students will be assessed with internal test by a. Multiple choice questions b. Descriptivetype questions (Two internal assessment tests with 25 marks/test)
2.	Final test shall be conducted for whole syllabus for 50 marks.
3.	Continuous Internal Evaluation shall be for 100 marks (including IA test)
Suggested Learning Resources **Books:**	
1.	**Yogapravesha in Kannada by Ajitkumar**
2.	**Light on Yoga by BKS Iyengar**
3.	**Teaching Methods for Yogic practices by Dr. M L Gharote & Dr. S K Ganguly**
4.	**Yoga Instructor Course hand book published by SVYASA University, Bengaluru**
5.	**Yoga for Children –step by step – by Yamini Muthanna**
Web links and Video Lectures (e-Resources): Refer links **https://youtu.be/KB-TYlgd1wE** **https://youtu.be/aa-TG0Wg1Ls**	

		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
No	Programme Outcomes Course Outcomes															
After successful completion of the course the students will be able to:																

1	**Understand** the meaning, aims, and objectives of Yoga and explain its relevance in daily life.	-	-	1	-	-	1	1	1	-	1	-	1			
2	**Perform and Teach Suryanamaskar**, demonstrating its correct sequence, technique, and explaining its physical and mental benefits.	-	-	1	-	-	1	1	1	-	1	-	1			
3	**Identify, Demonstrate, and Teach Various Asanas** by name, including their significance, correct methods of practice, and associated benefits for overall well-being	-	-	1	-	-	1	1	1	-	1	-	1			
4	**Instruct and Explain Kapalabhati**, including its purpose, technique, precautions, and health benefits	-	-	1	-	-	1	1	1	-	1	-	1			
5	**Teach Different Types of Pranayama**, detailing their names, procedures, safety precautions, and therapeutic uses.	-	-	1	-	-	1	1	1	-	1	-	1			
6	**Coach Various Yogic Kriyas**, explaining their methods, importance, and practical applications for maintaining internal cleansing and health	-	-	1	-	-	1	1	1	-	1	-	1			

Course Code: BHSB360M	**National Service Scheme**	**Credit** : 00
Hours/Week (L:T:P:S) : 0:0:2:0	**(NSS)**	**CIE Marks** : 100

Course objectives:

National Service Scheme(NSS)will enable the students to:

1. Understand the community in general in which they work.
2. Identify the needs and problems of the community and involve them in problem–solving.
3. Develop among themselves a sense of social & civic responsibility & utilize their. Knowledge in finding practical solutions to individual and community problems.
4. Develop competence required for group-living and sharing of responsibilities & gains kills In mobilizing community participation to acquire leadership qualities and democratic attitudes.
5. Develop capacity to meet emergencies and natural disasters &practice national integration and social harmony in general.

General Instructions-Pedagogy:

These are sample Strategies, which teachers can use to accelerate the attainment of the various course outcomes.

1. In addition to the traditional lecture method, different types of innovative teaching methods may be adopted so that the activities will develop students'theoretical and applied social and cultural skills.
2. State the need for NSS activities and its present relevance in the society and Provide real-life examples.
3. Support and guide the students for self-planned activities.
4. You will also be responsible for assigning home work, grading assignments and quizzes, and documenting students' progress in real activities in the field.
5. Encourage the students for group work to improve their creative and analytical skills.

National Service Scheme (NSS)–Contents

1. Organic farming, Indian Agriculture (Past, Present and Future) Connectivity for marketing.
2. Waste management–Public, Private and Govtorganization,5R's.
3. Setting of the information imparting club for women leading to contribution in social and economic issues.
4. Water conservation techniques – Role of different stake holders–Implementation.
5. Preparing an actionable business proposal for enhancing the village income and approach for implementation.
6. Helpinglocalschoolstoachievegoodresultsandenhancetheirenrolmentin Higher/ technical vocation.
7. Developing Sustainable Water management system for rural areas and implementation approaches.
8. ContributiontoanynationallevelinitiativeofGovernmentofIndia.Foreg.DigitalIndia, SkillIndia,SwatchBharat, Atma nirbhar Bharath, Make in India, Mudra scheme, Skill development programs etc.
9. Spreadingpublicawarenessunderruraloutreachprograms.(minimum5programs).
10. Social connect and responsibilities.
11. Plantation and adoption of plants. Know your plants.
12. Organize National integrationandsocial harmonyevents/workshops/seminars.(Minimum02programs).
13. Govt.schoolRejuvenationandhelpingthemtoachieve goodinfrastructure.
14. NOTE:

15. Student/s in individual or in agroup Should select any one activity in the beginning of each semester till end of thatrespective semester for successful completion as per the instructions of NSS officer with the consent of HOD of the department.
16. At the end of every semester, activity report should be submitted for evaluation.

DistributionofActivities-Semesterwisefrom3rdto 6thsemester

Sem	Topics/Activities to be Covered
3rdSemfor 25Marks	1. Organic farming,Indian Agriculture (Past,PresentandFuture)Connectivity formarketing. 2. Waste management–Public, Private and Govtorganization,5R's. 3. Setting of the in formation imparting club for women leading to contributionin social and economic issues.
4thSemfor 25Marks	4. Water conservationtechniques –Role of different take holders–Implementation. 5. Preparinganaction ablebusinessproposal for enhancing the village in come and approach for implementation. 6. HelpinglocalschoolstoachievegoodresultsandenhancetheirenrolmentinHigher/ technical/vocationaleducation.
5thSemfor25Marks	7. Developing Sustainable Water management system forruralareas and implementationapproaches. 8. Contribution to any national level initiative of Government of India. Foreg. Digital India, SkillIndia,SwachhBharat,AtmanirbharBharath, MakeinIndia,Mudrascheme,Skilldevelopmentprogramsetc. 9. Spreading publicawareness underruraloutreachprograms.(minimum5programs). 10. Social connect and responsibilities.
6thSemfor 25Marks	11. Plantation and adoption of plants. Know your plants. 12. Organize Nation alintegration and social harmonyevents/workshops/seminars.(Minimum02programs). 13. Govt.school Rejuvenation and helping them to achieve good infrastructure.

Pedagogy–Guidelines,itmaydifferdependingonlocalresourcesavailableforthestudyaswellas environmentand climaticdifferences,locationand timeof execution.

SINo	Topic	Groups ize	Location	Activityexecution	Reporting	EvaluationOftheTopic
1.	Organicfarming,Indian Agriculture (Past,Present and Future)Connectivity formarketing.	May beindividual orteam	Farmers land/Villages/roadside /communityarea/ Collegecampusetc…..	Siteselection/properconsultation/Continuous monitoring/Informationboard	Reportshouldbe submitted byindividual to theconcernedevaluationauthority	Evaluation asper the rubricsOf scheme andsyllabusbyNSSofficer
2.	Waste management– Public,PrivateandGovtorganization,5 R's.	May beindividual orteam	Villages/CityAreas/Grama panchayat/publicassociations/GovernmentSchemesofficers/ campusetc…..	Siteselection/properconsultation/Continuous monitoring/Informationboard	Reportshouldbe submitted byindividual to theconcernedevaluationauthority	Evaluation asper the rubricsOf scheme andsyllabusbyNSSofficer
3.	Setting of theinformation impartingclub forwomenleadingtocontributioninsocial andeconomicissues.	May beindividual orteam	Women empowermentgroups/ ConsultingNGOs & Govt Teams /Collegecampusetc…..	Groupselection/properconsultation/Continuous monitoring/Informationboard	Reportshouldbe submitted byindividual to theconcernedevaluationauthority	Evaluation asper the rubricsOf scheme andsyllabusbyNSSofficer
4.	Water conservationtechniques – Role ofdifferentstakeholders–Implementation.	May beindividual orteam	Villages/CityAreas/Grama panchayat/publicassociations/GovernmentSchemesofficers/ campusetc…..	siteselection /properconsultation/Continuous monitoring/Informationboard	Reportshouldbe submitted byindividual to theconcernedevaluationauthority	Evaluation asper the rubricsOf scheme andsyllabusbyNSSofficer
5.	Preparinganactionablebusiness proposal forenhancing the villageincome and approachforimplementation.	May beindividual orteam	Villages/CityAreas/Grama panchayat/publicassociations/GovernmentSchemesofficers/ campusetc…..	Groupselection/properconsultation/Continuous monitoring/Informationboard	Reportshouldbe submitted byindividual to theconcernedevaluationauthority	Evaluation asper the rubricsOf scheme andsyllabusbyNSSofficer

