Dr. Babasaheb Ambedkar Technological University

(Established a University of Technology in the State of Maharashtra)
(Under Maharashtra Act No. XXIX of 2014)
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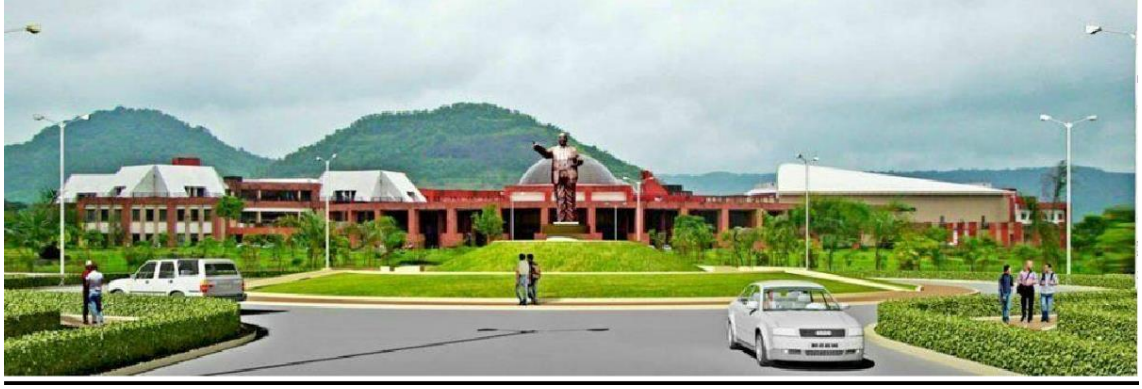
PROPOSED CURRICULUM OF UNDER GRADUATE PROGRAMME B. TECH

Electronics & Communication (Advanced Communication Technology) &

Electronics & Communication (5G)

Second Year [2024-25]
Third Year [2025-26]
Final Year [2026-27] and onwards



Rules and Regulations

1. The normal duration of the course leading to B. Tech degree will be EIGHT semesters.
2. The normal duration of the course leading to M. Tech. degree will be FOUR semesters.
3. Each academic year shall be divided into 2 semesters, each of 20 weeks duration, including evaluation and grade finalization, etc. The Academic Session in each semester shall provide for at least 90 Teaching Days, with at least 40 hours of teaching contact periods in a five to six days session per week. The semester that is typically from Mid-July to November is called the ODD SEMESTER, and the one that is from January to Mid-May is called the EVEN SEMESTER. Academic Session may be scheduled for the Summer Session/Semester as well. For 1st year B. Tech and M. Tech the schedule will be decided as per the admission schedule declared by Government of Maharashtra.
4. The schedule of academic activities for a Semester, including the dates of registration, mid-semester examination, end- semester examination, inter-semester vacation, etc. shall be referred to as the Academic Calendar of the Semester, which shall be prepared by the Dean (Academic), and announced at least TWO weeks before the Closing Date of the previous Semester.
5. The Academic Calendar must be strictly adhered to, and all other activities including co-curricular and/or extra -curricular activities must be scheduled so as not to interfere with the Curricular Activities as stipulated in the Academic Calendar.

REGISTRATION:

1. Lower and Upper Limits for Course Credits Registered in a Semester, by a Full-Time Student of a UG/PG Programme: A full time student of a particular UG/PG programme shall register for the appropriate number of course credits in each semester/session that is within the minimum and maximum limits specific to that UG/PG programme as stipulated in the specific Regulations pertaining to that UG/PG programme.
2. Mandatory Pre-Registration for higher semesters: In order to facilitate proper planning of the academic activities of a semester, it is essential for the every institute to inform to Dean (Academics) and COE regarding details of total no. of electives offered (Course-wise) along with the number of students opted for the same. This information should be submitted within two weeks from the date of commencement of the semester as per academic calendar.
3. PhD students can register for any of PG/PhD courses and the corresponding rules of evaluation will apply.
4. Under Graduate students may be permitted to register for a few selected Post Graduate courses, in exceptionally rare circumstances, only if the DUGC/DPGC is convinced of the level of the academic achievement and the potential in a student.

Course Pre-Requisites:

1. In order to register for some courses, it may be required either to have exposure in, or to have completed satisfactorily, or to have prior earned credits in, some specified courses.
2. Students who do not register on the day announced for the purpose may be permitted LATE REGISTRATION up to the notified day in academic calendar on payment of late fee.

3. REGISTRATION IN ABSENTIA will be allowed only in exceptional cases with the approval of the Dean (Academic) / Principal.

4. A student will be permitted to register in the next semester only if he fulfills the following conditions:

(a) Satisfied all the Academic Requirements to continue with the programme of Studies without termination

(b) Cleared all Institute, Hostel and Library dues and fines (if any) of the previous semesters;

(c) Paid all required advance payments of the Institute and hostel for the current semester;

(d) Not been debarred from registering on any specific ground by the Institute.

EVALUATION SYSTEM:

1. Absolute grading system based on absolute marks as indicated below will be implemented from academic year 2023-24, starting from I year B. Tech.

Percentage of Marks	Letter Grade	Grade Point
91-100	EX	10.0
86-90	AA	9.0
81-85	AB	8.5
76-80	BB	8.0
71-75	BC	7.5
66-70	CC	7.0
61-65	CD	6.5
56-60	DD	6.0
51-55	DE	5.5
40-50	EE	5.0
<40	EF	0.0

2. Class is awarded based on CGPA of all eight semester of B. Tech Program.

CGPA for pass is minimum 5.0	
CGPA upto < 5.50	Pass class
CGPA ≥ 5.50 & < 6.00	Second Class
CGPA ≥ 6.00 & < 7.50	First Class
CGPA ≥ 7.50	Distinction
[Percentage of Marks =CGPA*10.0]	

3. A total of 100 Marks for each theory course are distributed as follows:

1	Mid Semester Exam (MSE) Marks	20
2	Continuous Assessment Marks	20
3	End Semester Examination (ESE) Marks	60

4. A total of 100 Marks for each practical course are distributed as follows:

1.	Continuous Assessment Marks	60
2.	End Semester Examination (ESE)Marks	40

It is mandatory for every student of B. Tech to score a minimum of 40 marks out of 100, with a minimum of 20 marks out of 60 marks in End Semester Examination for theory course.

This will be implemented from the first year of B. Tech starting from Academic Year 2023-24.

5. Description of Grades:

EX Grade: An „EX" grade stands for outstanding achievement.

EE Grade: The „EE" grade stands for minimum passing grade.

The students may appear for the remedial examination for the subjects he/she failed for the current semester of admission only and his/her performance will be awarded with EE grade only. If any of the student remain **absent** for the regular examination due to genuine reason and the same will be verified and tested by the Dean (Academics) or committee constituted by the University Authority.

FF Grade: The „FF" grade denotes very poor performance, i.e. failure in a course due to poor performance .The students who have been awarded „FF" grade in a course in any semester must repeat the subject in next semester.

6. Evaluation of Performance:

6.1. Semester Grade Point Average (SGPA) and Cumulative Grade Point Average (CGPA)

(A) Semester Grade Point Average (SGPA) The performance of a student in a semester is indicated by Semester Grade Point Average (SGPA) which is a weighted average of the grade points obtained in all the courses taken by the student in the semester and scaled to a maximum of 10. (SGPI is to be calculated up to two decimal places). A Semester Grade Point Average (SGPA) will be computed for each semester as follows:

$$SGPA = \frac{[\sum_{i=1}^{n} c_i g_i]}{[\sum_{i=1}^{n} c_i]}$$

Where

„n" is the number of subjects for the semester,

„ci" is the number of credits allotted to a particular subject, and

„gi" is the grade-points awarded to the student for the subject based on his performance as per the above table.

-SGPA will be rounded off to the second place of decimal and recorded as such.

(B) Cumulative Grade Point Average (CGPA): An up to date assessment of the overall performance of a student from the time he entered the Institute is obtained by calculating Cumulative Grade Point Average (CGPA) of a student. The CGPA is weighted average of the grade points obtained in all the courses registered by the student since s/he

entered the Institute. CGPA is also calculated at the end of every semester (upto two decimal places).Starting from the first semester at the end of each semester (S), a Cumulative Grade Point Average (CGPA) will be computed as follows:

$$CGPA = \frac{[\sum_{i=1}^{m} c_i g_i]}{[\sum_{i=1}^{m} c_i]}$$

Where
„m" is the total number of subjects from the first semester onwards up to and including the semester S,
„ci" is the number of credits allotted to a particular subject, and
„gi" is the grade-points awarded to the student for the subject based on his/her performance as per the above table.
#CGPA will be rounded off to the second place of decimal and recorded as such.

Award of Degree of Honours

Major Degree

The concept of Major and Minors at B. Tech level is introduced to enhance learning skills of students, acquisition of additional knowledge in domains other than the discipline being pursued by the student, to make the students better employable with additional knowledge and encourage students to pursue cross-discipline research.

A. Eligibility Criteria for Majors

1. The Student should have Minimum CGPA of 7.5 up to 4th Semester
2. Student willing to opt for majors has to register at the beginning of 5th Semester
3. The Student has to complete 5 additional advanced courses from the same discipline specified in the curriculum. These five courses should be of 4 credits each amounting to 20 credits. The students should complete these credits before the end of last semester.
4. Student may opt for the courses from NPTEL/ SWAYAM platform. (if the credits of NPTEL/ SWAYAM courses do not match with the existing subject proper scaling will be done)

Student complying with these criteria will be awarded B. Tech (Honors) Degree.

B. Eligibility Criteria for Minors

1. The Student should have Minimum CGPA of 7.5 up to 4th Semester
2. Student willing to opt for minors has to register at the beginning of 5th Semester
3. The Student has to complete 5 additional courses from other discipline of their interest, which are specified in the respective discipline. These five courses should be of 4 credits each amounting to 20 credits.
4. Student may opt for the courses from NPTEL/ SWAYAM platform. (if the credits of NPTEL/ SWAYAM courses do not match with the existing subject proper scaling will be done)

Student complying with these criteria will be awarded with B. Tech Degree in Engineering with Minor in ---------- Engineering.

(For e.g.: B. Tech in Electronics & Communication (Advanced Communication Technology) with Minor in Computer Engineering).

For applying for Honors and Minor Degree the student has to register themselves through the proper system.

ATTENDANCE REQUIREMENTS:

1. All students must attend every lecture, tutorial and practical classes.
2. To account for approved leave of absence (e.g. representing the Institute in sports, games or athletics; placement activities; NCC/NSS activities; etc.) and/or any other such contingencies like Medical emergencies, etc., the attendance requirement shall be a minimum of 75% of the classes actually conducted.
    a) If the student failed to maintain 75% attendance, he/she will be detained for appearing the successive examination.
    b) The Dean (Academics)/ Principal is permitted to give 10% concession for the genuine reasons as such the case may be.
    c) In any case the student will not be permitted for appearing the examination if the attendance is less than 65%.
3. The course instructor handling a course must finalize the attendance 3 calendar days before the last day of classes in the current semester and communicate clearly to the students by displaying prominently in the department and also in report writing to the head of the department concerned.
4. The attendance records are to be maintained by the course instructor and he shall show it to the student, if and when required.

TRANSFER OF CREDITS

The courses credited elsewhere, in Indian or foreign University/Institutions/ Colleges/ Swayam Courses by students during their study period at DBATU may count towards the credit requirements for the award of degree. The guidelines for such transfer of credits are as follows:

a) 20 % of the total credit will be considered for respective calculations.

b) Credits transferred will be considered for overall credits requirements of the programme.

c) Credits transfer can be considered only for the course at same level i. e UG, PG etc.

d) A student must provide all details (original or attested authentic copies)such as course contents, number of contact hours, course instructor /project guide and evaluation system for the course for which he is requesting a credits transfer. He shall also provide the approval or acceptance letter from the other side. These details will be evaluated by the concerned Board of Studies before giving approval. The Board of Studies will then decide the number of equivalent credits the student will get for such course(s) in DBATU. The complete details will then be forwarded to Dean for approval.

e) A student has to get minimum passing grades/ marks for such courses for which the credits transfers are to be made.

f) Credits transfers availed by a student shall be properly recorded on academic record(s) of the student.

g) In exceptional cases, the students may opt for higher credits than the prescribed.

B. Tech. in Electronics & Communication (Advanced Communication Technology)

Different Categories of Courses and Credits for Degree Requirements

a) Humanities and Social Science including Management Courses

Sr. No.	Course Code	Course Name	(L-T-P) Credits
1	BTECA403	Basic Human Rights	(3-0-0) 3
2	BTECA505	1. Economics and Management 2. Business Communication 3. Profession Ethics and Values 4. Project Management	(3-0-0) 3
3	BTECA605	1. Development Engineering 2. Employability and Skills Development 3. Consumer Behavior	(3-0-0) 3
4	BTECA706	1. Foreign Language Studies 2. Universal Human Values and Ethics 3. Intellectual Property Rights	(0-0-4) Audit
		TOTAL	**9**

b) Basic Science Course

Sr. No.	Course Code	Course Name	(L-T-P) Credits
1	BTECA301	Engineering Mathematics – III	(3-1-0) 4
2	BTECA404	Probability Theory and Random Processes	(3-0-0) 3
		TOTAL	**07**

c) Engineering Science Course

Sr. No.	Course Code	Course Name	(L-T-P) Credits
1	BTECA304	Digital Electronics and Microprocessor	(3-1-0) 4
2	BTECA305	Network Theory	(3-0-0) 3
3	BTECA308	Digital Electronics and Microprocessor Lab	(0-0-2) 1
		TOTAL	**08**

d) Professional Core Course

Sr. No.	Course Code	Course Name	(L-T-P) Credits
1	BTECA302	Analog Circuits	(3-1-0) 4
2	BTECA303	Analog Communication and Signals & System	(3-0-0) 3
3	BTECA401	Digital Communication	(3-1-0) 4
4	BTECA402	Control System Engineering	(3-0-0) 3
5	BTECA501	Electromagnetic Field Theory	(3-1-0) 4
6	BTECA502	Information Theory & Coding	(3-0-0) 3
7	BTECA601	Microwave Engineering	(3-0-0) 3
8	BTECA602	Digital Signal Processing	(3-1-0) 4
9	BTECA701	5G Technology	(3-0-0) 3
10	BTECA702	Software Defined Radio	(3-1-0) 4
11	BTECA703	Optical Fiber & Satellite Communication	(3-0-0) 3
12	BTECA306	Analog Circuits	(0-0-2) 1