6.	Helpinglocalschoolstoachievegoodresultsand enhance theirenrolmentin Higher/ technical/vocationaleducation.	May beindividual orteam	Local government /private/ aidedschools/GovernmentSchemesofficers/ etc…..	Schoolselection/properconsultation/Continuous monitoring/Informationboard	Reportshouldbe submitted byindividual to theconcernedevaluationauthority	Evaluation asper the rubricsOf scheme andsyllabusbyNSSofficer
7.	Developing SustainableWater managementsystem for rural areasand implementationapproaches.	May beindividual orteam	Villages/CityAreas/Grama panchayat/publicassociations/GovernmentSchemesofficers/ campusetc…..	siteselection/propersonsultation/Continuous monitoring/Informationboard	Reportshouldbe submitted byindividual to theconcernedevaluationauthority	Evaluation asper the rubricsOf scheme andsyllabusbyNSSofficer
8.	Contribution to anynational level initiativeofGovernment ofIndia.For eg. Digital India,Skill India, SwachhBharat, AtmanirbharBharath, Make inIndia,Mudraschem e,Skill developmentprogram setc.	May beindividual orteam	Villages/CityAreas/Grama panchayat/publicassociations/GovernmentSchemesofficers/ campusetc…..	Groupselection/properconsultation/Continuous monitoring /Informationboard	Reportshouldbe submitted byindividual to theconcernedevaluationauthority	Evaluation asper the rubricsOf scheme andsyllabusbyNSSofficer
9.	Spreading publicawareness under ruraloutreachprograms.(minimum5programs).////Socialconnect andresponsibilities.	May beindividual orteam	Villages/CityAreas/Grama panchayat/publicassociations/GovernmentSchemesofficers/ campusetc…..	Groupselection/properconsultation/Continuous monitoring /Informationboard	Reportshouldbe submitted byindividual to theconcernedevaluationauthority	Evaluation asper the rubricsOf scheme andsyllabusbyNSSofficer
10.	Plantationandadoptionof plants. Know yourplants.	May beindividual orteam	Villages/CityAreas/Grama panchayat/publicassociations/GovernmentSchemesofficers/ campusetc…..	Placeselection/properconsultation/Continuous monitoring /Informationboard	Reportshouldbe submitted byindividual to theconcernedevaluationauthority	Evaluation asper the rubricsOf scheme andsyllabusbyNSSofficer

11.	Organize Nationalintegrationa ndsocialharmonyeve nts /workshops /seminars.(Minimum0 2 programs).	May beindivid ual orteam	Villages/CityAreas/G rama panchayat/publicassoci ations/GovernmentSche mesofficers/ campusetc…..	Placeselection/proper consultation/Continuou s monitoring /Informationboard	Reportshouldbe submitted byindividual to theconcernedev aluationauthorit y	Evaluation asper the rubricsOf scheme andsyllabusbyNS Sofficer
12.	Govt. schoolRejuvenati on andhelping them toachievegoodinf rastructure.	May beindivid ual orteam	Villages/CityAreas/G rama panchayat/publicassoci ations/GovernmentSche mesofficers/ campusetc…..	Placeselection/proper consultation/Continuou s monitoring /Informationboard	Reportshouldbe submitted byindividual to theconcernedev aluationauthorit y	Evaluation asper the rubricsOf scheme andsyllabusbyNS Sofficer

Plan of Action (Execution of Activities For Each Semester)

Sl.NO	Practice Session Description
1	**Lecture session by NSS Officer**
2	**Students Presentation on Topics**
3	**Presentation- 1,Selectionoftopic,PHASE-1**
4	**Commencement of activity and its progress-PHASE- 2**
5	**Execution of Activity**
6	**Execution of Activity**
7	**Execution of Activity**
8	**Execution of Activity**
9	**Execution of Activity**
10	**Casestudy based Assessment, Individual performance**
11	**Sectorwise study and its consolidation**
12	**Video based seminar for 10 minutes by each student At the end of semester with Report.**

- In every semester from 3rd semester 6th semester, Each student should do activities according to the scheme and syllabus.
- At the end of every semester student performance has to be evaluated by the NSS officer for the assigned activity progress and its completion.
- At last in 6th semester consolidated report of all activities from 3rd to 6th semester, compiled report should be submitted as per the instructions.

Course Outcomes: After completing the course, the students will be able to

CO1:	Recognize and understand their roles and responsibilities towards society for its betterment.
CO2:	Analyze environmental and societal issues and design effective and sustainable solutions
CO3:	Assess existing systems critically and propose practical, innovative solutions to promote sustainable development
CO4:	Plan and implement government-led or self-initiated projects efficiently for community and societal welfare
CO5:	Develop the ability to respond to emergencies and natural disasters, while fostering national integration, social harmony, and unity.

AssessmentDetails forCIE(bothCIE andSEE)

Weightage	**CIE– 100%**	• Implementationstrategiesoftheproject(NSSwork). • The last report should be signed byNSSOfficer,theHODandprincipal. • Atlastreportshould beevaluated bytheNSSofficer ofthe institute. • Finallytheconsolidatedmarkssheetshouldbesent to the university and also to be madeavailableat LICvisit.
Presentation -1 Selectionoftopic,PHASE-1	10Marks	
Commencementofactivityand itsprogress-PHASE-2	10Marks	
Casestudybased Assessment Individualperformance	10Marks	
Sectorwisestudyand itsconsolidation	10Marks	
Videobasedseminarfor10minutesbyeach studentAttheendofsemesterwithReport.	10Marks	
Totalmarksforthecourseineachsemester	**50Marks**	

Marksscoredfor50bythestudentsshouldbeScaledownto25marksIneachsemester for CIEentryintheVTUportal.

25marksCIEentry will beenteredinUniversity IAmarksportalattheendofeachsemester3rdto6th sem,Reportandassessmentcopyshouldbe madeavailableinthedepartmentsemesterwise.

Studentsshouldpresenttheprogressoftheactivitiesasperthescheduleintheprescribedpracticalsessioninthefield.Thereshouldbepositive progressinthevertical order for thebenefitof societyingeneral.

Suggested Learning Resources:

Books:

1. **NSS CourseManual,** PublishedbyNSSCell,VTUBelagavi.
2. GovernmentofKarnataka,NSS cell,activitiesreportsanditsmanual.
3. GovernmentofIndia,nsscell,Activitiesreportsanditsmanual.

CO-PO Mapping

		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
No	Programme Outcomes / Course Outcomes															
After successful completion of the course the students will be able to:																
1	Recognize and understand their roles and responsibilities towards society for its betterment.	-	-	1	-	-	1	2	1	1	1	2	1	-	-	-
2	Analyze environmental and societal issues and design effective and sustainable solutions	-	-	1	-	-	1	2	1	1	1	2	1	-	-	-
3	Assess existing systems critically and propose practical, innovative solutions to promote sustainable development	-	-	1	-	-	1	2	1	1	1	2	1	-	-	-
4	Plan and implement government-led or self-initiated projects efficiently for community and societal welfare	-	-	1	-	-	1	2	1	1	1	2	1	-	-	-
5	Develop the ability to respond to emergencies and natural disasters, while fostering	-	-	1	-	-	1	2	1	1	1	2	1	-	-	-

	national integration, social harmony, and unity.															

Course Code :22UHS003M	PHYSICAL EDUCITION AND SPORTS (PE) **(Common to All Branches)**	**Credits :**	00
Course Code :BHSC360M		**Credits :**	00
Hours/Week (L:T:P:S) : 0:0:2:0		**CIE Marks :**	100
Total Hours Per Semester : 26hrs		**SEE Marks :**	00

Course Outcomes: At the end of the course, the student will be able to	
1.	Understand the fundamental concepts and skills of Physical Education, Health, Nutrition and Fitness
2.	Familiarization of health- related Exercises, Sports for overall growth and development
3.	Create a foundation for the professionals in Physical Education and Sports
4.	Participate in the competition at regional/state/national/international levels.
5.	Create consciousness among the students on Health, Fitness and Wellness in developing and maintaining a healthy lifestyle.
6.	Understand and practice of Traditional Games
Module I: Orientation	**4Hours**
A.	Lifestyle
B.	Health & Wellness
C.	Pre-Fitness test.
Module II: General Fitness & Components of Fitness	**4Hours**
A. Warming up (Free Handexercises)	
B. Strength–Push-up/ Pull-ups	
C. Speed–30Mtr Dash	
Module III: Specific games (Any one to be selected by the student)	**16Hours**
1. Kabaddi–Hand touch, Toe Touch, Thigh Hold, Ankle hold and Bonus.	
2. Kho-Kho–GivingKho,Single Chain,Pole dive,Pole turning,3-6Up.	
Module IV: Orientation	**4Hours**
A.	Postural deformities.
B.	Stress management
Module V : Specific Games (Any one to be selected by the student)	**16Hours**
A.	Throw ball
B.	Table Tennis

C.	Athletics (Field Events-Jumps)–Any event as per availability of Ground.
Module VI: Aerobics	**4 Hours**

Scheme and Assessment for auditing the course and Grades:

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

Course Outcomes:

1.Identify and Understand common postural deformities and apply stress management techniques in the context of sports and athletics

2.Participate Confidently in competitions at regional, state, national, and international levels

3.Demonstrate Proficiency in specific games and athletic jumping events through regular practice and skill development.

4.Understand and Perform various Aerobic exercises for fitness and endurance enhancement.

5.Acquire Skills and Practice specific games and athletic throwing events with proper techniques and strategies

Module I: Ethics and Moral Values	**4Hours**
A.	Ethics in Sports
B.	Moral Values in Sports and Games
Module II: Specific Games (Any one to be selected by the student)	**16Hours**
A.	Volley ball–Attack, Block, Service, Upper Hand Pass and Lower hand Pass.
B.	Athletics (TrackEvents) –Any event as per availability of Ground
Module III: Role of Organisation and administration	**4Hours**

		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
No	Programme Outcomes															

	Course Outcomes															
After successful completion of the course the students will be able to:																
1	**Identify and Understand** common postural deformities and apply stress management techniques in the context of sports and athletics	-	-	1	-	-	1	1	-	-	-	-	1			
2	**Participate Confidently** in competitions at regional, state, national, and international levels	-	-	1	-	-	1	1	-	-	-	-	1			
3	**Demonstrate Proficiency** in specific games and athletic jumping events through regular practice and skill development.	-	-	1	-	-	1	1	-	-	-	-	1			
4	**Understand and Perform** various Aerobic exercises for fitness and endurance enhancement.	-	-	1	-	-	1	1	-	-	-	-	1			
5	**Acquire Skills and Practice** specific games and athletic throwing events with proper techniques and strategies	-	-	1	-	-	1	1	-	-	-	-	1			

4th Semester Syllabus

Course Code: BECA401C	Signals and Systems	Credits:03
L:T:P:S–**3:2:0:2**		CIEMarks:50
TotalHours/Week: 03		SEEMarks: 50

UNIT-I	10 Hrs

IntroductiontoContinuous-timeandDiscrete-timeSignalsandSystems: Definitionofsignals and systems, sampling, classification of signals, elementary signals, basic operations on signals, interconnection of systems and operations, classification of systems and properties of systems
SelfStudyComponent: Introductiontotimevariant systems

UNIT–II	10 Hrs

TimedomainrepresentationofLTIsystems: Convolutionsum,convolutionintegral,impulse response representation of systems, properties of impulse response.
SelfStudyComponent: Introductiontofastconvolution-WinogradAlgorithm

UNIT–III	10 Hrs

FourierandinverseFouriertransformationofsignals: Introductiontocomplexsinusoidalsignals and their use in Fourier representation of periodic signals, continuous time Fourier series (CTFS), discretetimeFourierseries(DTFS),continuoustimeFouriertransform(CTFT),discretetimeFourier transform (DTFT), inverse discrete Fourier transformation (IDTFT), properties of DTFT,
SelfStudyComponent: BasicsofdiscreteCosinetransform

UNIT–IV	10Hrs.

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.
SelfStudyComponent: BasicsofHilberttransform

ReferenceBooks*

1. SimonHaykinandBarryVanVeen,"Signalsandsystems",Edition2,JohnWileyIndianEd, 2008.
2. AlanV.Oppenheim,AlanS.WillskyandSyedHamidNawab,"SignalsandSystems",Edition2, PHI, 2014.

WeblinksandVideoLectures (e-Resources):

1. https://nptel.ac.in/courses/117101055
2. https://www.digimat.in/nptel/courses/video/108104100/L02.html
3. https://nptel.ac.in/courses/117104074

Course Outcomes**

Aftercompletion ofthecoursestudentwill beableto

1. Perform different operations on signals and systems.
2. Characterize different class of signals and systems in time and transform domain
3. Compute system response to arbitrary inputs using time and frequency domain tools.
4. Explore the concepts of signals and systems through implementation using MATLAB/SCILAB/Python.

Course Outcomes	Programme Outcomes (POs)											Program Specific Outcomes(PSOs)		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
CO1	3	2	1	0	0	0	0	0	0	0	0	3	0	0
CO2	3	3	1	0	0	0	0	0	0	0	0	3	0	0
CO3	3	3	1	0	0	0	0	0	0	0	0	3	0	0
CO4	3	2	1	0	0	0	0	0	0	0	0	3	0	0

Course Code: BECA402C	Analog and Digital Communication	Credits: 03
L:T:P - 3 : 0: 0		CIE Marks: 50
Total Hours/Week: 40		SEE Marks: 50

UNIT-I	10 Hrs.

Random Variables and Processes: Introduction, probability, conditional probability.
Random variables: Continuous and discrete random variable, statistical averages, distribution and density functions, central limit theorem.
Random processes: Mean, correlation and covariance function, properties of autocorrelation function, cross–correlation function, Gaussian process.

UNIT–II	10 Hrs.

Amplitude Modulation (AM) Fundamentals: AM concepts, time domain and frequency domain description, generation and detection of AM waves, Generation of DSB-SC, SSB, VSB modulation, superheterodyne receiver.
Angle modulation: Concept of angle modulation, relation between frequency and phase modulation, bandwidth of angle modulated wave. Generation of FM: Direct and indirect methods, PLL, demodulation of FM, pre-emphasis and de-emphasis, FM radio.

UNIT–III	10 Hrs.

Digital Representation of Analog Signals: Introduction, sampling process, pulse amplitude modulation, time-division multiplexing.
Pulse Position Modulation (PPM): Generation and detection of PPM wave, the quantization process.
Pulse Code Modulation: Sampling, quantization, encoding, line codes, differential encoding.

UNIT–IV	10 Hrs.

Digital Modulation Techniques: Digital Modulation formats, Coherent binary modulation techniques (ASK,PSK, FSK), Probability of error for each ASK, PSK, FSK.
Coherent quadrature modulation techniques: Minimum Shift Keying.
Non-coherent binary modulation techniques: Frequency Shift Keying and Differential Phase Shift Keying

Reference Books *

5. Lathi B.P., Zhi Ding (2010), "Modern Digital and Analog Communication Systems" (4), Oxford University Press
6. Louis E Frenzel (2016), "Principles of Electronic Communication Systems" (3), Mc Graw Hill Education (India) Private Limited
7. Simon Haykin & Michael Moher (2010), "Communication Systems" (5), John Wiley, India Pvt. Ltd, 2010,
8. John. G. Proakis, &Masoulsalehi (2014), "Fundamental of Communication System" Pearson Education,
9. Sam Shanmugan K. (2006), "Digital and Analog Communication Systems", John Wiley & Sons

Course Outcomes**

After completion of the course student will be able to

1. Apply the basics of probability to random variables and random processes for communication systems
2. Generate and detect AM/FM waves using electronic circuits
3. Design PCM systems through the processes sampling, quantization and encoding
4. Apply various digital modulation techniques for signal transmission

*Books to be listed as per the format with decreasing level of coverage of syllabus
** Each CO to be written with proper action word and should be assessable and quantifiable

Course Outcomes	Programme Outcomes (POs)											Program Specific Outcomes (PSOs)		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**1**	**2**	**3**
CO1	3	2	2	1	1							**3**	**2**	**1**
CO2	3	-	1	1	1							**3**	**2**	**1**
CO3	3	2	2	1	1							3	**2**	**1**
CO4	3	3	3	1	1							**3**	**2**	**1**

Course Code: BECA403C	Linear Integrated Circuits	Credits: 03
L:T:P –3:0:0		CIEMarks:50
Total Hours: 40		SEEMarks:50

UNIT-I	10 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	10 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.