13	BTECA307	Analog Communication and Signals & System	(0-0-2) 1
14	BTECA406	Digital Communication	(0-0-2)1
15	BTECA407	Control System Engineering	(0-0-2) 1
16	BTECA506	Information Theory & Coding Lab	(0-0-2) 1
17	BTECA606	Digital Signal Processing Lab	(0-0-2)1
18	BTECA607	Microwave Engineering Lab	(0-0-2) 1
19	BTECA707	5G Technology	(0-0-2)1
20	BTECA708	Software Defined Radio	(0-0-2)1
21	BTECA709	Optical Fiber & Satellite Communication	(0-0-2)1
		TOTAL	**48**

e) Professional Elective Course

Sr. No.	Course Code	Course Name	(L-T-P) Credits
1	BTECA405	Professional Elective Courses –I A. Python Programming B. Sensors & Actuators C. Data Structure & Algorithms using C++ D. Electrical Machine & Instrumentation	(3-1-0) 4
2	BTECA408	3. Professional Elective Courses –I Lab A. Python Programming B. Sensors & Actuators C. Data Structure & Algorithms using C++ D. Electrical Machine & Instrumentation	(0-0-2) 1
3	BTECA503	Professional Elective Course (PEC) -II A. Antennas and Propagation B. Microcontroller & Embedded System C. Wireless Communication D. Power Electronics & Drives	(3-1-0) 4
4	BTECA507	2.Professional Elective Course (PEC) –II Lab A. Antennas and Propagation B. Microcontroller & Embedded System C. Wireless Communication D. Power Electronics & Drives	(0-0-2) 1
5	BTECA603	Professional Elective Course (PEC) –III A. Antenna Design B. Computer Networks & Cloud Computing C .Mobile Communication & Networks D. VLSI Design	(3-0-0) 3
5	BTECA704	Professional Elective Course (PEC) -IV A. Advanced Antenna Technology B. Industry 4.0 C. Wireless Sensor Network D. VLSI Testing and Verification	(3-1-0) 4
		TOTAL	**17**

f) Open Elective Course

Sr. No.	Course Code	Course Name	(L-T-P) Credits
1	BTECA504	Open Elective Course (OEC) - I A.HDL Programming B.Database Management Systems C. Data Analysis D. Java Programming	(3-0-0) 3
2	BTECA508	3. Open Elective Course (OEC) – I Lab A. HDL Programming B. Database Management Systems C. Data Analysis D. Java Programming	(0-0-2) 1
3	BTECA604	Open Elective Course (OEC) - II A. Internet of Things B. Software Engineering & Testing C. Machine Learning D. Advanced Java	(3-0-0) 3
4	BTECA608	3. Open Elective Course (OEC) – II Lab A. Internet of Things B. Software Engineering & Testing C. Machine Learning D. Advanced Java	(0-0-2) 1
5	BTECA705	Open Elective Course (OEC) -III A. PLC & Automation B. Web Development C. Deep Learning & Computer Vision D. Android Programming	(3-1-0) 4
		TOTAL	**12**

f) Seminar / Mini Project / Internship

Sr. No.	Course Code	Course Name	(L-T-P) Credits
1	BTECA309	Seminar-I	(0-0-2) 1
2	BTECA310	Internship –I (Evaluation) / MOOC	Audit
3	BTECA409	Seminar - II	(0-0-4) 2
4	BTECA410	Internship –II / MOOC	Audit
5	BTECA509	Mini Project I	(0-0-4) 2
6	BTECA510	Internship –II (Evaluation) / MOOC	Audit
7	BTECA609	Mini Project II	(0-0-4) 2
8	BTECA610	Internship –III / MOOC	Audit
9	BTECA710	Project Work	(0-0-4) 2
10	BTECA711	Internship –III (Evaluation) / MOOC	Audit
11	BTECA801	Project Work/ Internship	(0-0-24) 12
		TOTAL	**22**

Category – wise total number of credits

Sr. No	Category	Suggested Breakup of Credits by AICTE	Credits awarded to First year	Credits awarded to Second year to Final Year	Total
1	Humanities and Social Sciences including Management courses	**12***	3	9	**12**
2	Basic Science courses	**25***	18	7	**25**
3	Engineering Science courses including workshop, drawing, basics of electrical / mechanical / computer etc.	**24***	15	8	**23**
4	Professional core courses	**48***	0	48	**48**
5	Professional Elective courses relevant to chosen specialization/branch	**18***	0	17	**17**
6	Open subjects – Electives from other technical and /or emerging subjects	**18***	0	12	**12**
7	Project work, seminar and internship in industry or Elsewhere	**15***	1	22	**23**
8	Mandatory Courses [Environmental Sciences, Induction training, Indian Constitution, Essence of Indian Knowledge Tradition]	**NC**	--	--	**--**
	Total	**160***	**37**	**123**	**160**

**Minor variation is allowed as per need of the respective disciplines.*

Suggested Plan of Study

Number of Courses	Semester							
	I	**II**	**III**	**IV**	**V**	**VI**	**VII**	**VIII**
1	BTBS101	BTBS201	BTECA301	BTECA401	BTECA501	BTECA601	BTECA701	BTECA801
2	BTBS102	BTBS202	BTECA302	BTECA402	BTECA502	BTECA602	BTECA702	--
3	BTES103	BTES203	BTECA303	BTECA403	BTECA503 **(PEC-II Elective)**	BTECA603 **(PEC-III Elective)**	BTECA703	--
4	BTHM104	BTES204	BTECA304	BTECA404	BTECA504 **(OEC -I Elective)**	BTECA604 **(OEC -II Elective)**	BTECA704 **(PEC-IV Elective)**	--
5	BTES105	BTES205	BTECA305	BTECA405 **(PEC-I Elective)**	BTECA505 **(HSSMEC-IV Elective)**	BTECA605 **(HSSMEC-V Elective)**	BTECA705 **(OEC -III Elective)**	--
6	BTES106	BTES206	BTECA306	BTECA406	BTECA506	BTECA606	BTECA706 **(HSSMEC-VI Elective)**	--
7	BTBS107L	BTBS207L	BTECA307	BTECA407	BTECA507	BTECA607	BTECA707	--
8	BTES108L	BTES208L	BTECA308 (Internship –I Evaluation)	BTECA408 (Internship –II)	BTECA508 (Internship –II Evaluation)	BTECA608 (Internship –1 Evaluation)	BTECA708	--
9	BTHM109L	BTES209S					BTECA709 (Internship –III Evaluation)	--
10	--	BTES211P (Internship - 1)						--

Programme Educational Objectives (PEO)

Name of Programme: B.Tech. Electronics & Communication (Advanced Communication Technology) A graduate in the discipline of Advanced Communication Technology is generally expected to have three kinds of knowledge. First, the graduate should have conceptual knowledge of the core topics of B.Tech. Electronics & Communication (Advanced Communication Technology).Second, she/he should have knowledge of mathematical formalism underlying various concepts. Third, graduates in the discipline of B.Tech. Electronics & Communication (Advanced Communication Technology) should have the knowledge of the state of the latest tools and technologies, so that he/she can apply the principles of Electronics & Communication Engineering to solve real-life problems from diverse application domains. The programme of B.Tech. Electronics & Communication (Advanced Communication Technology) at Dr. Babasaheb Ambedkar Technological University (DBATU) essentially aims to meet these broad expectations. At the same time, the program intends to comply with the courses and syllabus available at National Program on Technology Enhanced Learning (NPTEL) and SWAYAM. The following specific educational objective aims to achieve these global and regional expectations**.**

Objective Identifier	Objectives
PEO1	Graduates will be able to serve in domain specific and interdisciplinary industry to solve society problems
PEO2	Graduates will be successful in pursuing higher studies and research in the field of engineering.
PEO3	Graduates will exhibit professional ethics and teamwork in their profession through lifelong learning.

Programme Outcomes (PO)

After undergoing the learning process of four years, students of B.Tech. Electronics & Communication (Advanced Communication Technology) at Dr. Babasaheb Ambedkar Technological University will have an ability to build information systems and provide computer based solutions to real life problems. The graduates of this programme will demonstrate following abilities and skill sets.

Outcome Identifier	Outcomes
PO1	**Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO2	**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.
PO3	**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.
PO4	**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.
PO5	**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.

PO6	**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.
PO7	**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.
PO8	**Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO9	**Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO10	**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.
PO11	**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.
PO12	**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.

Program Specific Outcomes (PSOs)

Outcome Identifier	Outcomes
PSO1	Apply knowledge of mathematics and science to solve advanced engineering problems in the areas of analog and digital communication.
PSO2	Demonstrate professional competencies in the domain of advanced communication technology to meet industry standards.
PSO3	Graduate will be able to work on micro-machining, automation projects.

Graduate Attributes / ABET's Criteria

The Graduate Attributes are the knowledge skills and attitudes which the students have at the time of graduation. These Graduate Attributes identified by National Board of Accreditation are as follows:

(a) Engineering knowledge: An ability to apply knowledge of mathematics, science and engineering.

(b) Problem analysis: An ability to design and conduct experiments as well as to analyze and interpret data.

(c) Design / development of solutions: An ability to design a system, a component, or process, to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability.

(d) Individual and team work: An ability to function on multidisciplinary teams.

(e) Problem Solving: An ability to identify, formulate and solve engineering problems.

(f) Ethics: An understanding of professional and ethical responsibility.

(g) Communication: An ability to communicate effectively.

(h) Environment and sustainability: The broad education necessary to understand the impact of engineering solutions in a global, economic, environmental and social context.

(i) Life-long learning: Recognition of the need for and an ability to engage in life-long learning.

(j) A knowledge of technology: Acknowledge of contemporary issues, and state of art technology

(k) Modern tool usage: An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

(l) Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply in multidisciplinary environments.

Mapping of Programme Outcomes with Graduate Attributes / ABET's Criteria

	A	B	C	D	E	F	G	H	I	J	K	L
PO1	X									X		
PO2		X			X							
PO3			X		X							
PO4			X		X							
PO5											X	
PO6					X					X		
PO7								X				
PO8						X						
PO9				X								
PO10							X					
PO11												X
PO12									X			

Course Structure for Second Year

Electronics & Communication (Advanced Communication Technology)

Semester III (Term 3)										
Course Category	Course Code	Course Title	Teaching Scheme			Evaluation Scheme				Credit
			L	T	P	CA	MSE	ESE	Total	
BSC	BTECA301	Engineering Mathematics-III	3	1	-	20	20	60	100	4
PCC1	BTECA302	Analog Circuits	3	1	-	20	20	60	100	4
PCC2	BTECA303	Analog Communication and Signals & System	3		-	20	20	60	100	3
ESC11	BTECA304	Digital Electronics and Microprocessor	3	1	-	20	20	60	100	4
ESC12	BTECA305	Network Theory	3		-	20	20	60	100	3
LC1	BTECA306	Analog Circuits Lab ,	-	-	2	30	-	20	50	1
LC2	BTECA307	Analog Communication Lab	-	-	2	30	-	20	50	1
LC3	BTECA308	Digital Electronics and Microprocessor Lab	-	-	2	30	-	20	50	1
Seminar	BTECA309	Seminar-I	-		4	60	-	40	100	2
Internship	BTECA310	Internship –I (Evaluation)	-		-	-	-	-	-	Audit
			15	**3**	**10**	**250**	**100**	**400**	**750**	**23**

BSC = Basic Science Course, ESC = Engineering Science Course, PCC = Professional Core Course PEC = Professional Elective Course, OEC = Open Elective Course, LC = Laboratory Course HSSMC = Humanities and Social Science including Management Courses

Course Structure for Second Year

Electronics & Communication (Advanced Communication Technology)

Semester IV (Term 4)										
Course Category	Course Code	Course Title	Teaching Scheme			Evaluation Scheme				
			L	T	P	CA	MSE	ESE	Total	Credit
PCC3	BTECA401	Digital Communication	3	1	-	20	20	60	100	4
PCC4	BTECA402	Control System Engineering	3	-	-	20	20	60	100	3
HSSM C3	BTECA403	Basic Human Rights	3	-	-	20	20	60	100	3
BSC8	BTECA404	Probability Theory and Random Processes	3	-	-	20	20	60	100	3
PEC-1	BTECA405	**Professional Elective Courses –I**	3	1	-	20	20	60	100	4
	BTECA405A	Python Programming								
	BTECA405B	Sensors and Actuators								
	BTECA405C	Data Structure and Algorithm Using C++								
	BTECA405D	Electrical Machine & Instrumentation								
LC4	BTECA406	Digital Communication Lab	-	-	2	30	-	20	50	1
LC5	BTECA407	Control System Engineering	-	-	2	30	-	20	50	1
LC6	BTECA408	PEC-1 Lab	-	-	2	30	-	20	50	1
Seminar	BTECA409	Seminar - II	-	-	4	60	-	40	100	2
Internship	BTECA410	Internship -II	-	-	-	-	-	-	-	Audit
			15	**2**	**10**	**250**	**100**	**400**	**750**	**22**

Note: The Lab of Professional Elective Courses –I (PEC1) (BTECPE405) should be conducted as per syllabus contents.

BSC = Basic Science Course, ESC = Engineering Science Course, PCC = Professional Core Course PEC = Professional Elective Course, OEC = Open Elective Course, LC = Laboratory Course HSSMC = Humanities and Social Science including Management Courses

Course Structure for Third Year

Electronics & Communication (Advanced Communication Technology)

Semester V (Term 5)											
Sr. No.	**Course Category**	**Course Code**	**Course Title**	**Teaching Scheme**			**Evaluation Scheme**				**Credit**
				L	**T**	**P**	**CA**	**MSE**	**ESE**	**Total**	
1	PCC5	BTECA501	Electromagnetic Field Theory	3	1	-	20	20	60	100	4
2	PCC6	BTECA502	Information Theory & Coding	3	-	-	20	20	60	100	3
3	PEC-2	BTECA503	**Professional Elective Course (PEC) -II**	3	1	-	20	20	60	100	4
		BTECA503A	Antennas and Propagation								
		BTECA503B	Microcontroller & Embedded System								
		BTECA503C	Wireless Communication								
		BTECA503D	Power Electronics & Drives								
4	OEC-1	BTECA504	**Open Elective Course (OEC) - I**	3	-	-	20	20	60	100	3
		BTECA504A	HDL Programming								
		BTECA504B	Database Management Systems								
		BTECA504C	Data Analysis								
		BTECA504D	Java Programming								
5	HSSMEC-4	BTECA505	**Humanities and Social Sciences including Management Elective Course - I**	3	-	-	20	20	60	100	3
		BTECA505A	Economics & Management								
		BTECA505B	Business Communication								
		BTECA505C	Professional Ethics and Values								
		BTECA505D	Project Management								
6	LC7	BTECA506	Information Theory & Coding Lab	-	-	2	30	-	20	50	1
7	LC8	BTECA507	PEC-2 Lab	-	-	2	30	-	20	50	1
8	LC9	BTECA508	OEC-1 lab	-	-	2	30	-	20	50	1
9	PROJ	BTECA509	Mini Project I	-	-	4	60	-	40	100	2
10	Internship	BTECA510	Internship –II (Evaluation) / MOOC	-	-	-	-	-	-	-	Audit
	Total for Semester V			**15**	**2**	**10**	**250**	**100**	**400**	**750**	**22**

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Course Structure for Third Year

Electronics & Communication (Advanced Communication Technology)