Reference Books *

1. Ramakanth A Gayakwad, “Operational Amplifiers and Linear Integrated Circuits”, 3rd& 4th Edition, PHI.
2. James M. Fiore, “Op-amps and linear integrated circuits: Concepts and applications”, CENGAGE Learning 2009.
3. D. Roy Choudary, “Linear Integrated Circuits”, 2ndEdition.

Course Outcomes**

After completion of the course student will be able to

1. Identify and analyse the different configurations of differential amplifier.
2. Analyse the differentfeedback amplifiers and various parameters of practical op-amp.
3. Design of the op amp circuits to performs mathematical operations and active filters.
4. Design different types of waveform generators, data converters, Precision rectifier, comparators and converters.

Course Outcomes	POs											PSOs		
	1	2	3	4	5	6	7	8	9	10	11	m	n	o

CO1: Identify and analyze the different configurations of differential amplifier.	3	2	1	1	0	0	0	0	0	0	0	3	1	0
CO2: Analyze the different feedback amplifiers and various parameters of practical op-amp.	3	3	1	0	0	0	0	0	0	0	0	3	2	0
CO3: Design of the op amp circuits to perform mathematical operations and active filters.	3	3	2	2	0	1	1	0	0	0	0	3	2	0
CO4: Design different types of waveform generators, comparators and converters.	3	2	2	1	0	1	1	0	0	0	0	3	2	0
Course Contribution toPOs	**3.00**	**2.5**	**1.5**	**0.75**	**0**	**0.5**	**0.5**	**0**	**0**	**0**	**0**	**3**	**1.75**	**0**

SUBJECT CODE: BECA404C	ARM Microcontroller	Credits: 03
3:0:-		CIEMarks:50
Total Hours: 03		SEEMarks:50

UNIT-I	xx Hrs.

TheARM7TDMI Programmer's Model : Introduction , Data Types , Processor Modes , Registers ,Program Status Registers : The Control Bits , The Mode Bits , The Vector Table. *First Programs:* ***Introduction :***
Program1: Shifting Data ,Running the Code ,Examining Register and Memory Contents
Program2:FactorialCalculation , Program3:SwappingRegisterContents
Assembler Rules and Directives : Introduction , Structure of Assembly Language Modules , Predefined Register Names.

UNIT–II	xx Hrs.

Frequently Used Directives: AREA , RN , EQU , ENTRY , DCB , DCW , DCD , ALIGN SPACE , LTORG **,** END**.** Macros Miscellaneous Assembler Features ,Assembler Operators ,Literals. **Loads, Stores, and Addressing***:*Introduction ,Memory .

UNIT–III	xx Hrs.

Loads , Stores: *The Instructions* ,Operand Addressing: Pre-Indexed Addressing , Post-Indexed Addressing Endianness :Changing Endianness , Defining Memory Areas. **Constants and Literal Pools:**Introduction ,The ARM Rotation Scheme , Loading Constants into Registers , Loading Addresses into Registers. **Logic and Arithmetic***:* Introduction , Flags and Their Use , The N Flag , The V Flag , The Z Flag , The C Flag . Comparison Instructions.

UNIT–IV	xx Hrs.

Data Processing Operations : Boolean Operations , Shifts and Rotates Addition/Subtraction , Multiplication , Multiplication by a Constant , Division , Fractional Notation . ***Loops and Branches :*** Introduction , Branching , Looping , While Loops , For Loops Do-While Loops , ***Tables :***Introduction , Lookup Tables , Jump Tables , Binary Searches.

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 Education Limited,.

Course Outcomes**

After completion of the course student will be able to

1. Demonstrate proficiency in utilizing ARM development tools to write and debug assembly language programs, showing a deep comprehension of the ARM programmer's model.
2. Exhibit competence in writing and executing simple ARM assembly language programs, incorporating data processing, data transfer, and control flow instructions effectively.
3. Demonstrate skill in using the ARM instruction set to perform various operations, including branching, data processing, and coprocessor instructions.

*Books to be listed as per the format with decreasing level of coverage of syllabus
** Each CO to be written with proper action word and should be assessable and quantifiable

Course Outcomes	Programme Outcomes (POs)	Program Specific

													Outcomes (PSOs)		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO1	3	3	3	1	3	1	1	1	2	1	0	1	**0**	3	0
CO2	3	3	3	1	3	1	1	1	2	1	0	1	**0**	3	0
CO3	3	3	3	1	3	1	1	1	2	1	2	1	**0**	3	0
CO4	3	2	3	1	3	1	1	1	2	1	2	1	**0**	3	0

Course Code: BBTA405C	BIOLOGY FOR ENGINEERS	03 - Credits (3 : 0 : 0)
Hours / Week: 03		CIE Marks: 50
Total Hours: 40		SEE Marks: 50
Exam Hours: 03		Total Marks: 100

Course objectives:
- To familiarize the students with the basic biological aspects.
- To enable the students to apply biological concepts for engineering applications.
- To show the students how nature and biological systems inspire building sustainable solutions and technologies.
- To motivate the students to develop the interdisciplinary vision of biological engineering.

UNIT-I — 10 Hrs.

Introduction to Biology:

The cell: Structure, and functions of a cell. Biomolecules: Properties and functions of Carbohydrates, Nucleic acids, Proteins and Lipids. Importance of special biomolecules: Enzymes, vitamins and hormones -properties and functions.

Biomolecules and their Applications:

Carbohydrates in cellulose-based water filters production, PHA and PLA in bioplastics production, Nucleic acids in vaccines and diagnosis, Proteins in food production, Lipids in biodiesel, Enzymes in biosensor fabrication, food processing, detergent formulation and textile processing.

UNIT-II — 10 Hrs.

Bio Inspiration Models Used In Engineering:

Bio inspiration - Introduction, Alliance between Engineering and Biology, Biomimicry - Science mimicking nature. Bird flying (GPS and aircrafts), Lotus leaf effect (Super hydrophobic and self-cleaning surfaces), Gecko Feet, Plant burrs (Velcro), Shark skin (Friction reducing swimsuits), Kingfisher beak (Bullet train), Fire fly LED.

Nature Bioinspired Materials And Mechanisms:

BioEcholocation (ultrasonography, sonars), Photosynthesis (photovoltaic cells, bionic leaf), Respiration (MFCs) Human Blood substitutes-hemoglobin based oxygen carriers (HBOCs) and perflourocarbons (PFCs).

UNIT-III — 10 Hrs.

Human Organ Systems And Bio Designs

Brain as a CPU system (architecture, CNS and Peripheral Nervous System, signal transmission, EEG, Robotic arms for prosthetics. Engineering solutions for Parkinson's disease).

Heart as a pump system (architecture, electrical signalling - ECG monitoring and heart related issues, reasons for blockages of blood vessels, design of stents, pace makers, defibrillators).

Lungs as purification system gas exchange mechanisms, spirometry, Ventilators, Heart-lung machine).

Eye as a Camera system, bionic eye. **Kidney** as a filtration system - dialysis systems.

UNIT-IV — 10 Hrs.

Trends In Bioengineering

Bioprinting techniques and materials, 3D printing of ear, bone and skin, electrical tongue and electrical nose in food science, Self-healing bioconcrete (based on bacillus spores, calcium lactate nutrients and biomineralization processes), Biomining via microbial surface adsorption. Artificial Intelligence for disease diagnosis. Biochips & their applications. Biosensors & their applications.