Semester VI (Term 6)											
Sr. No.	**Course Category**	**Course Code**	**Course Title**	**Teaching Scheme**			**Evaluation Scheme**				**Credit**
				L	**T**	**P**	**CA**	**MSE**	**ESE**	**Total**	
1	PCC7	BTECA601	Microwave Engineering	3	0	-	20	20	60	100	3
2	PCC8	BTECA602	Digital Signal Processing	3	1	-	20	20	60	100	4
3	PEC-3	BTECA603	**Professional Elective Course (PEC) -III**	3	-	-	20	20	60	100	3
		BTECA603A	Antenna Design								
		BTECA603B	Computer Networks & Cloud Computing								
		BTECA603C	Mobile Communication & Networks								
		BTECA603D	VLSI Design								
4	OEC-2	BTECA604	**Open Elective Course (OEC) - I**	3	1	-	20	20	60	100	4
		BTECA604A	Internet of Things								
		BTECA604B	Software Engineering & Testing								
		BTECA604C	Machine Learning								
		BTECA604D	Advanced Java								
5	HSSMEC-5	BTECA605	**Humanities and Social Sciences including Management Elective Course (HSSMEC) - II**	3	-	-	20	20	60	100	3
		BTECA605A	Development Engineering								
		BTECA605B	Employability and Skill Development								
		BTECA605C	Consumer Behavior								
6	LC10	BTECA606	Digital Signal Processing Lab,	-	-	2	30	-	20	50	1
7	LC11	BTECA607	Microwave Engineering Lab	-	-	2	30	-	20	50	1
8	LC12	BTECA608	OEC-2 lab	-	-	2	30	-	20	50	1
9	PROJ	BTECA609	Mini Project II	-	-	4	60	-	40	100	2
10	Internship	BTECA610	Internship –III / MOOC	-	-	-	-	-	-	-	Audit
	Total for Semester VI			**15**	**2**	**10**	**250**	**100**	**400**	**750**	**22**

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HSSMC = Humanities and Social Science including Management Courses

With effective from academic year 2025-26

Course Structure for Final Year

Electronics & Communication (Advanced Communication Technology)

Semester VII (Term 7)											
Sr. No.	**Course Category**	**Course Code**	**Course Title**	**Teaching Scheme**			**Evaluation Scheme**				**Credit**
				L	**T**	**P**	**CA**	**MSE**	**ESE**	**Total**	
1	PCC9	BTECA701	5G Technology	3	-	-	20	20	60	100	3
2	PCC10	BTECA702	Software Defined Radio	3	-	-	20	20	60	100	3
3	PCC11	BTECA703	Optical Fiber & Satellite Communication	3	-	-	20	20	60	100	3
4	PEC-4	BTECA704	**Professional Elective Course (PEC) -IV**	3	1	-	20	20	60	100	4
		BTECA704A	Advanced Antenna Technology								
		BTECA704B	Industry 4.0								
		BTECA704C	Wireless Sensor Network								
		BTECA704D	VLSI Testing and Verification								
5	OEC-3	BTECA705	**Open Elective Course (OEC) - III**	3	1	-	20	20	60	100	4
		BTECA705A	PLC & Automation								
		BTECA705B	Web Development								
		BTECA705C	Deep Learning & Computer Vision								
		BTECA705D	Android Programming								
6	HSSMEC -6	BTECA706	**Humanities and Social Sciences including Management Elective Course (HSSMEC) - II**	-	-	4	-	-	-	-	Audit
		BTECA706A	Foreign Language Studies								
		BTECA706B	Universal Human Value & Ethics								
		BTECA706C	Intellectual Property Rights								
7	LC13	BTECA707	5G Technology Lab	-	-	2	30	-	20	50	1
8	LC14	BTECA708	Software Defined Radio Lab	-	-	2	30	-	20	50	1
9	LC15	BTECA709	Optical Fiber Communication Lab	-	-	2	30	-	20	50	1
10	PROJ	BTECA710	Project Work	-	-	4	60	-	40	100	2
11	Internship	BTECA711	Internship –III (Evaluation) / MOOC	-	-	-	-	-	-	-	Audit
	Total for Semester VII			**15**	**2**	**14**	**250**	**100**	**400**	**750**	**22**

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Course Structure for Final Year

Electronics & Communication (Advanced Communication Technology)

Semester VIII (Term 8)											
Sr. No.	**Course Category**	**Course Code**	**Course Title**	**Teaching Scheme**			**Evaluation Scheme**				**Credit**
				L	**T**	**P**	**CA**	**MSE**	**ESE**	**Total**	
1	Project/ Internship	BTECA801	Project Work/ Internship	-	-	24	60	-	40	100	12
	Total for Semester VIII			**0**	**0**	**24**	**60**	**-**	**40**	**100**	**12**

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Third Year (Semester –V)

Electromagnetic Field Theory

BTECA501	Electromagnetic Field Theory	PCC5	3L- 1T -0P	4 Credits

Teaching Scheme	**Examination Scheme**
Lecture: 3 hrs./week Tutorial :1 hr/week	Continuous Assessment: 20 Marks Mid Semester Exam:20 Marks End Semester Exam: 60 Marks (Duration 03 hrs.)

Course Objectives:

1	Students will gain knowledge in the area of EM Waves and its analysis.
2	Students will learn basic coordinate system, significance of divergence, gradient, curl and its applications to EM Waves.
3	To understand the boundary conditions for different materials/surfaces.
4	To get insight on finding solution for non-regular geometrical bodies using Finite Element Method, Method of Moments, Finite Difference Time Domain.
5	To get the basics of microwave, transmission lines and antenna parameters

Course Outcomes: At the end of the course, students will demonstrate the ability to:

CO1	Understand basic vector calculus, electrostatic fields and capacitance.
CO2	Analyze steady electric currents and magnetic fields using fundamental laws.
CO3	Apply Maxwell’s equations to understand time-varying electromagnetic fields.
CO4	Use transmission line theory and Smith charts for signal analysis and impedance matching.
CO5	Explain electromagnetic wave propagation, reflection, and power flow in different media

COURSE CONTENTS:

UNIT I: Mathematical Fundamentals and Static Electric Fields [08Hours]

Introduction, Vector Analysis, Coordinate systems and Transformations, Line, surface and volume integrals, Divergence Theorem, Stoke's theorem, Columb's Law, Electric Field, Electric flux density, Gauss's Law with Application, Electrostatic Potential and Equipotential Surfaces, Boundary conditions for Electrostatic fields, Capacitance and Capacitors, Electrostatic Energy and Energy Density.

UNIT II: Steady Electric Currents and Static Magnetic Fields [08Hours]

Current Density and Ohm's Law, Electromotive force and Kirchhoff's Voltage Law, ContinuityEquationandKirchhoff‟sCurrentLaw,PowerDissipationandJoule'sLaw,Biot-Savart Law and its Application, Ampere's Circuital Law and its Application, Magnetic Flux Density, Magnetic Scalar and Vector Potentials, Boundary Condition Magnetic Fields, Inductance and Inductor, Energy stored in Magnetic Field.

UNIT III: Time Varying Field &Maxwell's Equations [07Hours]

Introduction, Faraday's Law of electromagnetic Induction, Maxwell's Equation, Boundary Conditions for Electromagnetic fields, Time Harmonic Fields.

UNIT IV: Transmission Lines [08Hours]

Equations of Voltage and Current on TX line, Propagation constant and characteristic impedance, and reflection coefficient and VSWR, Impedance Transformation on Loss-less and Low loss Transmission line, Power transfer on TX line, Smith Chart, Admittance Smith Chart, Applications of transmission lines: Impedance Matching, use transmission line sections as circuit elements.

UNIT V: Electromagnetic Waves [07 Hours]

Maxwell Equations in phasor form, Wave Equation, Uniform Plane wave in Homogeneous, free space, dielectric, conducting medium. Polarization: Linear, circular & Elliptical polarization, unpolarized wave. Reflection of plane waves, Normal incidence, oblique incidence, Electromagnetic Power and Poynting theorem and vector.

TEXT BOOKS

1. R.K. Shevgaonkar, Electromagnetic Waves, Tata McGraw Hill India,2005
2. E.C. Jordan & K.G. Balmain, Electromagnetic waves & Radiating Systems, Prentice Hall, India
3. Narayana Rao, N: Engineering Electromagnetics, 3rd ed., Prentice Hall,1997.

REFERENCE BOOKS

1. David Cheng, “Electromagnetics”, PrenticeHall.
2. Sadiku, "Elements of Electromagnetics",Oxford.
3. Krauss, "Electromagnetics", McGraw Hill, New York, 4th edition.
4. W. H. Hayt, "Engineering Electromagnetics", McGraw Hill, New Delhi,1999.
5. Edminister, Schaum series, "Electromagnetics", McGraw Hill, New York, 1993, 2nd edition.
6. Sarvate, "Electromagnetism", WileyEastern.

Third Year (Semester –V)

Information Theory and Coding

BTECA502	Information Theory and Coding	PCC6	3L- 0T -0P	3 Credits

Teaching Scheme	**Examination Scheme**
Lecture: 3 hrs./week	Continuous Assessment: 20 Marks Mid Semester Exam:20 Marks End Semester Exam: 60 Marks (Duration 03 hrs.)

Course Objectives:

1	To provide in-depth understanding of principles and applications of information theory.
2	To provide in-depth understanding of how information is measured in terms of probability and entropy and how these are used to calculate the capacity of a communication channel.
3	To provide in-depth understanding of different coding techniques for error detection and correction.
4	To Build and understanding of fundamental concepts of data communication and networking

Course Outcomes: At the end of the course, students will demonstrate the ability to:

CO1	Understand the concept of information and entropy
CO2	Understand theorem for coding
CO3	Calculation of channel capacity
CO4	Apply coding techniques
CO5	Understand Various Markov sources

COURSE CONTENTS:

UNIT I: Theory of Probability and Random Processes [09Hours]

Concept of probability, random variables, random process, power spectral density of a random process, probability models, statistical averages, central limit theorem, correlation, linear mean square Estimation.

UNIT II: Noise in Communication Systems [09Hours]

Behavior of analog and digital communication systems in the presence of noise, Sources of noise, Noise representation, Noise filtering, Noise bandwidth, Performance of Analog and Digital communication systems in the presence of noise.

UNIT III: Information Theory [09Hours]

Measure of information, Joint entropy and conditional entropy, Relative entropy and mutual information, Markov sources, Source encoding, Shannon-Fano coding and Huffman Coding, Shannon's first and second fundamental theorems, Channel capacity theorem.

UNIT IV: Error Correcting Codes **[09Hours]**

Galois fields, Vector spaces and matrices, Block codes, cyclic codes, Burst-error detecting and correcting codes, multiple error correcting codes, Convolutional codes, ARQ (Automatic Repeat Request)

UNIT V: Markov sources **[09 Hours]**

Shannon's noisy coding theorem and converse for discrete channels; Calculation of channel capacity and bounds for discrete channels; Application to continuous channels

TEXT BOOKS:

1. N. Abramson, Information and Coding, McGraw Hill, 1963.
2. B. P. Lathi; Modern Digital and Analog Communication Systems; Oxford Publication.
3. Das, Mullick, Chaterjee; Principles of Digital Communication; New Age International.

REFERENCE BOOKS:

1. Taub, Schilling, Principles of Communication Engineering (2nd Edition), TMH.
2. Thomas M. Cover, Joy A. Thomas, Elements of Information Theory, Wiley Inter science.
3. R.P.Singh, S.D. Sapre; Communication systems: Analog and Digital; TMH.
4. Theodore S. Rappaport; Wireless Communication: Principles and Practice (2nd Edition), Pearson India.
5. M. Mansurpur, Introduction to Information Theory, McGraw Hill, 1987.

Third Year (Semester –V)

Antennas and Propagation

BTECA503A	Antennas and Propagation	PEC-2	3L- 1T -0P	4 Credits

Teaching Scheme	**Examination Scheme**
Lecture: 3 hrs./week Tutorial :1 hr/week	Continuous Assessment: 20 Marks Mid Semester Exam:20 Marks End Semester Exam: 60 Marks (Duration 03 hrs.)

Course Objectives:

1	To understand the applications of electromagnetic engineering.
2	To formulate and solve the Helmholtz wave equation and solve it for Uniform Plane Wave
3	To analyse and understand the Uniform plane wave propagation in various media
4	To solve the electric field and magnetic fields for a given wire antenna

Course Outcomes: At the end of the course, students will demonstrate the ability to:

CO1	Understand wave propagation and ionospheric effects.
CO2	Explain basics and types of wire antennas.
CO3	Analyze antenna array types and patterns
CO4	Describe smart antenna concepts and beamforming.
CO5	Identify and compare practical antenna types and uses.

COURSE CONTENTS:

UNIT I: Wave Propagation [07Hours]

Fundamental equations for free space propagation, Friis Transmission equation, Attenuation over reflecting surface, Effect of earth's curvature. Ground, sky & space wave propagations. Structure of atmosphere. Characteristics of ionized regions. Effects of earth's magnetic field. Virtual height, MUF, Skip distance. Ionospheric abnormalities. Multi-hop propagation. Characteristics of Wireless Channel: Fading, Multipath delay spread.

UNIT II: Antenna Fundamentals and Wire Antennas [08Hours]

Introduction, Types of Antenna, Radiation Mechanism, Antenna Terminologies, Radiation Integrals: Vector potentials A, J, F, M, Electric and magnetic fields electric and magnetic current sources, solution of inhomogeneous vector potential wave equation, far field radiation.Wire Antennas: Analysis of Linear and Loop antennas: Infinitesimal dipole, small dipole, and finite length dipole half wave length dipole, small circular loop antenna. Complete Analytical treatment of all these elements.

UNIT III: Antenna Arrays [07Hours]

Antenna Arrays: Two element array, pattern multiplication N-element linear array, uniform amplitude and spacing, broad side and end-fire array, N-element array: Uniform spacing, non-uniform amplitude, array factor, binomial and Dolph Chebyshev array. Planar Array, Circular Array, Log Periodic Antenna, Yagi Uda Antenna Array.

UNIT IV: Concepts of Smart Antennas [07Hours]

Introduction, Smart Antenna Analogy, Cellular Radio System Evolution, benefits and drawbacks of smart antennas, fixed weight beam forming basics, Antenna beamforming.

UNIT V: Antennas and Applications [07Hours]

Structural details, dimensions, radiation pattern, specifications, features and applications of following Antennas: Hertz & Marconi antennas, V- Antenna, Rhombic antenna. TW antennas. Loop antenna, Whip antenna, Biconical, Helical, Horn, Slot, Microstrip, Turnstile, Super turnstile & Lens antennas. Antennas with parabolic reflectors.

TEXT BOOKS

1. C. A. Balanis, “Antenna Theory - Analysis and Design", JohnWiley.
2. Mathew N O Sadiku, “Elements of Electromagnetics” 3rd edition, Oxford University Press.
3. John D Kraus, Ronald J Marhefka, Ahmad S Khan, Antennas for All Applications, 3rd Edition, the McGraw Hill Companies.

REFERENCE BOOKS

1. K. D. Prasad, “Antenna & Wave Propagation”, SatyaPrakashan, NewDelhi.
2. John D Kraus, “Antenna& Wave Propagation”, 4th Edition, McGraw Hill,2010.
3. Vijay K Garg, Wireless Communications and Networking, Morgan Kaufmann Publishers, An Imprint of Elsevier, 2008.