Web links and Video Lectures (e-Resources)

• https://nptel.ac.in/courses/121106008

• https://freevideolectures.com/course/4877/nptel-biology-engineers-other-non-biologists

•https://ocw.mit.edu/courses/20-020-introduction-to-biological-engineering-design-spring-2009

• https://ocw.mit.edu/courses/20-010j-introduction-to-bioengineering-be-010j-spring-2006

• https://www.coursera.org/courses?query=biology

• https://onlinecourses.nptel.ac.in/noc19_ge31/preview

• https://www.classcentral.com/subject/biology

• https://www.futurelearn.com/courses/biology-basic-concepts

Reference Books

1. Biology for Engineers, Rajendra Singh C and Rathnakar Rao N, Rajendra Singh C and Rathnakar Rao N Publishing, Bengaluru, 2023.
2. Biology for Engineers, Thyagarajan S., Selvamurugan N., Rajesh M.P., Nazeer R.A., Thilagaraj W., Barathi S., and Jaganthan M.K., Tata McGraw-Hill, New Delhi, 2012.
3. Biology for Engineers, Arthur T. Johnson, CRC Press, Taylor and Francis, 2011
4. Biomedical Instrumentation, Leslie Cromwell, Prentice Hall 2011.
5. Biology for Engineers, Sohini Singh and Tanu Allen, Vayu Education of India, New Delhi, 2014.
6. Biomimetics: Nature-Based Innovation, Yoseph Bar-Cohen, 1st edition, 2012, CRC Press.
7. 3D Bioprinting: Fundamentals, Principles and Applications by Ibrahim Ozbolat, Academic Press, 2016.
8. Electronic Noses and Tongues in Food Science, Maria Rodriguez Mende, Academic Press, 2016

Course Outcomes

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

1. Elucidate the basic biological concepts required for engineering applications.

2. Use nature inspired concepts for domain specific applications.

3. Analyze and apply the principles of bioengineering in developing biomedical devices.

4. Apply the innovative biobased solutions for eco-friendly and socially relevant problems.

Course Outcomes	Programme Outcomes											Programme Specific Outcomes		
	1	2	3	4	5	6	7	8	9	10	11	PSO1	PSO2	PSO3
CO 1	3	3	2	2	2						3	3	2	2
CO 2	3	3	2	2	3						3	3	2	2
CO 3	3	3	2	2	3						3	3	2	2
CO 4	3	3	2	2	3						3	3	2	2

Course Code: BHSA424C	**Universal Human Values (UHV) (Common to all Branches)**	Credits	01
Hours/Week (L:T:P: S): 1:0:0:0		CIE Marks	50
Total Hours of Pedagogy (Theory + Lab) 15		SEE Marks	50

UNIT-I	**(3 Hrs.)**

Introduction to Value Education

Right Understanding, Relationship and Physical Facility (Holistic Development and the Role of Education) Understanding Value Education, Self-exploration as the Process for Value Education, Continuous Happiness and Prosperity – the Basic Human Aspirations, Happiness and Prosperity – Current Scenario, Method to Fulfill the Basic Human Aspirations

UNIT-II	**4 Hrs.)**

Harmony in the Human Being :

Understanding Human being as the Co-existence of the Self and the Body, Distinguishing between the Needs of the Self and the Body, The Body as an Instrument of the Self, Understanding Harmony in the Self, Harmony of the Self with the Body, Programme to ensure self-regulation and Health

UNIT-III	**(4 Hrs.)**

Harmony in the Family and Society :

Harmony in the Family – the Basic Unit of Human Interaction, 'Trust' – the Foundational Value in Relationship, 'Respect' – as the Right Evaluation, Other Feelings, Justice in Human-to-Human Relationship, Understanding Harmony in the Society, Vision for the Universal Human Order

UNIT-IV	**4 Hrs.)**

Harmony in the Nature/Existence Implications of the Holistic Understanding – a Look at Professional Ethics :

Understanding Harmony in the Nature, Interconnectedness, self-regulation and Mutual Fulfillment among the Four Orders of Nature, Realizing Existence as Co-existence at All Levels, The Holistic Perception of Harmony in Existence.

Natural Acceptance of Human Values, Definitiveness of (Ethical) Human Conduct, A Basis forHumanistic Education, Humanistic Constitution and Universal Human Order, Competence inProfessional Ethics Holistic Technologies, Production Systems and Management Models-Typical

Case Studies, Strategies for Transition towards Value-based Life and Profession

Reference Books

1. Gaur R R, Asthana,R.G, Bagaria G P (2019).A Foundation Course in Human Values and Professional Ethics,2nd Revised Edition, Excel Books, New Delhi,
2. The Teacher"s Manual for A Foundation Course in Human Values and ProfessionalEthics, R R Gaur, R Asthana, G
3. Jeevan Vidya: Ek Parichaya, A Nagaraj, Jeevan Vidya Prakashan, Amar kantak, 1999.
4. Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004.
5. The Story of Stuff (Book).
6. The Story of My Experiments with Truth - by Mohandas Karamchand Gandhi
7. Small is Beautiful - E. F Schumacher.
8. Andrews Cecile, Slow is Beautiful
9. Kumarappa J C ,Economy of Permanence

10. Pandit Sunderlal ,Bharat Mein Angreji Raj
11. Dharampa l, Rediscovering India
12. Gandhi Mohandas K ,Hind Swaraj or Indian Home Rule.
13. Maulana Abdul Kalam Azad :India Wins Freedom -
14. Romain Rolland (English) Vivekananda
15. Romain Rolland (English), Gandhi
16. Sussan George, 1976, How the Other Half Dies, Penguin Press. Reprinted 1986, 1991
17. Donella H. Meadows, Dennis L. Meadows, Jorgen Randers, William W. Behrens III, 1972,Limits to Growth – Club of Rome's report, Universe Books.
18. A Nagraj, 1998, Jeevan Vidya Ek Parichay, Divya Path Sansthan, Amarkantak.
19. P L Dhar, RR Gaur, 1990, Science and Humanism, Commonwealth Publishers.
20. A N Tripathy, 2003, Human Values, New Age International Publishers.
21. SubhasPalekar, 2000, How to practice NaturalFarming, Pracheen (Vaidik)KrishiTantraShodh, Amravati.
22. E G Seebauer & Robert L. Berry, 2000, Fundamentals of Ethics for Scientists & Engineers ,Oxford University Press
23. M Govindrajran, S Natrajan & V.S. Senthil Kumar, Engineering Ethics (including HumanValues), Eastern Economy Edition, Prentice Hall of India Ltd.
24. B P Banerjee, 2005, Foundations of Ethics and Management, Excel Books.
25. B L Bajpai, 2004, Indian Ethos and Modern Management, New Royal Book Co., Lucknow.Reprinted 2008.

Suggested Web Links:

1. Value Education websites,
2. https://www.uhv.org.in/uhv-ii,
3. http://uhv.ac.in,
4. http://www.uptu.ac.in
5. Story of Stuff,
6. http://www.storyofstuff.com
7. Al Gore, An Inconvenient Truth, Paramount Classics, USA
8. Charlie Chaplin, Modern Times, United Artists, USA
9. IIT Delhi, Modern Technology – the Untold Story
10. Gandhi A., Right Here Right Now, Cyclewala Productions
11. https://www.youtube.com/channel/UCQxWr5QB_eZUnwxSwxXEkQw
12. https://fdp-si.aicte-india.org/8dayUHV_download.php
13. https://www.youtube.com/watch?v=8ovkLRYXIjE
14. https://www.youtube.com/watch?v=OgdNx0X923I
15. https://www.youtube.com/watch?v=nGRcbRpvGoU
16. https://www.youtube.com/watch?v=sDxGXOgYEKM

Course Outcomes:

At the completion of the course student will be able to:

1. Understand the need and role of value education for holistic development
2. Differentiate between self and body needs, and practice harmony within the human being.
3. Analyze relationship dynamics based on trust, respect, and justice within families and society.
4. Recognize harmony in nature and existence, and apply these ideas to sustainable living
5. Explore ethical practices and professional conduct within personal and professional contexts

Course Outcomes	Programme Outcomes(POs)

	1	2	3	4	5	6	7	8	9	10	11
CO1	-	-	-	-	-	2	-	3	-	2	2
CO2	-	2	-	-	-	-	-	3	-	-	-
CO3	-	2	-	-	-	3	3	3	-	2	2
CO4	-	-	-	-	-	-	2	3	-	-	3
CO5	-	-	-	-	-	-	-	3	-	3	3

Course Code: BECA405L	Communication Engineering Laboratory	Credits: 01
L:T:P - 0 : 0 : 2		CIE Marks:50
Total Hours/Week: 02		SEE Marks:50

List of Experiments

Sl. No	Title of the Experiment
1	Design and verification of amplitude modulation and demodulation circuit.
2	Design and verification of frequency modulation and demodulation circuit.
3	Verification of sampling theorem for $f_s=2f_m$, $f_s>2fm$, $f_s<2f_m$.
4	Design and verification of pulse amplitude modulation and demodulation circuit.
5	Design and verification of amplitude shift keying modulation and demodulation circuit.
6	Design and verification of frequency shift keying modulation and demodulation circuit.
7	Design and verification of phase shift keying modulation and demodulation circuit.
8	Design and verification of pulse width modulation and demodulation circuit.
9	Design and verification of pulse position modulation and demodulation circuit.
10	Design and verification of voltage controlled oscillator circuit using phase locked loop.
11	Design and verification of sample and hold circuit.
12	Design and verification BJT mixer circuit.