Third Year (Semester –V)
Microcontroller & Embedded System

BTECA503B	Microcontroller & Embedded System	PEC-2	3L- 1T - 0P	4 Credits

Teaching Scheme	Examination Scheme
Lecture: 3 hr./week Tutorial :1 hr/week	Continuous Assessment: 20Marks Mid Semester Exam : 20 Marks End Semester Exam: 60 Marks (Duration 03 hrs.)

Pre-Requisites: Microprocessor, Analog and Digital interfacing, and Peripherals, C language

Course Objectives:

1	To introduce 8051 microcontroller programming concepts and System design from a Hardware and software point of view.
2	To provide the basic concepts of an Embedded System.
3	To illustrate the tools and methodologies needed for embedded system design..

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

CO1	Understand the basic architecture of 8051 micro controller
CO2	Develop 8051 microcontroller programming
CO3	Develop code for interfacing various devices
CO4	Understand the basics of Embedded system and the concepts of Real Time Operating Systems
CO5	Compose simple embedded system with error free software to obtain target system

COURSE CONTENTS:

UNIT I: Fundamentals of Microcontrollers [07Hours]

Introduction: MCS-51 family, Harward & Von Neumann architecture, RISC & CISC processors, Comparison of microprocessor and microcontroller, architecture and pin functions of 8051, Port structure, memory organization, Interrupt structure, timers and its modes, serial communication modes. Overview of Instruction set, Addressing modes.

UNIT II: Programming with 8051 [08Hours]

Assembly Language Programming examples, Delay using Timer and interrupt, Programming Timer 0&1, Data transmission and reception using Serial port. Software and Hardware tools for development

of microcontroller-based systems such as assemblers, compliers, IDE, Emulators, debuggers, programmers, development board.

UNIT III: Interfacing Of 8051 [07Hours]

Interfacing LED with and without interrupt, interrupt programming ,Seven Segment Display, LCD and keyboard interfacing, ADC and DAC interfacing, interfacing to external memory, Temperature sensors, Stepper motor, Motion detectors, Relay, Buzzer, Optoisolators.

UNIT IV: Introduction To Embedded Systems [07 Hours]

Introduction to Embedded Systems, Architecture of Embedded System, Design Methodology, Design Metrics, General Purpose Processor, System On chip. Embedded system design and development: Embedded system design, Life-Cycle Models, Problem solving, The design process, Requirement identification, Formulation of requirements specification. Development tools.

UNIT V: Arm Processor Fundamentals And Instruction Set [07Hours]

Registers, Current Program Status Registers(CPSR), Pipeline, exceptions, Interrupts and the vector table, Data Processing Instruction, Branch Instruction, Load-Store Instructions, Software Interrupts instructions, Program Status Register Instructions, Loading Constants, Thumb register usage, ARM-Thumb Interworking, other branch instructions, Data Processing instructions, Stack instructions, Single -register load -store instruction, multiple –register load- store instruction, software interrupt instructions

TEXT BOOKS

1. “The 8051 Microcontroller”- Kenneth J.Ayala, Thomson
2. “The 8051 Microcontroller and Embedded Systems”, Muhammad A Mazidi, Pearson Education.
3. An Embedded Software Primer- David E. Simon, Pearson Education.

REFERENCE BOOKS:

1. 8051 Microcontrollers, Satish Shah, Oxford Higher Education.
2. Embedded Microcomputer Systems Real Time Interfacing, Jonathan W. Valvano, Cengage Learning.
3. Micro Controllers, Ajay V Deshmukhi, TMH.
4. Embedded System Design, Frank Vahid, Tony Givargis, John Wiley.
5. Microcontrollers, Raj kamal, Pearson Education.

Third Year (Semester –V)

Wireless Communication

BTECA503C	Wireless Communication	PEC-2	3L- 1T -0P	4 Credits

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Teaching Scheme	**Examination Scheme**
Lecture: 3 hrs./week Tutorial : 1 hr./week	Continuous Assessment: 20 Marks Mid Semester Exam:20 Marks End Semester Exam: 60 Marks (Duration 03 hrs.)

Course Objectives:

1	The objective of the course is to introduce the Concepts of basic wireless mobile communication systems.
2	To learn and understand the basic principles of Telecommunication switching, traffic and networks
3	To learn and understand basic concepts of cellular system, wireless propagation and the techniques used to maximize the capacity of cellular network.
4	To learn and understand architecture of GSM and CDMA system
5	To understand mobile management, voice signal processing and coding in GSM and CDMA system

Course Outcomes:

CO1	Explain and apply the concepts telecommunication switching, traffic and network.
CO2	Analyze the telecommunication traffic.
CO3	Analyze radio channel and cellular capacity
CO4	Explain and apply concepts of GSM and CDMA system.
CO5	Understand wireless communication standards

COURSE CONTENTS:

UNIT I: Introduction and Cellular Concept [09Hours]

Existing technology, Evolution in wireless systems, Trends in cellular system Frequency Reuse channel Assignment Strategies, Handoff Strategies, Interference and System Capacity, Cellular System, Design in worst case with an omni Directional Antenna, Co-Channel Interference Reduction with use of Directional Antenna, Improving Coverage and Capacity in Cellular systems, Trunking and Grade of services.

UNIT II: Wireless Communication Systems GSM [09Hours]

GSM Services and features, GSM (Global system for mobile communication) Architecture and interfaces, GSM Radio Sub System, GSM Channel Types , Traffic Channels, Control Channels, Example of a GSM call, Frame structure for GSM , Signal Processing in GSM, GPRS (General packet radio service).

UNIT III: Wideband Modulation Techniques and OFDM [09Hours]

Basic Principles, OFDM (Orthogonal Frequency Division Multiplexing) Signal Mathematical representation, Block Diagram, Selection Parameters for modulation, Pulse shaping, Windowing, Spectral Efficiency, Synchronization.

UNIT IV: Wireless Communication Systems CDMA IS95 [09Hours]

Direct sequence Spread Spectrum, Spreading codes, Multipath Signal Propagation and RAKE receiver, Frame Quality and BER (Bit Error Rate) Requirements, Critical challenges of CDMA, TIA (Telecommunication Industry Application) IS95 (Communication Standard) System, Physical and Logical Channels of IS95, CDMA IS95 call processing, soft hand off and power control in CDMA, Access and Paging Channel Capacity, Reverse and Forward Link Capacity of a CDMA System, DSSS.

UNIT V: Wireless Communication Systems [09Hours]

CDMA 2000: CDMA layering structure, CDMA 2000 channels, logical channels, forward link physical, forward link features, reverse physical channels, CDMA 2000 Media Access control and LLC (Logical Link Control) sub layer, Data services, Data services in CDMA 2000, mapping of logical channels to physicals, evolution of CDMA IS95 to CDMA 2000. Bluetooth, Wi Fi Standards, Wireless Sensor Networks, Zigbee, IEEE 802.20

TEXT BOOKS:

1. Wireless Communication: Principles and Practice ñ Theodare. S. Rappaport- Pearson Education.
2. Wireless Network Evolution: 2G to 3G ñ Vijay. K. Garg ñ Pearson Education.
3. Principles and Application of GSM ñ Vijay Garg, Joseph. E. Wilkes ñ Pearson Education.

REFERENCE BOOKS:

1. Mobile Cellular Telecommunications: Analog and Digital Systems, William C. Y. Lee, Tata McGraw ñ Hill Edition.
2. 6Introduction to Wireless Telecommunication Systems and Networks- Gary. J. Mullet, DELMAR CENGAGE Learning
3. Wireless Communications and Networks: 3G and Beyond, ITI Saha Misra, Tata McGraw ñ Hill Edition.
4. Fundamentals of Wireless Communication: David Tse, Pramod Viswanath, CAMBRIDGE University Press.
5. Mobile Wireless communications, Mischa Schwartz, CAMBRIDGE University Press.
6. Wireless Communication: Upena Dalal ñ Oxford Higher Education.

Third Year (Semester –V)

Power Electronics & Drives

BTECA503D	Power Electronics and Drives	PEC-2	3L- 1T -0P	4 Credits

Teaching Scheme	Examination Scheme
Lecture: 3 hrs./week Tutorial : 1 hr./week	Continuous Assessment: 20 Marks Mid Semester Exam:20 Marks End Semester Exam: 60 Marks (Duration 03 hrs.)

Course Objectives:

1	To introduce students to different power devices to study their construction, characteristics and turning on circuits.
2	To give an exposure to students of working & analysis of controlled rectifiers for different loads, inverters, DC choppers, AC voltage controllers and resonant converters
3	To study the different motor drives, various power electronics applications like UPS, SMPS, etc. and some protection circuits

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

CO1	Design & implement a triggering / gate drive circuit for a power device.
CO2	Understand, perform & analyze different controlled converters.
CO3	Evaluate battery backup time & design a battery charger
CO4	Design & implement over voltage / over current protection circuit
CO5	Study of various power devices

COURSE CONTENTS:

UNIT I: Power Devices **[09Hours]**

Construction, Steady state characteristics & Switching characteristics of SCR, Construction, Steady state characteristics Power MOSFET & IGBT, DIAC, TRIAC, SCR ratings: IL, IH, VBO, VBR, dv/dt, di/dt, surge current & rated current. Gate characteristics, Gate drive requirements, Synchronized UJT triggering for SCR, triggering of SCR using IC-785, gate drive circuits for Power MOSFET / IGBT DIAC/TRIAC.

UNIT II: AC-DC Power Converters **[09Hours]**

Concept of line& forced commutation, Single phase Semi & Full converters for R, R-L loads, Performance parameters, Effect of freewheeling diode, Three phase Semi & Full converters for R load.

UNIT III: DC-AC Converters **[09Hours]**

Single phase bridge inverter for R and R-L load using MOSFET / IGBT, performance parameters, single phase PWM inverters. Three phase voltage source inverter for balanced star R load.

UNIT IV: DC-DC Converters AC Voltage Controller [09Hours]

Working principle of step down chopper for R-L load (highly inductive), control strategies. Performance parameters, Step up chopper, 2-quadrant& 4-quadrant choppers, SMPS. Single phase full wave AC voltage controller with R load.

UNIT V: Power Electronics Applications [09Hours]

On-line and OFF line UPS with battery AH, back up time, battery charger rating. Electronic ballast: Characteristics of fluorescent lamps and advantages over conventional ballast. Single phase separately excited DC motor drive, stepper motor drive, BLDC motors. Variable voltage & variable frequency three phase induction motor drive, Chopper and Types of Chopper, Four Quadrant chopper, Voltage and Current commutated chopper.

TEXT BOOKS:

1. M.H. Rashid, “Power Electronics circuits devices and applications”, PHI 3rdedition, 2004 edition, New Delhi.

2.. P.C. Sen, “Modern Power Electronics”, S Chand & Co New Delhi.

REFERENCE BOOKS:

2. M. S. Jamil Asghar, "POWER ELECTRONICS", PHI, 2004, New Delhi.

3. Ned Mohan, T. Undeland & W. Robbins, “Power Electronics Converters applications and design” 2nd edition, John Willey & sons, Singapore.

4. U. R. Moorthi, "POWER ELECTRONICS, DEVICES, CIRCUITS &INDUSTRIAL APPLICATIONS", Oxford University Press, New Delhi, 2005.

Third Year (Semester-V)

HDL Programming

BTECA504A	HDL Programming	OEC-1	3L- 0T - 0P	3 Credits

Teaching Scheme	**Examination Scheme**
Lecture: 3 hrs./week	Continuous Assessment: 20 Marks Mid Semester Exam: 20 Marks End Semester Exam: 60 Marks (Duration 03 hrs.)

Course Objectives: The aim of this course is:

1	To use the industry-standard hardware description language VHDL into the digital design process.
2	To design VHDL models ranging in complexity from a simple adder to more complex circuits.
3	To understand the synthesis and testing of the models.

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

CO1	Remember the Boolean laws, truth tables & standard forms of logic functions used in Digital Design.
CO2	Understand the FSM, state diagram and asynchronous sequential networks.
CO3	Write the codes for basic combinational and sequential circuits using VHDL.
CO4	Apply the knowledge of PLDs for analyzing logic functions.
CO5	Design simple digital circuits based on FPGA.

COURSE CONTENTS:

UNIT I: Digital Logic Design Fundamentals [09 Hours]

Review of Logic Design Fundamentals: 5 Variable K-map, Quine-McCluskey method, Designing with NAND and NOR gates, Truth Tables and Excitation tables of Flip- flop: SR, JK, D, T; Conversion from one type to another type of Flip Flop. Ring counters, BCD counter, Half adder & full adder.

UNIT II: State Machines [08 Hours]

Finite State Machines (FSM) Models – Moore and Mealy, Design Procedure, State diagram, deviation of state graphs and tables, reduction of state assignments, Sequence generator and detector, SM Charts.
Asynchronous sequential networks: Primitive flow tables, hazards.

UNIT III: Basics of VHDL [07 Hours]

VHDL: Design flow, EDA tools, code structures, modelling styles, data types, operators and attributes. Signals & Variables, Statements used in data flow & behavioral modelling styles.

UNIT IV: Programming using VHDL [08 Hours]

Design of combinational blocks such as multi-bit adders, ALU, MUX, encoders, decoders, Design of sequential circuits, state machine modeling (Moore and Mealy machines). Common VHDL

programming Errors.

UNIT V: Introduction to Programmable Logic Devices [08 Hours]

Combinational Logic Design using ROM array, PLA, PAL, General Architecture of FPGA, FPGA architecture modules their meaning & usage, Programming platforms, Programmable Interconnects, Programmable I/O Blocks, Applications of FPGAs, Design Flow for FPGAs. Implementing simple functions using FPGAs.

TEXT BOOKS

1. Digital Systems Design using VHDL", Charles H. Roth, Jr., The University of Texas at Austin. 2006 reprint, Thomson Asia Pte Ltd, Singapore
2. "HDL Programming VHDL and Verilog", Nazeih M. Botros, 2009 reprint, Dreamtech Press.
3. Stephen Brown, ZvonkoVranesic, ―Fundamentals of Digital Logic with VHDL Design‖, McGraw- Hill, ISBN–13:978-1-25-902597-6.

REFERENCE BOOKS

1. "VHDL for Programmable Logic", Kevin Skahill, Pearson education, 2006.
2. "Fundamentals of Digital Logic with VHDL Design", Stephen Brown and Zvonko Vranesic, McGraw- Hill Higher Education.
3. Anil Maini, ―Digital Electronics: Principles and Integrated Circuits‖, Wiley India Ltd, ISBN:978-81- 265-1466-3.
4. Norman B & Bradley, ―Digital Logic Design Principles, Wiley India Ltd, ISBN:978-81-265-1258-4

Third Year (Semester –V)

Database Management Systems

BTECA504B	Database Management Systems	OEC-I	3L- 0T - 0P	3 Credits

Teaching Scheme	**Examination Scheme**
Lecture: 3 hrs./week	Continuous Assessment : 20 Marks Mid Semester Exam: 20 Marks End Semester Exam: 60 Marks (Duration 03 hrs.)

Pre-Requisites: Programming in C, Structures and Pointers.