Course Outcomes

After completion of the course students will be able to

1. Design and verify analog modulation and demodulation circuits.
2. Design and verify pulse modulation and demodulation circuits.
3. Design and verify sampling circuit.
4. Design and verify mixer circuit.

Course Articulation Matrix

Course Outcomes	Programme Outcomes (POs)											Program Specific Outcomes (PSOs)		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
CO1. Design and verify analog modulation and demodulation circuits.	3	3	3	2	3	0	0	0	0	0	2	3	1	0

CO2. Design and verify pulse modulation and demodulation circuits.	3	3	3	2	3	0	0	0	0	0	2	3	1	0
CO3. Design and verify sampling circuit.	3	3	3	2	3	0	0	0	0	0	2	3	1	0
CO4. Design and verify mixer circuit.	3	3	3	2	3	0	0	0	0	0	2	3	1	0
Course Contribution to POs and PSOs	**3**	**3**	**3**	**2**	**3**	**0**	**0**	**0**	**0**	**0**	**2**	**3**	**1**	**0**

Course Code: BECA406L	Linear Integrated Circuits Laboratory	Credits: 01
L:T:P – 0:0:2		CIEMarks:50
Total Hours/Week(L:T:P:S): 0:0:2:0		SEEMarks:50

Name of Experiments	10 Hrs.
5. To realize using op-amp an Inverting Amplifier and Non-Inverting Amplifier **6. To realize using op-amps i) Summing Amplifier ii)Difference amplifier** **7. To realize using op-amps an Instrumentation Amplifier** **8. To realize using op-amps i) Differentiator ii) Integrator** **9. To realize using op-amps a Full wave Precision Rectifier** **10. To realize using op-amps** • **Inverting and Non-Inverting Zero Crossing Detectors** • **Positive and Negative Voltage level detectors** **11. To realize using op-amp an Inverting Schmitt Trigger** **12. To realize using op-amp an Astable Multivibrator** **13. To design and implement using op-amps** • **Butterworth I & II order Low Pass Filter** • **Butterworth I & II order High Pass Filter** **14. To design and implement using op-amp a RC Phase Shift Oscillator** **15. To design and implement Mono-stable Multivibrator using 555 timer** **16. To design and implement 4 - bit R-2R Digital to Analog Converter**	

Course Outcomes**

After studying this course, students will be able to

1. **Sketch/draw circuit schematics, construct circuits, analyze and troubleshoot circuits containing op-amps, resistors, diodes, capacitors and independent sources.**
2. **Relate to the manufacturer's data sheets of IC 555 timer and IC µa741 op-amp.**
3. **Realize and verify the operation of analog integrated circuits like Amplifiers, Precision Rectifiers, Comparators and Waveform generators.**
4. **Design and implement analog integrated circuits like Oscillators, Active filters, Timer circuits, Data converters and compare the experimental results with theoretical values.**

Cos/POs	PO1	PO3	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO2
CO1	3	2	2	2	3	2	2	2	3	1
CO2	3	2	2	2	3	2	2	2	3	1
CO3	3	2	2	2	3	2	2	2	3	1
CO4	3	2	2	2	3	2	2	2	3	1

Course Title: ARM Microcontroller Laboratory		Course Code: BECA407L
Credits:		Contact Hours: 3 Hrs/Week
CIE Marks: 50	SEE Marks: 50	Total Marks: 100

Course Objectives:

- To have hands-on experience in using ARM7TDMI/LPC2148. family microcontrollers.
- To provide practical knowledge of ARM7TDMI/LPC2148. assembly language programming.
- To have exposure in using Keil compiler and embedded C programming.
- To understand different inbuilt peripherals in ARM7TDMI/LPC2148.family and their interfacing.
- To encourage the students in building embedded applications.

Course Outcomes:

- Able to get fundamental concepts of ARM7TDMI/LPC2148. microcontroller from practical point of view.
- Able to write efficient programs in assembly level language of the RM7TDMI/LPC2148. microcontroller.
- Able to carry out interface between the ARM7TDMI/LPC2148.microcontroller and peripheral devices so that they can design and develop a complete microcontroller based systems (projects).
- Able to develop the ability to use embedded C language to perform a defined task.

Suggested Simulation/Modelling/Design/Verification/Hardware Boards/etc. (preferably open sources):

- Develop and test Program using ARM7TDMI/LPC2148.
- Conduct the experiments on an ARM7TDMI/LPC2148 evaluation board using evaluation version of Embedded 'C' & Keil Uvision-4 tool/compiler.

Sl. No.	Experiments
	Part-A
1	Write a program to multiply two 16 bit binary numbers.
2	Write a program to find the sum of first 10 integer numbers.
3	Write a program to find factorial of a number.
4	Write a program to add an array of 16 bit numbers and store the 32 bit result in internal RAM
5	Write a program to find the square of a number (1 to 10) using look-up table.
6	Write a program to find the largest/smallest number in an array of 32 numbers.
7	Write a program to arrange a series of 32 bit numbers in ascending/descending order.
8	Write a program to count the number of ones and zeros in two consecutive memory locations.
	Part-B
9	Display “Hello World” message using Internal UART.
10	Interface and Control a DC Motor.

11	Interface a Stepper motor and rotate it in clockwise and anti-clockwise direction.
12	Determine Digital output for a given Analog input using Internal ADC of ARM controller.
13	Interface a DAC and generate Triangular and Square waveforms.
14	Interface a 4x4 keyboard and display the key code on an LCD.
15	Demonstrate the use of an external interrupt to toggle an LED On/Off.
16	Display the Hex digits 0 to F on a 7-segment LED interface, with an appropriate delay in between.

Course Outcomes	**Programme Outcomes (POs)**												**Program Specific Outcomes (PSOs)**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO1	3	3	3	1	3	1	1	1	2	1	0	1	**0**	3	0
CO2	3	3	3	1	3	1	1	1	2	1	0	1	**0**	3	0
CO3	3	3	3	1	3	1	1	1	2	1	2	1	**0**	3	0
CO4	3	2	3	1	3	1	1	1	2	1	2	1	**0**	3	0
CO5	3	2	2	1	3	1	1	1	2	1	1	2	0	3	0

Course Code: BHSA460M	**YOGA** **(Common to All Branches)**	Credit :	00
Hours/Week : (L:T:P:S) : 0:0:2:0		CIE Marks :	100
Total Hours Per Semester : 26hrs		SEE Marks :	00

Semester IV	
Patanjali's Ashtanga Yoga, its need and importance.	
Yama :Ahimsa, satya, asteya, brahmacarya, aparigraha	
Niyama :shoucha, santosh, tapa, svaadhyaya, Eshvarapranidhan	
Suryanamaskar12 count- 4 rounds of practice	
Asana, Need, importance of Asana.	
Different types of asana. Asana its meaning by name,technique, precautionary measures and benefits of each asana	
Different types of Asanas	
Sitting	1. Sukhasana 2. Paschimottanasana
Standing	1. Ardhakati Chakrasana 2. Parshva Chakrasana
Prone line	1. Dhanurasana
Supine line	1. Halasana 2. Karna Peedasana
Meaning, importance and benefits of Kapalabhati.40 strokes/min 3 rounds	
Meaning, Need, importance of Pranayama. Different types. Meaning by name, technique, precautionary measures and benefits of each pranayama	
Pranayama :1.Suryanuloma-Viloma 2. Chandranuloma-Viloma 3. Suryabhedana	
4.Chandra Bhedana 5. Nadishodhana	

Course Code: BHSB460M	**National Service Scheme**	**Credit** : 00
Hours/Week (L:T:P:S) : 0:0:2:0	**(NSS)**	**CIE Marks** : 100

Course objectives:

National Service Scheme(NSS)will enable the students to:

6. Understand the community in general in which they work.
7. Identify the needs and problems of the community and involve them in problem–solving.
8. Develop among themselves a sense of social & civic responsibility & utilize their. Knowledge in finding practical solutions to individual and community problems.
9. Develop competence required for group-living and sharing of responsibilities & gains kills In mobilizing community participation to acquire leadership qualities and democratic attitudes.
10. Develop capacity to meet emergencies and natural disasters &practice national integration and social harmony in general.

General Instructions-Pedagogy:

These are sample Strategies, which teachers can use to accelerate the attainment of the various course outcomes.

6. In addition to the traditional lecture method, different types of innovative teaching methods may be adopted so that the activities will develop students'theoretical and applied social and cultural skills.
7. State the need for NSS activities and its present relevance in the society and Provide real-life examples.
8. Support and guide the students for self-planned activities.
9. You will also be responsible for assigning home work, grading assignments and quizzes, and documenting students' progress in real activities in the field.
10. Encourage the students for group work to improve their creative and analytical skills.

National Service Scheme (NSS)–Contents

17. Organic farming ,Indian Agriculture(Past,Present and Future) Connectivity for marketing.
18. Waste management–Public, Private and Govtorganization,5R's.
19. Settingoftheinformationimpartingclubforwomenleadingtocontributioninsocialandeconomicissues.
20. Waterconservationtechniques–Roleofdifferentstakeholders–Implementation.
21. Preparinganactionablebusinessproposalforenhancingthevillageincomeandapproachforimplementation.
22. Helpinglocalschoolstoachievegoodresultsandenhancetheirenrolmentin Higher/ technical vocation.
23. Developing Sustainable Water management system for rural areas and implementation approaches.
24. ContributiontoanynationallevelinitiativeofGovernmentofIndia.Foreg.DigitalIndia, SkillIndia,SwatchBharat, Atma nirbhar Bharath, Make in India, Mudra scheme, Skill development programs etc.
25. Spreadingpublicawarenessunderruraloutreachprograms.(minimum5programs).
26. Social connect and responsibilities.
27. Plantation and adoption of plants. Know your plants.
28. Organize National integrationandsocial harmonyevents/workshops/seminars.(Minimum02programs).

29. Govt.schoolRejuvenationandhelpingthemtoachieve goodinfrastructure.
30. NOTE:
31. Student/s in individual or in agroup Should select any one activity in the beginning of each semester till end of thatrespective semester for successful completion as per the instructions of NSS officer with the consent of HOD of thedepartment.
32. Attheendofevery semester,activityreportshouldbesubmittedforevaluation.

DistributionofActivities-Semesterwisefrom3rdto 6thsemester

Sem	Topics/Activities to be Covered
3rdSemfor 25Marks	4. Organic farming,Indian Agriculture (Past,PresentandFuture)Connectivity formarketing. 5. Waste management–Public, Private and Govtorganization,5R's. 6. Setting of the in formation imparting club for women leading to contributionin social and economic issues.
4thSemfor 25Marks	7. Water conservationtechniques –Role of different take holders–Implementation. 8. Preparinganaction ablebusinessproposal for enhancing the village in come and approach for implementation. 9. Helpinglocalschoolstoachievegoodresultsandenhancetheirenrolmentin Higher/ technical/vocationaleducation.
5thSemfor25Marks	11. Developing Sustainable Water management system forruralareas and implementationapproaches. 12.Contribution to any national level initiative of Government of India. Foreg. Digital India, SkillIndia,SwachhBharat,AtmanirbharBharath, MakeinIndia,Mudrascheme,Skilldevelopmentprogramsetc. 13. Spreading publicawareness underruraloutreachprograms.(minimum5programs). 14. Social connect and responsibilities.
6thSemfor 25Marks	14. Plantation and adoption of plants. Know your plants. 15. Organize Nation alintegration and social harmonyevents/workshops/seminars.(Minimum02programs). 16. Govt.school Rejuvenation and helping them to achieve good infrastructure.

Pedagogy–Guidelines,itmaydifferdependingonlocalresourcesavailableforthestudyaswellas environmentand climaticdifferences,locationand timeof execution.

SINo	Topic	Groups ize	Location	Activityexecution	Reporting	EvaluationOftheTopic
1.	Organicfarming,Indian Agriculture (Past,Present and Future)Connectivity formarketing.	May beindividual orteam	Farmers land/Villages/roadside /communityarea/ Collegecampusetc…..	Siteselection/properconsultation/Continuous monitoring/Informationboard	Reportshouldbe submitted byindividual to theconcernedevaluationauthority	Evaluation asper the rubricsOf scheme andsyllabusbyNSSofficer
2.	Waste management– Public,PrivateandGovtorganization,5 R's.	May beindividual orteam	Villages/CityAreas/Grama panchayat/publicassociations/GovernmentSchemesofficers/ campusetc…..	Siteselection/properconsultation/Continuous monitoring/Informationboard	Reportshouldbe submitted byindividual to theconcernedevaluationauthority	Evaluation asper the rubricsOf scheme andsyllabusbyNSSofficer
3.	Setting of theinformation impartingclub forwomenleadingtocontributioninsocial andeconomicissues.	May beindividual orteam	Women empowermentgroups/ ConsultingNGOs & Govt Teams /Collegecampusetc…..	Groupselection/properconsultation/Continuous monitoring/Informationboard	Reportshouldbe submitted byindividual to theconcernedevaluationauthority	Evaluation asper the rubricsOf scheme andsyllabusbyNSSofficer
4.	Water conservationtechniques – Role ofdifferentstakeholders–Implementation.	May beindividual orteam	Villages/CityAreas/Grama panchayat/publicassociations/GovernmentSchemesofficers/ campusetc…..	siteselection /properconsultation/Continuous monitoring/Informationboard	Reportshouldbe submitted byindividual to theconcernedevaluationauthority	Evaluation asper the rubricsOf scheme andsyllabusbyNSSofficer
5.	Preparinganactionablebusiness proposal forenhancing the villageincome and approachforimplementation.	May beindividual orteam	Villages/CityAreas/Grama panchayat/publicassociations/GovernmentSchemesofficers/ campusetc…..	Groupselection/properconsultation/Continuous monitoring/Informationboard	Reportshouldbe submitted byindividual to theconcernedevaluationauthority	Evaluation asper the rubricsOf scheme andsyllabusbyNSSofficer

6.	Helpinglocalschoolstoachievegoodresultsand enhance theirenrolmentin Higher/ technical/vocationaleducation.	May beindividual orteam	Local government /private/ aidedschools/GovernmentSchemesofficers/ etc…..	Schoolselection/properconsultation/Continuous monitoring/Informationboard	Reportshouldbe submitted byindividual to theconcernedevaluationauthority	Evaluation asper the rubricsOf scheme andsyllabusbyNSSofficer
7.	Developing SustainableWater managementsystem for rural areasand implementationapproaches.	May beindividual orteam	Villages/CityAreas/Grama panchayat/publicassociations/GovernmentSchemesofficers/ campusetc…..	siteselection/propersonsultation/Continuous monitoring/Informationboard	Reportshouldbe submitted byindividual to theconcernedevaluationauthority	Evaluation asper the rubricsOf scheme andsyllabusbyNSSofficer
8.	Contribution to anynational level initiativeofGovernment ofIndia.For eg. Digital India,Skill India, SwachhBharat, AtmanirbharBharath, Make inIndia,Mudraschem e,Skill developmentprogram setc.	May beindividual orteam	Villages/CityAreas/Grama panchayat/publicassociations/GovernmentSchemesofficers/ campusetc…..	Groupselection/properconsultation/Continuous monitoring /Informationboard	Reportshouldbe submitted byindividual to theconcernedevaluationauthority	Evaluation asper the rubricsOf scheme andsyllabusbyNSSofficer
9.	Spreading publicawareness under ruraloutreachprograms.(minimum5programs).////Socialconnect andresponsibilities.	May beindividual orteam	Villages/CityAreas/Grama panchayat/publicassociations/GovernmentSchemesofficers/ campusetc…..	Groupselection/properconsultation/Continuous monitoring /Informationboard	Reportshouldbe submitted byindividual to theconcernedevaluationauthority	Evaluation asper the rubricsOf scheme andsyllabusbyNSSofficer
10.	Plantationandadoptionof plants. Know yourplants.	May beindividual orteam	Villages/CityAreas/Grama panchayat/publicassociations/GovernmentSchemesofficers/ campusetc…..	Placeselection/properconsultation/Continuous monitoring /Informationboard	Reportshouldbe submitted byindividual to theconcernedevaluationauthority	Evaluation asper the rubricsOf scheme andsyllabusbyNSSofficer