Course Objectives:

1	To teach the basic database concepts, applications, data models, schemas and instances.
2	To familiarize Entity Relationship model for a database
3	To demonstrate the use of constraints and relational algebra operations.
4	To emphasize the importance of normalization in databases
5	To demonstrate the basic concepts of transaction processing and concurrency control.
6	To familiarize the concepts of database storage structures and identify the access techniques.

Course Outcomes: On completion of the course, students will be able to:

CO1	Use the basic concepts of Database Systems in Database system
CO2	Apply SQL queries to interact with Database
CO3	Apply normalization on database design to eliminate anomalies
CO4	Analyze database transactions and can control them by applying ACID properties.
CO5	Study of NOSQL database and oriented using Mongo DB.

COURSE CONTENTS:

Unit I: Introduction to Database Management System [6 Hours]

Database system architecture, Data Abstraction, Data Independence, Types of databases, Introduction to Relational Database management system, Schema and instances, Data models: Entity-relationship model.

Unit II: Structured Query Language (SQL): [8 Hours]

Data Definition Language (DDL), Data Manipulation Language (DML), Relational integrity constraints, data manipulation operations using WHERE clause, Order By Clause,NULL,LIMIT etc, SQL functions, joins, group by and having clause, Subqueries, views.

Unit III: Relational database design: [7 Hours]

Types of keys, Need of Normalization, Functional dependency and its types, Dependency preservation, Lossy and Lossless design, dependency, Normal forms, 1NF, 2NF, 3NF and BCNF.

Unit IV: Transaction Processing: **[8 Hours]**

Concurrency control, ACID property, Serializability of scheduling, Concurrency Control schemes, Locking and timestamp based schedulers, Database recovery.

Unit V: NOSQL Database: **[7 Hours]**

Difference between RDBMS and NOSQL Database, Need of NOSQL databases, Types of NOSQL databases, CAP Theorem, Introduction to Document oriented databased with MongoDB, MongoDB installation, Basic CRUD operation with MongoDB.

TEXT BOOKS

1. Henry Korth, Abraham Silberschatz & S. Sudarshan, Database System Concepts, McGrawHill Publication, 6th Edition, 2011.
2. Navathe, Fundamentals of Database System, Addison-Wesley Publication, 6th Edition, 2012.
3. MongoDB: The Definitive Guide, 2nd Edition, Powerful and Scalable Data Storage, By Kristina Chodorow, Publisher: O'Reilly.

REFERENCE BOOKS

1. Raghu Ramakrishnan, Johannes Gehrke, Database Management Systems, McGrawHill Publication, 3rd Edition, 2003.
2. Media 3. MongoDB Basics - EelDavid Hows,Peter Membrey,coPlugge, Publisher Apress – Ebook(free)https://it-ebooks.info/book/4527

Third Year (Semester –V)

Data Analysis

BTECA 504C	Data Analysis	OEC1	3L- 0T -0P	3 Credits

Teaching Scheme	**Examination Scheme**
Lecture: 3 hrs./week	Continuous Assessment : 20 Marks Mid Semester Exam:20 Marks End Semester Exam: 60 Marks (Duration 03 hrs.)

Pre-Requisites: Basics of Linear Algebra, Introduction, Probability and Statistics.

Course Objectives:

1	To obtain a Comprehensive knowledge of various tools and techniques for Data transformation and visualization
2	To learn the probability and probabilistic models of data science
3	To learn the basic statistics and testing hypothesis for specific problems
4	To learn about the prediction models
5	To give a hands-on experience with real-world data analysis

Course Outcomes: On completion of this course, the student should be able to

CO1	Apply preprocessing techniques to convert raw data so as to enable further analysis
CO2	Apply exploratory data analysis and create insightful visualizations to identify patterns
CO3	Understand how to derive the probability density function of transformations of random variables and use these techniques to generate data from various distributions
CO4	Understand the statistical foundations of data science and analyze the degree of certainty of predictions using statistical test and models
CO5	Introduce machine learning algorithms for prediction and to derive insights

COURSE CONTENTS:

Unit I: Statistical data and Concepts **[07 Hours]**

The statistical Methods, Misuse, Misinterpretation and bias, Sampling and sampling size, Data preparation and cleaning, Missing data and data errors, Exploratory Data Analysis, Statistical error, Statistical Modeling, Computational Statistics, Inference, Bias, Cofounding, Hypothesis testing, Types of error, Statistical significance, Confidence Interval, Power and robustness, Degrees of freedom, Non parametric analysis.

Unit II: Descriptive Statistics **[07 Hours]**

Counts and specific values, Measure of central tendency, Measure of spread, Measure of distribution shape, Statistical indices, Moments, Key functions, Measures of complexity and model selection.

Unit III: Data transformation and standardization **[07 Hours]**

Box-Cox and power transforms, Freeman-Tukey (square root and arcsine) transforms, Log and

Exponential transforms, Logit transforms, Normal transform

Unit IV: Classical Tests and Contingency Tables [7 Hours]

Goodness of fit tests: Anderson-Darling, Chi-square test, Kolmogorov-Smirnov, Ryan-Joiner, Shapiro-Wilk, Jarque-Bera, Lilliefors; Z- test: test of single mean, standard deviation known, Test of the difference between two means, standard deviation known, test for proportions, P; T-tests: test of single mean, standard deviation not known, Test of the difference between two means, standard deviation not known, test of regression coefficients

Unit V: Analysis of Variance and Covariance [08 Hours]

Variance test: Chi square test of single variable, F-test of two variables, test of homogeneity; Wilcoxon rank-sum/Mann-Whitney U test; Sign test. **Contingency Tables:** Chi-square contingency table test, G contingency table test, Fisher's exact test, Measures of association, McNemar's test. **ANOVA**: Single factor or one way ANOVA, Two factor or two-way and higher-way ANOVA, MANOVA, ANCOVA; Non Parametric ANOVA: Kruskal Wallis ANOVA, Friedam ANOVA test, Mood's median.

TEXT BOOKS

1. Dr. Michael J de Smith, Statistical Analysis Handbook, A Comprehensive guide to statistical concepts methods and tools, The Winchelsea Press, Drumlin Security Ltd, Edinburgh 2018 edition. https://www.statsref.com/HTML/index.html
2. Douglas C. Montgomery, George C. Runger, Applied Statistics and Probability for Engineers, Sixth Edition, Wiley, 2013
3. Dr.J.Ravichandran, Probability And Statistics For Engineers, First Edition, Wiley, 2010 Scientists

REFERENCE BOOKS

1. Jure Leskovek, Anand Rajaraman and Jeffrey Ullman. Mining of Massive Datasets. v2.1, Cambridge University Press. 2014. (free online)
2. Kevin P. Murphy. Machine Learning: A Probabilistic Perspective. ISBN 0262018020. 2013.
3. Foster Provost and Tom Fawcett. Data Science for Business: What You Need to Know about Data Mining and Data-analytic Thinking. ISBN 1449361323. 2013.
4. Cathy O'Neil and Rachel Schutt. Doing Data Science, Straight Talk From The Frontline. O'Reilly. 20

Third Year (Semester –V)

Java programming

BTECA504D	Java Programming	OEC-I	3L- 0T -0P	3 Credits

Teaching Scheme	**Examination Scheme**
Lecture: 3 hrs./week	Continuous Assessment: 20 Marks Mid Semester Exam:20 Marks End Semester Exam: 60 Marks (Duration 03 hrs.)

Course Objectives:

1	To introduce students to the principles of programming logic and algorithmic thinking.
2	To develop the ability to write, debug, and test Java programs.
3	To understand the structure and syntax of the Java programming language.
4	To apply basic object-oriented programming principles.
5	To perform simple file and exception handling operations.

Course Outcomes:

CO1	Understand basic programming ideas and write simple programs using Java.
CO2	Use conditions and loops to control how a Java program runs.
CO3	Write Java programs using functions (methods) and arrays to organize and store data.
CO4	Create and use objects and classes to build Java programs using object-oriented ideas.
CO5	Handle errors and work with files in Java programs.

COURSE CONTENTS:

UNIT I: Introduction to Programming and Java Fundamentals [09Hours]

Basics of Programming: Definitions, Purpose, and Applications, Introduction to Java: History, Features, and Applications, Java Development Kit (JDK), Integrated Development Environment (IDE), Structure of a Java Program, Writing and Executing a Simple Java Program, Java Syntax: Keywords, Identifiers, Data Types, Variables, and Literals, Basic Input and Output.

UNIT II: Control Structures and Operators [09Hours]

Operators in Java: Arithmetic, Relational, Logical, and Assignment. Decision-Making Statements: if, if-else, nested if, switch-case. Looping Constructs: for, while, do-while. Loop Control Statements: break, continue. Basic Introduction to Debugging and Flow Control.

UNIT III: Methods and Arrays [09Hours]

Defining and Calling Methods, Method Parameters and Return Types, Method Overloading. Introduction to Arrays: Declaration, Initialization, and Access. One-Dimensional and Two-Dimensional Arrays. Common Array Operations and Use Cases.

UNIT IV: Object-Oriented Programming Concepts [09Hours]

Introduction to Object-Oriented Programming. Defining Classes and Creating Objects. Constructors and

Initialization. Instance Variables, Class Variables, and Methods. Access Modifiers: public, private, and default. The this Keyword and Encapsulation. Basic Use of the static Keyword.

UNIT V: Exception Handling and File I/O [09Hours]

Introduction to Exceptions and Error Types. Exception Handling Mechanism: try, catch, finally. Commonly Used Exception Classes. Introduction to File Handling in Java. Reading from and Writing to Text Files. Use of File, FileReader, FileWriter, and Scanner for File Operations

TEXT BOOKS

1. E. Balagurusamy, Programming with Java, McGraw Hill

REFERENCE BOOKS

1. Herbert Schildt, Java: The Complete Reference, McGraw Hill Education
2. Kathy Sierra and Bert Bates, Head First Java, O'Reilly Media

Third Year (Semester –V)

Economics and Management

BTECA505A	Economics and Management	HSSMEC-4	3L- 0T -0P	3 Credits

Teaching Scheme	**Examination Scheme**
Lecture: 3 hrs./week	Continuous Assessment : 20 Marks Mid Semester Exam:20 Marks End Semester Exam: 60 Marks (Duration 03 hrs.)

Course Objectives:

1	To introduce students to the principles of economics and management.
2	To develop the ability to take decision in social society

Course Outcomes: On completion of the course, students will be able to:

CO1	Study of Market Equilibrium
CO2	Understand Relevant Information and Decision Making
CO3	Aware Financial Statements
CO4	Study of Depreciation Accounting
CO5	Understand Product Development

COURSE CONTENTS:

Unit I: Introduction: [7Hours]

Market Equilibrium: Demand and Supply, Elasticity of Demand Forecasting, Production, Exercises on Economics, Cost-Volume-Profit Relationships, Cost Management Systems and Activity Costing System.

Unit II: Relevant Information and Decision Making [8Hours]

Cost Allocation, Exercises on Economics, Double-Entry Book keeping, Job Casting, Process Costing, The Master Budget, Flexible Budgets and Variance Analysis.

Unit III: Financial Statements [7Hours]

Analysis of Financial Statements, Time Value of Money, Comparison of Alternatives.

Unit IV: Depreciation Accounting [7Hours]

Evolution of Management Thoughts, Functions of Management Directing.

Unit V: Product Development [7Hours]

Forecasting Revisited, Capacity Planning, Product / Services Strategies and Plant Layout, Production Planning and Control.

TEXT BOOKS

1. R. Paneerselvam, Engineering Economics, PHI publication.

REFERENCE BOOKS

1. Robbins S.P. and Decenzo David A., Fundamentals of Management: Essential Concepts and Applications, Pearson Education. 2. L. M. Prasad, Principles and Practices of Management. 3. K. K. Dewett & M. H. Navalur, Modern Economic Theory, S. Chand Publications.

Third Year (Semester –V)
Business Communication

BTECA505B	Business Communication	HSSMEC-4	3L- 0T -0P	3 Credits

Teaching Scheme	**Examination Scheme**
Lecture: 3 hrs./week	Continuous Assessment : 20 Marks Mid Semester Exam:20 Marks End Semester Exam: 60 Marks (Duration 03 hrs.)

Course Objectives:

1	To learn concepts of business communication.
2	To learn all qualities with related business communication

Course Outcomes: On completion of the course, students will be able to:

CO1	Study of business
CO2	Understand Intercultural Communication
CO3	Aware Barriers to Communication
CO4	Study of Interpersonal Communication
CO5	Understand Negotiation and Conflict Management

COURSE CONTENTS:

Unit I: Introduction: [07Hours]

Introduction, Definitions & Concepts, Communicative Competence.

Unit II: Intercultural Communication [08Hours]

Intercultural Communication, Nonverbal Communication, Thought and Speech, Translation as Problematic Discourse.

Unit III: Barriers to Communication [07Hours]

Barriers to Communication, Listening, Communication Rules, Communication Style.

Unit IV: Interpersonal Communication [07Hours]

Interpersonal Communication, Relational Communication, Organizational Communication. Collaboration, Communication in Groups and Teams, Persuasive Communication.

Unit V: Negotiation and Conflict Management [07Hours]

Negotiation and Conflict Management, Leadership, Written Communication in International Business, Role of Technology in international Business Communication, Moving to Another Culture, Crisis Communication, Ethics in Business Communication.

TEXT BOOKS

1. Mary Ellen Guffey, Essentials of Business Communication, Sixth Edition, South-Western College Publishing.

REFERENCE BOOKS

1. Bovee, Courtland, John Thill & Mukesh Chaturvedi, Business Communication Today: Dorling kindersley, Delhi.
2. Kaul, Asha, Business Communication, Prentice-Hall of India, Delhi.
3. Monippally, Matthukutty M. Business Communication Strategies. Tata McGraw-Hill Publishing Company Ltd., New Delhi.
4. Sharma, Sangeeta and Binod Mishra, Communication Skills for Engineers and Scientists, PHI Learning Pvt. Ltd., New Delhi

Third Year (Semester –V)

Professional Ethics And Values

BTECA505C	Professional Ethics and Values	HSSMEC-4	3L- 0T -0P	3 Credits

Teaching Scheme	**Examination Scheme**
Lecture: 3 hrs./week	Continuous Assessment : 20 Marks Mid Semester Exam:20 Marks End Semester Exam: 60 Marks (Duration 03 hrs.)

Course Ojectives:

1	To enable the students to create an awareness on Engineering Ethics and Human Values.
2	To instill Moral and Social Values and Loyalty and to appreciate the rights of others.

Course Outcomes : On completion of the course, students will be able to:

CO1	Study of human values
CO2	Understand engineering ethics
CO3	Study of engineering as a experimentation.
CO4	Study of safety, responsibilities and rights.
CO5	Understanding global values

COURSE CONTENTS:

UNIT I : Human Values [08Hours]

Morals, values and Ethics – Integrity – Work ethic – Service learning – Civic virtue – Respect for others – Living peacefully – Caring – Sharing – Honesty – Courage – Valuing time – Cooperation – Commitment – Empathy – Self Confidence – Character – Spirituality – Introduction to Yoga and meditation for professional excellence and stress management.

UNIT II: Engineering Ethics [07Hours]

Senses of Engineering Ethics – Variety of moral issues – Types of inquiry – Moral dilemmas – Moral Autonomy – Kohlberg's theory – Gilligan's theory – Consensus and Controversy – Models of professional roles – Theories about right action – Self-interest – Customs and Religion – Uses of Ethical Theories.

UNIT III: Engineering As Social Experimentation [07Hours]

Engineering as Experimentation – Engineers as responsible Experimenters – Codes of Ethics – A Balanced Outlook on Law.

UNIT IV: Safety, Responsibilities And Rights [07Hours]

Safety and Risk – Assessment of Safety and Risk – Risk Benefit Analysis and Reducing Risk – Respect for Authority – Collective Bargaining – Confidentiality – Conflicts of Interest – Occupational Crime – Professional Rights – Employee Rights – Intellectual Property Rights (IPR) – Discrimination.

UNIT V: Global Issues **[07Hours]**

Multinational Corporations – Environmental Ethics – Computer Ethics – Weapons Development – Engineers as Managers – Consulting Engineers – Engineers as Expert Witnesses and Advisors – Moral Leadership –Code of Conduct – Corporate Social Responsibility.

TEXT BOOKS

1. Mike W. Martin and Roland Schinzinger, Ethics in Engineering, Tata McGraw Hill, New Delhi,2003.
2. Govindarajan M, Natarajan S, Senthil Kumar V. S, Engineering Ethics, Prentice Hall of India, New Delhi, 2004.

REFERENCES

1. Charles B. Fleddermann, ―Engineering Ethics, Pearson Prentice Hall, New Jersey, 2004.
2. Charles E. Harris, Michael S. Pritchard and Michael J. Rabins, ―Engineering Ethics – Concepts and Cases, Cengage Learning, 2009.
3. John R Boatright, ―Ethics and the Conduct of Business, Pearson Education, New Delhi, 2003
4. Edmund G Seebauer and Robert L Barry, ―Fundamentals of Ethics for Scientists and Engineers, Oxford University Press, Oxford, 2001.
5. Laura P. Hartman and Joe Desjardins, ―Business Ethics: Decision Making for Personal Integrity and Social Responsibility Mc Graw Hill education, India Pvt. Ltd.,New Delhi, 2013.
6. World Community Service Centre, Value Education‘, Vethathiri publications, Erode, 201

Third Year (Semester –V)

Project Management

BTECA505D	Project Management	HSSMEC-4	3L- 0T -0P	3 Credits

Teaching Scheme	**Examination Scheme**
Theory: 3 hrs	Mid-term test: 20 Marks Internal Assessment: 20 Marks End semester exam: 60 Marks

Course objective:

1	To define project and implementation of project process
2	To learn project process

Course outcome:

CO1	Understand concepts of project management.
CO2	Defining project and its defination
CO3	Scheduling and working on it
CO4	Develop a project plan.
CO5	Understand the project implementation strategy.

COURSE CONTENTS:

UNIT I : Introduction to Project management [08Hours]

Characteristics of projects, Definition and objectives of Project Management, Stages of Project Management, Project Planning Process, Establishing Project organization.

UNIT II: Work definition [07Hours]

Defining work content, Time Estimation Method, Project Cost. Estimation and budgeting, Project Risk Management.

UNIT III: **Project scheduling and Planning Tools [07Hours]**

Work Breakdown structure, LRC, Gantt charts,CPM/PERT Networks

UNIT IV: Developing Project Plan (Baseline), Project cash flow analysis, Project scheduling with Resource constraints [07Hours]

Resource Levelling and Resource Allocation. Time Cost Trade off: Crashing Heuristic.

UNIT V: Project Implementation [09Hours]

Project Monitoring and Control with PERT/Cost, Computers applications in Project Management, Contract Management, Project Procurement Management. Post-Project Analysis

TEXT BOOKS

1. 1.Shtub, Bard and Globerson, Project Management: Engineering, Technology, and Implementation, Prentice Hall, India
2. Lock, Gower, Project Management Handbook.

REFERENCE BOOKS

1. Cleland and King, VNR Project Management Handbook.
2. Wiest and Levy, Management guide to PERT/CPM, Prentice Hall. Ibdia
3. Horald Kerzner, Project Management: A Systemic Approach to Planning, Scheduling and Controlling, CBS Publishers, 2002.
4. S. Choudhury, Project Scheduling and Monitoring in Practice.
5. P. K. Joy, Total Project Management: The Indian Context, Macmillan India Ltd.

Third Year (Semester –V)

Information Theory & Coding Lab

BTECA506	Information Theory & Coding Lab	LC7	0L-0T-2P	1 Credits

Teaching Scheme	**Examination Scheme**
Practical: 02 hrs./week	Continuous Assessment : 30 Marks End Semester Examination: 20 Marks Total Marks:50 Marks

(Minimum 08 to 10 experiments are to be performed based on contents in syllabus)

List of Practicals:

1. Simulate probability density and cumulative distribution functions for uniform, Gaussian, and exponential distributions.
2. Evaluate auto-correlation and cross-correlation functions of random sequences.
3. Calculate power spectral density of a stationary random process.
4. Evaluate signal-to-noise ratio performance of amplitude and frequency modulation under noise.
5. Calculate the effective noise bandwidth for various filter responses.
6. Calculate entropy and redundancy of discrete memoryless information sources.
7. Compute joint entropy, conditional entropy, and mutual information between two random variables.
8. Implement block encoding and decoding using Hamming code for single-bit error correction.
9. Generate **c**yclic redundancy check codes and verify error detection capabilities.
10. Detect and correct burst errors using interleaving or Reed–Solomon codes.
11. Model a first-order Markov information source and calculate source entropy.
12. Simulate noisy channel performance and demonstrate Shannon’s channel coding theorem.

Third Year (Semester –V)

Antennas and Propagation Lab

BTECA507A	Antennas and Propagation Lab	LC8	0L-0T-2P	1 Credits

Teaching Scheme	Examination Scheme
Practical: 02 hrs./week	Continuous Assessment : 30 Marks End Semester Examination: 20 Marks Total Marks : 50 Marks

(Minimum 08 to 10 experiments are to be performed based on contents in syllabus)

List of Practicals :

1. To plot the radiation pattern of an Omni-direction antenna.
2. To plot the radiation pattern of the direction antenna.
3. To plot the phenomenon of polarization of vertically, horizontally and circularly polarized antenna
4. To study the resonant and non-resonant antenna
5. To demonstrate that the Transmitting and Receiving radiation patterns of an antenna are equal and hence confirm the reciprocity of antennas.
6. To study the current distribution along the element of an antenna.
7. To study the dipole or folded dipole.
8. To study of Yagi Uda antenna.
9. To plot the radiation pattern of an half wave dipole
10. Study of the structure and operation of wired, aperture, planar and array antennas.
11. To Design and Simulate Micro strip patch antenna at resonating frequency = 2 GHz.

Third Year (Semester –V)

Microcontroller and embedded system Lab

BTECA507B	Microcontroller and embedded system Lab	LC8	0L-0T-2P	1 Credits

Teaching Scheme	**Examination Scheme**
Practical: 02 hrs./week	Continuous Assessment : 30 Marks End Semester Examination: 20 Marks Total Marks : 50 Marks

(Minimum 08 to 10 experiments are to be performed based on contents in syllabus)

List of Practicals:

1. Write an ALP to add two 16 bit binary numbers.
2. Write an ALP to multiply two 16 bit binary numbers.
3. Write an ALP to find factorial of number.
4. To perform data transfer from internal RAM to external RAM.
5. To Perform AND operation and Xor operation.
6. Write an ALP to find the smallest and largest number.
7. Write an ALP to arrange numbers in ascending or descending order.
8. Study of EPBARM7 Trainer kit.
9. Write a program to turn on LED for specific time using ARM 2148.
10. Write a program to display a message on LCD using 4-bit mode and using I2C module.
11. Write a program to rotate stepper motor clockwise and anticlockwise with specific degree rotation.
12. Write a program to turn ON and OFF Relay

Third Year (Semester –V)

Wireless Communication Lab

BTECA507C	Wireless Communication Lab	LC8	0L-0T-2P	1 Credits

Teaching Scheme	Examination Scheme
Practical: 02 hrs./week	Continuous Assessment : 30 Marks End Semester Examination: 20 Marks Total Marks : 50 Marks

(Minimum 08 to 10 experiments are to be performed based on contents in syllabus)

List of Practicals:

1. To understand basic wireless communication System.
2. To study and implement Commands concerning modem and SIM card hardware.
3. To study and implement Commands concerning Network registration.
4. Study of Direct Sequence Spread Spectrum Modulation and Demodulation Process.
5. Study of BPSK Modulation and Demodulation Process.
6. Study of DSSS Modulation/Demodulation using an analog signal as an input.
7. To understand its performance, and exploring real-world applications of GSM technology.
8. To design a model of wireless communication systems using Matlab (Two ray channel and Okumura –Hata model).
9. Design, analyze and test Wireless standards and evaluate the performance measurements such as BER, PER, BLER, throughput, capacity, ACLR, EVM for 4G and 5G using Matlab.
10. To design modulation: Spread Spectrum – DSSS Modulation & Demodulation.
11. To design a wireless Channel equalization: Zero-Forcing Equalizer (ZFE).
12. To model and simulate TDMA, FDMA and CDMA for wireless communication.

Third Year (Semester –V)

Power Electronics and drives Lab

BTECA507D	Power Electronics and drives Lab	LC8	0L-0T-2P	1 Credits

Teaching Scheme	Examination Scheme
Practical: 02 hrs./week	Continuous Assessment : 30 Marks End Semester Examination: 20 Marks Total Marks : 50 Marks

(Minimum 08 to 10 experiments are to be performed based on contents in syllabus)

List of Practicals:

1. Study Charactristics of any two devices SCR, IGBT, MOSFET,TRIAC
2. Study of R, RC Firing Circuits.
3. Study of Line Synchonized UJT Firing circuit
4. AC Voltage controller
5. Study of Single Phase full bridge converter with R,R-L load,with and without FWD.
6. Study of three phase converter.
7. Study of Single phase Inverter.
8. Study of Chopper Circuit.
9. Study of Time Delay Circuit.
10. Study of Diac Circuit

Third Year (Semester –V)

HDL Programming Lab

BTECA508A	HDL Programming Lab	LC9	0L-0T-2P	1 Credits

Teaching Scheme	**Examination Scheme**
Practical: 02 hrs./week	Continuous Assessment : 30 Marks End Semester Examination: 20 Marks Total Marks:50 Marks

(Minimum 8-10 experiments are to be performed based on contents from syllabus)

List of Practicals:

1. Design of half adder and full adder using Gates.
2. Design of 3-bit counter.
3. Design of sequence generator and sequence detector.
4. Design of Half / Full Adder using Data Flow / Behavioral modelling style in VHDL.
5. Implement 1-bit Full Adder using Structural modelling style in VHDL.
6. Design of Multiplexer (8:1) using VHDL.
7. Implement Priority Encoder using VHDL.
8. Implement Decoder (3:8) using VHDL.
9. Design BCD to 7 segment decoder using VHDL.
10. Implement negative edge triggered D Flip-Flop using VHDL.
11. Implement Synchronous Binary Up Counter using VHDL
12. Develop a program for combinational circuit and implement it using FPGA development board.
13. Develop a program for sequential circuit and implement it using FPGA development board.

Third Year (Semester –V)

Database Management System Lab

BTECA508B	Database Management System Lab	LC9	0L-0T-2P	1 Credits

Teaching Scheme	**Examination Scheme**
Practical: 02 hrs./week	Continuous Assessment : 30 Marks End Semester Examination: 20 Marks Total Marks:50 Marks

(Minimum 08 to 10 experiments are to be performed based on contents in syllabus)

List of Practicals:

1. DDL Commands
2. DML commands.
3. Data constraints (Primary key, Foreign key, Not Null).
4. SQL data types and functions.
5. SQL joins.
6. Grouping and ordering data, aggregate functions, group by and having clause.
7. Sub-queries and Set operations.
8. DCL commands
9. TCL Commands.
10. MongoDB database CRUP operations.
11. Triggers & Cursors

Third Year (Semester –V)

Data Analysis Lab

BTECA508C	Data Analysis Lab	LC9	0L-0T-2P	1 Credits

Teaching Scheme	**Examination Scheme**
Practical: 02 hrs./week	Continuous Assessment : 30 Marks End Semester Examination: 20 Marks Total Marks:50 Marks

(Minimum 08 to 10 experiments are to be performed based on contents in syllabus)

List of Practicals:

1. Installing R and R Studio/ Python
2. Data types, mathematical operators and functions in R/ Python
3. Vectors, Factors, Lists, Matrix, Data Frames in R/ Python
4. Measurement of Central Tendency Mean, Median and Mode.
5. Measurement of Variation - Range, IQR and Standard Deviation.
6. Descriptive Statistics Using psych Package.
7. One & two Sample z Test Using R/ Python
8. One & two Sample t Test Using R/ Python
9. Goodness of Fit Test Using R/ Python
10. Contingency Table Using R/ Python
11. Analysis of Variance (ANOVA) Using R/ Python
12. Central Limit Theorem Demonstration Using R/ Python
13. R Functions for Normal Distribution - rnorm, pnorm, qnorm and dnorm
14. R Functions for Binomial Distribution - rbinom, pbinom, qbinom and dbinom
15. R Functions for Poisson Distribution - rpois, ppois, qpois and dpois

Third Year (Semester –V)

Java Programming Lab

BTECA508D	Java Programming Lab	LC9	0L-0T-2P	2 Credits

Teaching Scheme	**Examination Scheme**
Practical: 02 hrs./week	Continuous Assessment : 30 Marks End Semester Examination: 20 Marks Total Marks:50 Marks

(Minimum 08 to 10 experiments are to be performed based on contents in syllabus)

List of Practicals:

1. Write a program to declare variables of different data types and display their values.
2. Write a program that demonstrates Java syntax using comments, keywords, and literals.
3. Write a program to demonstrate the use of arithmetic and relational operators.
4. Write a program to check if a number is positive, negative, or zero using if-else.
5. Write a program to display the day of the week using switch-case.
6. Write a program to print numbers 1 to 10 using a loop.
7. Write a program to demonstrate method overloading with different parameter types.
8. Write a program to find the largest element in an array.
9. Write a program to create and display a two-dimensional array.
10. Write a program to demonstrate the use of constructors.
11. Write a program to read content from a text file and print it to the console.
12. Write a program to write user input to a text file.
13. Write a program to copy contents from one file to another.

Third Year (Semester –V)

Mini Project –I

BTECA509	MINI PROJECT-I	PROJ	0L-0T-4P	2 Credits

Guidelines for Mini Project

The students shall study in group of two members (or individual) on some special topic beyond the scope of the syllabus under the subjects of Electronics & Computer Engineering, Artificial Intelligence, Data Science, Electronics Engineering and Computer Science Engineering or inter discipline branch from current literature, by referring the current technical journal or reference books, under the guidance of the teacher.