11.	Organize Nationalintegrationa ndsocialharmonyeve nts /workshops /seminars.(Minimum0 2 programs).	May beindivid ual orteam	Villages/CityAreas/G rama panchayat/publicassoci ations/GovernmentSche mesofficers/ campusetc…..	Placeselection/proper consultation/Continuou s monitoring /Informationboard	Reportshouldbe submitted byindividual to theconcernedev aluationauthorit y	Evaluation asper the rubricsOf scheme andsyllabusbyNS Sofficer
12.	Govt. schoolRejuvenati on andhelping them toachievegoodinf rastructure.	May beindivid ual orteam	Villages/CityAreas/G rama panchayat/publicassoci ations/GovernmentSche mesofficers/ campusetc…..	Placeselection/proper consultation/Continuou s monitoring /Informationboard	Reportshouldbe submitted byindividual to theconcernedev aluationauthorit y	Evaluation asper the rubricsOf scheme andsyllabusbyNS Sofficer

Plan of Action (Execution of Activities For Each Semester)

Sl.NO	PracticeSessionDescription
1	**Lecture session by NSSOfficer**
2	**Students Presentation on Topics**
3	**Presentation- 1,Selectionoftopic,PHASE-1**
4	**Commencement of activity and its progress-PHASE- 2**
5	**Execution of Activity**
6	**Execution of Activity**
7	**Execution of Activity**
8	**Execution of Activity**
9	**Execution of Activity**
10	**Casestudy based Assessment, Individual performance**
11	**Sectorwise study and its consolidation**
12	**Video based seminar for 10 minutes by each student At the end of semester with Report.**

- Ineverysemester from3rdsemesterto6thsemester,Eachstudentshoulddoactivitiesaccordingtothescheme and syllabus.
- At the end of every semester student performance has to be evaluated by the NSS officer for theassignedactivityprogress and its completion.
- At last in 6th semester consolidated report of all activities from 3rd to 6th semester, compiledreportshould be submitted as per theinstructions.

Course Outcomes: After completing the course, the students will be able to

CO1:	Recognize and understand their roles and responsibilities towards society for its betterment.
CO2:	Analyze environmental and societal issues and design effective and sustainable solutions
CO3:	Assess existing systems critically and propose practical, innovative solutions to promote sustainable development
CO4:	Plan and implement government-led or self-initiated projects efficiently for community and societal welfare
CO5:	Develop the ability to respond to emergencies and natural disasters, while fostering national integration, social harmony, and unity.

AssessmentDetails forCIE(bothCIE andSEE)

Weightage	**CIE– 100%**	• Implementationstrategiesoftheproject(NSSwork). • The last report should be signed byNSSOfficer,theHODandprincipal. • Atlastreportshould beevaluated bytheNSSofficer ofthe institute. • Finallytheconsolidatedmarkssheetshouldbesent to the university and also to be madeavailableat LICvisit.
Presentation -1 Selectionoftopic,PHASE-1	10Marks	
Commencementofactivityand itsprogress-PHASE-2	10Marks	
Casestudybased Assessment Individualperformance	10Marks	
Sectorwisestudyand itsconsolidation	10Marks	
Videobasedseminarfor10minutesbyeach studentAttheendofsemesterwithReport.	10Marks	
Totalmarksforthecourseineachsemester	**50Marks**	

Marksscoredfor50bythestudentsshouldbeScaledownto25marksIneachsemester for CIEentryintheVTUportal.

25marksCIEentry will beenteredinUniversity IAmarksportalattheendofeachsemester3rdto6th sem,Reportandassessmentcopyshouldbe madeavailableinthedepartmentsemesterwise.

Studentsshouldpresenttheprogressoftheactivitiesasperthescheduleintheprescribedpracticalsessioninthefield.Thereshouldbepositive progressinthevertical order for thebenefitof societyingeneral.

Suggested Learning Resources:

Books:

4. **NSS Course Manual,** Published by NSS Cell, VTU Belagavi.
5. Government of Karnataka,NSS cell, activities reports and its manual.
6. Government of India, nss cell, Activities reports and its manual.

CO-PO Mapping

		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
No	Programme Outcomes / Course Outcomes															
After successful completion of the course the students will be able to:																
1	Recognize and understand their roles and responsibilities towards society for its betterment.	-	-	1	-	-	1	2	1	1	1	2	1	-	-	-
2	Analyze environmental and societal issues and design effective and sustainable solutions	-	-	1	-	-	1	2	1	1	1	2	1	-	-	-
3	Assess existing systems critically and propose practical, innovative solutions to promote sustainable development	-	-	1	-	-	1	2	1	1	1	2	1	-	-	-
4	Plan and implement government-led or self-initiated projects efficiently for community and societal welfare	-	-	1	-	-	1	2	1	1	1	2	1	-	-	-
5	Develop the ability to respond to emergencies and natural disasters, while fostering	-	-	1	-	-	1	2	1	1	1	2	1	-	-	-

	national integration, social harmony, and unity.															

Course Code :BHSC460M	PHYSICAL EDUCITION AND SPORTS (PE) **(Common to All Branches)**	**Credits :**	00
Hours/Week (L:T:P:S) : 0:0:2:0		**CIE Marks :**	100
Total Hours Per Semester : 26hrs		**SEE Marks :**	00

Course Outcomes: At the end of the course, the student will be able to		
1.	Understand the fundamental concepts and skills of Physical Education, Health, Nutrition and Fitness	
2.	Familiarization of health- related Exercises, Sports for overall growth and development	
3.	Create a foundation for the professionals in Physical Education and Sports	
4.	Participate in the competition at regional/state/national/international levels.	
5.	Create consciousness among the students on Health, Fitness and Wellness in developing and maintaining a healthy lifestyle.	
6.	Understand and practice of Traditional Games	
Module I: Orientation		**4Hours**
A.	Lifestyle	
B.	Health & Wellness	
C.	Pre-Fitness test.	
Module II: General Fitness & Components of Fitness		**4Hours**
D.	Warming up (Free Handexercises)	
E.	Strength–Push-up/ Pull-ups	
F.	Speed–30Mtr Dash	
Module III: Specific games (Any one to be selected by the student)		**16Hours**
2.	Kabaddi–Hand touch, Toe Touch, Thigh Hold, Ankle hold and Bonus.	
2.	Kho-Kho–GivingKho,Single Chain,Pole dive,Pole turning,3-6Up.	
Module IV: Orientation		**4Hours**
A.	Postural deformities.	
B.	Stress management	
Module V : Specific Games (Any one to be selected by the student)		**16Hours**
A.	Throw ball	
B.	Table Tennis	

C.	Athletics (Field Events-Jumps)–Any event as per availability of Ground.

Module VI: Aerobics **4 Hours**

Scheme and Assessment for auditing the course and Grades:

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

Course Outcomes:

1.Identify and Understand common postural deformities and apply stress management techniques in the context of sports and athletics

2.Participate Confidently in competitions at regional, state, national, and international levels

3.Demonstrate Proficiency in specific games and athletic jumping events through regular practice and skill development.

4.Understand and Perform various Aerobic exercises for fitness and endurance enhancement.

5.Acquire Skills and Practice specific games and athletic throwing events with proper techniques and strategies

Module I: Ethics and Moral Values **4Hours**

A.	Ethics in Sports
B.	Moral Values in Sports and Games

Module II: Specific Games (Any one to be selected by the student) **16Hours**

A.	Volley ball–Attack, Block, Service, Upper Hand Pass and Lower hand Pass.
B.	Athletics (TrackEvents) –Any event as per availability of Ground

Module III: Role of Organisation and administration **4Hours**

		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
No	Programme Outcomes / Course Outcomes															

After successful completion of the course the students will be able to:																
1	**Identify and Understand** common postural deformities and apply stress management techniques in the context of sports and athletics	-	-	1	-	-	1	1	-	-	-	-	1			
2	**Participate Confidently** in competitions at regional, state, national, and international levels	-	-	1	-	-	1	1	-	-	-	-	1			
3	**Demonstrate Proficiency** in specific games and athletic jumping events through regular practice and skill development.	-	-	1	-	-	1	1	-	-	-	-	1			
4	**Understand and Perform** various Aerobic exercises for fitness and endurance enhancement.	-	-	1	-	-	1	1	-	-	-	-	1			
5	**Acquire Skills and Practice** specific games and athletic throwing events with proper techniques and strategies	-	-	1	-	-	1	1	-	-	-	-	1			