In this subject head, it is expected that the student should complete the following tasks.

1. Identify problem statement / idea which is solving one problem preferably local problem may be in their University / College / near by vicinity.
2. Do the literature survey,
3. Design the solutions
4. Implement solution using latest technology
5. Write 20-25 pages report (use of latex is more suitable).
6. Present / demonstrate the solution in front of faculty member

The students shall prepare his report and execution of project for other students of his class in the presence of his guide and examiner. The student is permitted to use audio-visual aids or any other such teaching aids.

Continues Assessment:

The Continues Assessment for this head will consists of the report written in technical reporting manner and execution of project will be assessed by the internal examiner appointed by the HOD of concern department of the institution.

Third Year (Semester –V)

Internship – II (Evaluation)/MOOC

BTECA510	Internship-II(Evaluation)/MOOC	Internship	0L-0T-0P	Audit

Guidelines for Internships

Guidelines for Field Training / Internship / Industrial Training Industrial Training:

1. To apply for a suitable Industrial Training, submit an application form to respective Organization concerned one semester before the Industrial Training Programmed commences.

2. Student can also apply through online platforms such as Internshala for industrial training.

3. Submit one copy of the offer letter for the Industrial Training to the Head of the department or Faculty coordinator (Industrial Training).

4. To complete the Industrial Training process within the specified time based on the Industrial Training Programme schedule.

5. Assessment within the Industrial Training context aims to evaluate the students work quality and appropriateness to the field of study with reference to the learning outcomes of the Industrial Training Program.

6. Evaluation of the students‟ performance should be done in the next upcoming semester.

7. Those students who fails, they can also complete online certification courses which are available at free of cost on various MOOC platforms.

Third Year (Semester –VI)

Microwave Engineering

BTECA601	Microwave Engineering	PCC7	3L- 0T -0P	3 Credits

Teaching Scheme	**Examination Scheme**
Lecture: 3 hrs./week	Continuous Assessment: 20 Marks Mid Semester Exam:20 Marks End Semester Exam: 60 Marks (Duration 03 hrs.)

Course Objectives:

1	Radio-frequency spectrum space, microwave communication.
2	Microwave principles, working of microwave devices.
3	RADAR and their applications.
4	Understand semiconductor Microwave Devices

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

CO1	Analyze the microwave passive circuit components and design the tunning and matching networks.
CO2	Identify the state of art in microwave tubes and semiconductors and their uses in real life.
CO3	Apply the microwave devices and RADAR for industrial and scientific purposes.
CO4	Describe microwave semiconductor devices.
CO5	Understand RADAR systems and their applications.

COURSE CONTENTS:

UNIT I: Waveguides and Microwave Components [09Hours]

Frequency bands and characteristics of microwaves, Rectangular and circular waveguides, mode analysis, Resonators, reentrant cavities, scattering parameters, tees, hybrid ring, directional couplers, phase shifters, terminations attenuators, ferrite devices, such as isolators, gyrators, and circulators.

UNIT II: Impedance Matching and Tuning [09Hours]

Lumped element matching, Single stub tuning, double stub tuning, triple stub tuning, Quarter wave transformer

UNIT III: Generation and Amplification of Microwaves [09Hours]

Two Cavity Klystron and Reflex Klystron, Helix Travelling Wave Tube and Backward Wave Oscillator, Cross Field Amplifier, Cylindrical Magnetron, and Gyrotrons.

UNIT IV: Semiconductor Microwave Devices (construction, working, equivalent circuit and performance characteristics) [09Hours]

Varactor, PIN, Tunnel, Point Contact, Schottky Barrier, Gunn, IMPATT, TRAPATT, and BARITT, BJT, Hetro junction BJT, MESFET, and HEMT Parametric Amplifiers.

UNIT 5- RADAR & Microwave Applications [09 Hours]

Basics of RADAR and RADAR range equation, Types of RADAR: Pulsed, Continuous wave and FMCW, Doppler, MTI, and Phased Array, Types of displays and Clutter, Tracking RADAR: Mono pulse, Conical, Sequential lobbing. Microwave heating and bio-medical applications, Remote sensing RADAR, MSTRADAR, radiometer, instrumentation landing system, and RADAR based navigation.

TEXT BOOKS

1. Microwave Engineering – Annapurna Das, Sisir K Das TMH Publication, 2nd, 2010
2. Microwave Devices and circuits- Liao / Pearson Education

REFERENCE BOOKS

1. David M Pozar, ―Microwave Engineering, John Wieley & Sons, Inc. Hobokenh, New Jersey, Fourth Edition, 2012.
2. Samuel Y Liao, ―Microwave Devices and Circuits, Pearson Education, Third Edition
3. Merill Skolnik, ―Introduction to RADAR Systems, Tata Mc graw Hill, Third Edition.
4. Annapurna Das and Sisir K Das, ―Microwave Engineering, Tata McGraw Hill, New Delhi, Second Edition, 2009.
5. K. T. Matthew, ―Microwave Engineering, Wieley india, 2011.

Third Year (Semester –VI)

Digital Signal Processing

BTECA602	Digital Signal Processing	PCC-8	3L- 1T - 0P	4 Credits

Teaching Scheme	**Examination Scheme**
Lecture: 3 hr./week Tutorial :1 hr/week	Continuous Assessment: 20Marks Mid Semester Exam : 20 Marks End Semester Exam: 60 Marks (Duration 03 hrs.)

Pre-Requisites: Standard test input signals, Types of system

Course Objectives:

1	To introduce students with transforms for analysis of discrete time signals and systems.
2	To understand the digital signal processing, sampling and aliasing.
3	To use and understand implementation of digital filters.
4	To understand concept of sampling rate conversion and DSP processor architecture

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

CO1	Understand use of different transforms and analyze the discrete time signals and systems
CO2	Realize the use of LTI filters for filtering different real-world signals.
CO3	Capable of calibrating and resolving different frequencies existing in any signal.
CO4	Design and implement multistage sampling rate converter
CO5	Design of different types of digital filters for various applications.

COURSE CONTENTS:

UNIT I: DSP Preliminaries: [07Hours]

Discrete time signals: Sequences; representation of signals on orthogonal basis; Sampling and Reconstruction of signals, Basic elements of DSP and its requirements, advantages of Digital over Analog signal processing.

UNIT II: Discrete Fourier Transform: [08Hours]

DTFT, Definition, Frequency domain sampling, DFT, Properties of DFT, circular convolution, linear convolution, Computation of linear convolution using circular convolution , FFT, decimation in time and decimation in frequency using Radix-2 FFT algorithm

UNIT III: Z transform: [07Hours]

Need for transform, relation between Laplace transform and Z transform, between Fourier transform and Z transform, Properties of ROC and properties of Z transform, Relation between pole locations and time domain behavior, causality and stability considerations for LTI systems, Inverse Z transform, Power series method, partial fraction expansion method, Solution of difference equations.

UNIT IV: IIR Filter Design: [07Hours]

Concept of analog filter design (required for digital filter design), Design of IIR filters from Analog filters, IIR filter design by impulse invariance method, bilinear transformation Method. Characteristics of Butterworth filters, Chebyshev filters, Butterworth filter design, IIR filter realization using direct form, cascade form and parallel form, Lowpass, High pass, Bandpass and Bandstop filters design using spectral transformation (Design of all filters Using Low pass filter)

UNIT V: FIR Filter Design and introduction to MDSP: [07Hours]

Ideal filter requirements, Gibbs phenomenon, windowing techniques, characteristics and comparison of different window functions, Design of linear phase FIR filter using windows and frequency sampling method. FIR filters realization using direct form, cascade form and lattice form. Introduction to Multirate signal processing: Concept of Multirate DSP, Introduction to Up sampler, Down sampler and two channel filter banks, Application of Multirate signal processing in communication, Music processing, Image processing and Radar signal processing.

TEXT BOOKS

1. S. K. Mitra, Digital Signal Processing: A computer-based approach,TMH
2. A.V. Oppenheim and Schafer, Discrete Time Signal Processing, Prentice Hall,1989.
3. John G. Proakis and D.G. Manolakis, Digital Signal Processing: Principles, Algorithms
    a. and Applications, Prentice Hall,1997.

REFERENCE BOOKS

1. L. R. Rabiner and B. Gold, Theory and Application of Digital Signal Processing, Prentice Hall,1992.
2. J. R. Johnson, Introduction to Digital Signal Processing, Prentice Hall,1992.
3. D. J. DeFatta, J. G. Lucas and W. S. Hodgkiss, Digital Signal Processing, John Wiley& Sons, 1988.

Third Year (Semester –VI)

Antenna Design

BTECA603A	Antenna Design	PEC-3	3L- 0T -0P	3 Credits

Teaching Scheme	Examination Scheme
Lecture: 3 hrs./week	Continuous Assessment: 20 Marks Mid Semester Exam:20 Marks End Semester Exam: 60 Marks (Duration 03 hrs.)

Course Objectives:

1	To understand the fundamental concepts of antenna .
2	To uberstand the different types of antenna and array of antenna.
3	To analyze antenna matching and measurment techniques
4	To solve the electric field and magnetic fields for a given wireantenna

Course Outcomes: At the end of the course, students will demonstrate the ability to:

CO1	Understand radiation mechanism and basic working principle of antenna.
CO2	Explain basics and types of antennas.
CO3	To Analyze antenna array types and Millimeter-wave Antennas
CO4	Antenna Matching and Antenna Measurements
CO5	Identify and compare practical antenna uses.

COURSE CONTENTS:

UNIT I: Foundational Concepts [07Hours]

Antenna Basics: Introduction to antennas, their function, and applications. Radiation Mechanisms: Understanding how antennas generate and radiate electromagnetic waves. Antenna Parameters: Key parameters like directivity, gain, radiation pattern, input impedance, polarization, and bandwidth.

UNIT II: Types of Antennas [08 Hours]

Wire Antennas: Dipole, monopole, loop, Yagi-Uda, and log-periodic antennas. Aperture Antennas: Horn antennas, slot antennas, and waveguide antennas. Reflector Antennas: Parabolic reflectors and corner reflectors. Microstrip Antennas: Rectangular and circular patch antennas. Specialized Antennas: Helical antennas, broadband antennas, and phased arrays.

UNIT III: Antenna Arrays and Millimeter-wave Antennas [08Hours]

Linear and planar arrays, including array synthesis. Design and analysis of antenna arrays, including array factors and mutual coupling. Antennas designed for high-frequency applications. **Phased Arrays:** Design and analysis of phased arrays for beam steering and beam forming.

UNIT IV: Antenna Matching and Antenna Measurements [07Hours]

Techniques for matching the antenna impedance to the transmission line. Techniques for measuring antenna performance, including radiation patterns and gain.

UNIT V: Antenna Simulation and Antenna Applications [07Hours]

Introduction to antenna simulation software and tools like Ansys HFSS. Real-world applications of antennas in various fields.

TEXT BOOKS

1. C. A. Balanis, “Antenna Theory - Analysis and Design", JohnWiley.
2. Mathew N O Sadiku, “Elements of Electromagnetics” 3rd edition, Oxford University Press.
3. John D Kraus, Ronald J Marhefka, Ahmad S Khan, Antennas for All Applications, 3rd Edition, the McGraw Hill Companies.

REFERENCE BOOKS

1. K. D. Prasad, “Antenna & Wave Propagation”, SatyaPrakashan, NewDelhi.
2. John D Kraus, “Antenna& Wave Propagation”, 4th Edition, McGraw Hill,2010.

Third Year (Semester –VI)

Computer Network and Cloud Computing

BTECA603B	Computer Network and Cloud Computing	PEC-3	3L- 0T - 0P	3Credits

Teaching Scheme	**Examination Scheme**
Lecture: 3 hrs./week	Continuous Assessment : 20 Marks Mid Semester Exam: 20 Marks End Semester Exam: 60 Marks (Duration 03 hrs.)

Pre-Requisites: Computer Fundamentals, Fundamentals of Digital Communication

Course Objectives:

1	Theoretical and practical base in computer networks issues
2	Outline the basic network configurations
3	Understand state-of-the-art in network protocols, architectures, and applications
4	Fundamental concepts of cloud computing
5	Implementation of virtualization and various cloud services

Course Outcomes: On completion of the course, students will be able to:

CO1	Analyze the requirements for a given organizational structure and select the most appropriate networking architecture and technologies
CO2	Specify and identify deficiencies in existing protocols, and then go onto select new and better
CO3	Have a basic knowledge of installing and configuring networking applications
CO4	Understand the different cloud computing environments
CO5	Apply concepts of virtualization and various cloud services to design, develop and deploying cloud applications.

COURSE CONTENTS:

Unit I:: Introduction to Computer Networks [07 Hours]

Uses of computer networks, Types of computer networks, Network technology- from local to global, Examples of networks, Network protocols, Reference models, Standardization, policy, legal, and social issues.

Unit II: The Data Link Layer and Network Layer [08 Hours]

Data link layer design issues, Error detection and correction, Elementary data link protocols, the channel allocation problem, Multiple access protocols, Network layer

design issues, Routing algorithms in a single network, Traffic management at the network layer, internetworking, software-defined networking, The network layer in the internet.

Unit III: Transport and Application Layers [07Hours]

The Transport service, Elements of transport protocols, The internet transport protocols: UDP and TCP, The Domain Name System (DNS), Electronic mail, The world wide web, Streaming audio and video, Content delivery.

Unit IV: Introduction to Cloud Computing [07Hours]

Definition and evolution of Cloud Computing, Enabling Technologies, Service and Deployment Models, Popular Cloud Stacks and Use Cases, Benefits, Risks, and Challenges of Cloud Computing, Economic Models and SLAs, Topics in Cloud Security. Historical Perspective of Data Centers, Data center Components.

Unit V: Virtualization and Cloud Services [07Hours]

Communication-as-a-Service (CaaS), Infrastructure-as-a-Service (IaaS), Monitoring-as-a-Service (MaaS), Platform-as-a-Service (PaaS), Software-as-a-Service (SaaS). Virtualization (CPU, Memory, I/O) Case Study: Amazon EC2.

TEXT BOOKS

1. A Tanenbaum, N Feamster, D Wetherall, Computer Networks, Sixth Edition, Pearson Education Limited. ISBN 10: 1-292-37406-3, 2021
2. John W. Rittinghouse, James F. Ransome, Cloud Computing Implementation, Management, and Security, CRC Press , Routledge Publisher, ISBN-10 : **1189978311879, 1818**

REFERENCE BOOKS

1. B. Forouzan, Data Communications and Networking, McGraw Hill Publication, 5th Edition, 2013.
2. Larry Peterson and Bruce Davie, Computer Networks: A Systems Approach, Morgan Kufman
3. Publication, 5th Edition, 2012.Ronald L. Krutz, Russell Dean Vines, Cloud Security: A Comprehensive Guide to Secure Cloud Computing, Wiley-India, 2010.
4. Anthony T. Velte, Toby J. Velte and Robert E, Cloud Computing – A Practical Approach, TMH, 2010

Third Year (Semester –VI)

Mobile Communication & Networks

BTECA603C	Mobile Communication & Networks	PEC-3	3L- 0T - 0P	3Credits

Teaching Scheme	**Examination Scheme**
Lecture: 3 hrs./week	Continuous Assessment : 20 Marks Mid Semester Exam: 20 Marks End Semester Exam: 60 Marks (Duration 03 hrs.)

Pre-Requisites: Computer Fundamentals, Fundamentals of Digital Communication

Course Objectives:

1	Introduce the fundamentals of mobile communication and cellular technology.
2	Understand propagation challenges and techniques in mobile environments.
3	Study various wireless access methods and mobile standards.
4	Explore IP mobility, wireless LANs, and mobile security.
5	Introduce advanced wireless systems and future trends.

Course Outcomes: On completion of the course, students will be able to:

CO1	Explain the fundamentals and evolution of mobile communication systems.
CO2	Analyze and design mobile network architectures and protocols.
CO3	Evaluate cellular concepts like frequency reuse and handoff strategies.
CO4	Describe and compare multiple access techniques and mobile standards.
CO5	Understand modern wireless technologies including LTE and 5G.

COURSE CONTENTS:

UNIT I: Introduction to Mobile Communication [07Hours]

Evolution of mobile communications, Mobile radio environment: fading, path loss, Doppler, Cellular concepts: frequency reuse, channel assignment, handoff, interference, GSM architecture and services

UNIT II: Mobile Radio Propagation & Antennas [07Hours]

Propagation models: large scale and small scale, Multipath propagation, Fading types, Diversity techniques and Rake receivers, Antennas for mobile communication

UNIT–III: Wireless Access Technologies [08Hours]

FDMA, TDMA, CDMA, OFDMA**,** 2G (GSM, IS-95), 2.5G (GPRS, EDGE)**,**3G (UMTS, CDMA2000)**,** Spread spectrum techniques

UNIT IV: Mobile IP and Wireless Networks [07Hours]

Mobile IP: addressing, tunneling, and handoff, Wireless LANs: IEEE 802.11, Bluetooth, Wi-Fi architecture, Wireless sensor networks, Security in mobile networks

UNIT V: Advanced Mobile Technologies [07Hours]

LTE, LTE-A: architecture, protocols, resource management, 5G networks: architecture, NR, use cases QoS in mobile networks, Introduction to mobile application development and IoT integration

TEXT BOOKS

1. Theodore S. Rappaport, Wireless Communications: Principles and Practice, Pearson Education.
2. ochen Schiller, Mobile Communications, Addison-Wesley.
3. William Stallings, Wireless Communications and Networks, Pearson Education.

REFERENCE BOOKS

1. Kaveh Pahlavan & Prashant Krishnamurthy, Principles of Wireless Networks, Prentice Hall.
2. Vijay Garg, Wireless Communications and Networking, Morgan Kaufmann.

Third Year (Semester –VI)

VLSI Design

BTECA603D	VLSI Design	PEC-3	3L- 0T - 0P	3 Credits

Teaching Scheme	**Examination Scheme**
Lecture: 3 hrs./week	Continuous Assessment : 20 Marks Mid Semester Exam:20 Marks End Semester Exam: 60 Marks (Duration 03 hrs.)

Course Objectives:

1	To understand the Basic NMOS, CMOS & Bi CMOS circuits and their process technology.
2	To learn the concepts of modelling of Delay techniques and MOS layers.
3	To learn the concepts of Technology Scaling of MOS transistors.
4	To understand the concepts of testing of combinational and sequential circuits and also the scan of design techniques.

Course Outcomes: On completion of the course, students will be able to:

CO1	Acquire qualitative knowledge about the fabrication process of integrated circuits using MOS transistors.
CO2	Draw the layout of any logic circuit which helps to understand and estimate parasitic effect of any logic circuit
CO3	Design building blocks of data path systems, memories and simple logic circuits using PLA, PAL, FPGA and CPLD.
CO4	Implement and design of building blocks of data path and array sub systems.
CO5	Understand different types of faults that can occur in a system and learn the concept of testing and adding extra hardware to improve testability of system.

COURSE CONTENTS:

Unit I: Introduction to MOS technology [7Hours]

Introduction: Introduction to IC Technology – MOS, PMOS, NMOS, CMOS&BiCMOS Basic Electrical Properties: Basic Electrical Properties of MOSand BiCMOS Circuits: Ids-Vds relationships, MOS transistor threshold Voltage, gm, gds, Figure of merit; Pass transistor, NMOS Inverter, Various pull ups, CMOS Inverter analysis and design, Bi-CMOS Inverters.

Unit II: VLSI Circuit Design Processes [08Hours]

VLSI Design Flow, MOS Layers, Stick Diagrams, Design Rules and Layout, Transistors Layout Diagrams for NMOS and CMOS Inverters and Gates, Scaling of MOS circuits.

Unit III: Gate Level Design: [07Hours]

Logic Gates and Other complex gates, Switch logic, Alternate gate circuits, Time delays, Driving large capacitive loads, Wiring capacitance, Fan – in, Fan – out.

Unit IV: Data Path Subsystems: [07Hours]

Data Path Subsystems: Subsystem Design, Shifters, Adders, ALUs, Multipliers, Parity generators, Comparators, Zero/One Detectors, Counters. Array Subsystems: SRAM, DRAM, ROM, Serial Access Memories.

Unit V: Programmable Logic Devices: [7Hours]

Programmable Logic Devices: Design Approach – PLA, PAL, Standard Cells FPGAs, CPLDs. CMOS Testing: CMOS Testing, Test Principles, Design Strategies for test, Chip level Test Techniques.

TEXT BOOKS

1. Essentials of VLSI circuits and systems – Kamran Eshraghian, Eshraghian Dougles and A. Pucknell, PHI, 2005 Edition.
2. CMOS VLSI Design – A Circuits and Systems Perspective, Neil H. E Weste, David Harris, Ayan Banerjee, 3rd Ed, Pearson, 2009. 3. 3. Basic VLSI design by Douglas A, Pucknell, Kamran Eshraghian, Prantice Hall, 1996 3rd edition.

REFERENCE BOOKS

1. Introduction to VLSI Systems: A Logic, Circuit and System Perspective – Ming-BO Lin, CRC Press, 2011
2. CMOS logic circuit Design - John. P. Uyemura, Springer, 2007.
3. Modern VLSI Design - Wayne Wolf, Pearson Education, 3rd Edition, 1997.
4. VLSI Design- K. Lal Kishore, V. S. V. Prabhakar, I.K International, 2009. 5. Mead, C.A and Conway, L.A., Introduction to VLSI Systems, Wesley – Wesley

Third Year (Semester –VI)

Internet of Things

BTECA604A	Internet of Things	OEC-2	3L-1T-0P	4 Credits

Teaching Scheme	**Examination Scheme**
Lecture: 3 hrs./week Tutorial: 1 hr/week	Continuous Assessment : 20 Marks Mid Semester Exam:20 Marks End Semester Exam: 60 Marks (Duration 03 hrs.)

Prerequisites: Basics of microprocessor, microcontroller, C language

Course Objectives:

1	To get the understanding of the concepts of Internet of Things
2	To enable the students to build IoT applications
3	To understand the various protocols in IoT and Networking.
4	To develop the essential programming skill required.

Course Outcomes: On completion of the course, students will be able to:

CO1	The use of concepts of IoT and its areas.
CO2	Understand the basics of C and NodeMCU
CO3	Understand the basics of Python & Raspberry Pi
CO4	Interacting with Web Services and IoT protocol
CO5	Apply the IoT in various applications.

COURSE CONTENTS:

Unit I: Introduction to IoT **[07 Hours]**

Definition, characteristics of IoT, logical design of IoT, IoT communication models, IoT communication APIs: REST, Websocket, IoT Enabling Technologies: Wireless sensor networks, Cloud computing, Big data analytics, communication protocols, Embedded systems, IoT vs M2M.

Unit II: Introduction to C and Node MCU **[07 Hours]**

C: Introduction, Data types, variable, operator, branches, loops, functions, Debugging and Optimization of C programs. NodeMCU: 8266 Wi-Fimodule, hardware and pin diagram, Interface with Arduino IDE. Interfacing of analog and digital sensors.

Unit III: Introduction to Python and Raspberry Pi **[08 Hours]**

Python: Python IDE, Data types, variable, operator, branches, loops, functions, List, Dictionary, Writing to a File, Reading from a File, handling exceptions. Raspberry Pi: Models of Raspberry pi,

R Pi 3 hardware, GPIO pins, operating system for R pi3, Basic of Linux commands, configuring R pi3, Interfacing of Digital and Analog sensors.

Unit IV : Interacting with Web Services [07 Hours]

Configuring NodeMCU to connecting to server, NodeMCU interfacing with web services, configuring R pi 3 Wi-Fi and Ethernet, publishing and subscribing data from web using R pi3, interfacing R Pi 3 with twitter and whatsapp.

Unit V: IoT Protocols [07 Hours]

UART, Wi-Fi, Ethernet, Bluetooth Low Energy (BLE), Message Queue Telemetry Transport (MQTT), Extensible Messaging and Presence Protocol (XMPP), Data Distribution Service (DDS), Advanced Message Queuing Protocol (AMQP).

TEXT BOOKS

1. Get Started With ESP8266 Programming NodeMCU Using Arduino, Up skill Learning.
2. Internet of Things with Raspberry Pi 3, ManeeshRao,pack
3. Internet of Things with ESP8266, Marco Schwartz
4. Internet of Things with Arduino Cookbook, Marco Schwartz

REFERENCE BOOKS

1. Internet of Things: A Hands-On Approach- Arsheep Bahga,Vijay Madisetti
2. Raspberry Pi Cookbook for Python Programmers by Tim Cox
3. Learning Internet of Things, Peter Waher

Third Year (Semester –VI)

Software Engineering & Testing

BTECA604B	Software Engineering & Testing	OEC-2	3L- 1T - 0P	4 Credits

Teaching Scheme	Examination Scheme
Lecture: 3 hr./week Tutorial :1 hr/week	Continuous Assessment: 20Marks Mid Semester Exam : 20 Marks End Semester Exam: 60 Marks (Duration 03 hrs.)

Pre-Requisites: Should have knowledge of one Programming Language (Java preferably), Practice of SQL (queries and sub queries), exposure to Linux Environment

Course Objectives:

1	To provide the idea of decomposing the given problem into Analysis, Design, Implementation, Testing and Maintenance phases
2	To provide an idea of using various process models in the software industry according to given circumstances.
3	To gain the knowledge of how Analysis, Design, Implementation, Testing and Maintenance processes are conducted in a software project.
4	To study fundamental concepts in software testing, including software testing objectives, processes, criteria, strategies, and methods

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

CO1	Choose appropriate process model depending on the user requirements.
CO2	Perform various life cycle activities like Analysis, Design, Implementation, Testing and Maintenance
CO3	Know various processes used in all the phases of the product
CO4	To apply software testing knowledge and its processes to software applications
CO5	To identify various software testing problems

COURSE CONTENTS:

UNIT I: Introduction and Agile software development: [08Hours]

Professional software development, Software engineering ethics, Software process models, Process activities, Agile methods, Plan-driven and agile development, Extreme programming, Agile project management, Scaling agile methods. Functional and non-functional requirements, the software requirements: document, specification, engineering processes, elicitation and analysis, validation, manage.

UNIT II: System modeling [08Hours]

Context models, Interaction models, Structural models, Behavioral models, Model-driven engineering. **Architectural design:** Architectural design decisions, Architectural views, Architectural patterns, Application architectures.

UNIT III: Design and implementation [06Hours]

Object-oriented design using UML, Design patterns Implementation issues, Open source development. Software testing, Development testing, Test-driven development, Release testing, User testing. Dependability properties, Availability and reliability, Safety Security.

UNIT IV: Introduction to Testing [07Hours]

Principles of Testing Software development life cycle model: Phases of software project, Quality, Quality assurance and quality control, Testing, Verification and validation, Process models to represent various phases, Life cycle models, Software testing life cycle.

UNIT V: Software testing Strategies [07Hours]

White Box Testing (WBT) and Black Box Testing: Static testing, Structural testing, Challenges in WBT. Black box testing: Black box testing process.

TEXT BOOKS

1. Ian Sommerville, Software Engineering; 9th Edition, Addison-Wesley Publishing Company, USA.
2. Srinivasan Desikan, Gopalaswamy Ramesh, "Software Testing: Principles and Practices", Pearson publication, 2nd edition, 2006.

REFERENCE BOOKS

1. Software Engineering, S. A. Kelkar, Prentice Hall of India, 2007
2. Software Engineering, Pressman, Tata McGraw Hill, 2006
3. . Software Engineering, Pankaj Jalote, Narosa Publishers, 2006
4. Loise Tamres, "Introducing Software Testing", Pearson publication, 2002
5. Boris Beizer, "Software Testing Techniques", 2nd edition, Dreamtech press, 2014

Third Year (Semester –VI)

Machine Learning

BTECA604	Machine Learning	OEC	3L-1T-0P	4 Credits

Teaching Scheme	**Examination Scheme**
Lecture: 3 hrs./week Tutorial :1 hr/week	Continuous Assessment : 20 Marks Mid Semester Exam:20 Marks End Semester Exam: 60 Marks (Duration 03

Prerequisites: Mathematics & Statistics**,** Python Programming language

Course Objectives: By the end of this course, students should be able to:

1	Understand core ML concepts and their role in solving ECE-related problems.
2	Apply supervised and unsupervised learning algorithms to engineering data.
3	Implement ML models using Python, Scikit-learn, TensorFlow, and Keras.
4	Analyze data and apply ML in signal, image, and communication systems.
5	Understand and apply neural networks and deep learning in ECE applications.

Course Outcomes : On completion of the course, students will be able to:

CO1	Understand and differentiate between various machine learning paradigms and apply basic data preprocessing techniques using Python.
CO2	Apply regression and classification algorithms to model and solve engineering problems in the domain of electronics and communication.
CO3	Implement clustering and dimensionality reduction techniques for pattern recognition and feature extraction in signal and image data
CO4	Design and train basic neural network models, including CNNs and RNNs, for applications such as image and speech recognition.
CO5	Analyze and apply suitable machine learning methods to real-world problems in signal processing, wireless communication, and IoT systems.

COURSE CONTENTS:

Unit I: Introduction to Machine Learning [07Hours]

Definition and scope of ML, types of learning: supervised, unsupervised, reinforcement learning Applications of ML ,Fundamentals of Python and libraries (NumPy, Pandas, Matplotlib, Scikit-learn) Data preprocessing: normalization, encoding, feature selection

Unit II: Supervised Learning Techniques [07Hours]

Regression: Linear regression, multivariate regression, regularization (Lasso, Ridge) Classification: k-NN, Naive Bayes, Decision Trees, Support Vector Machines (SVM) Model evaluation: confusion matrix, ROC curve, precision, recall, F1-score

Unit III: Unsupervised Learning & Dimensionality Reduction [07Hours]

Clustering: K-means, Hierarchical Clustering, DBSCAN Dimensionality Reduction: PCA, LDA, Applications in signal compression and noise reduction

UnitIV: Neural Networks and Deep Learning [07Hours]

Introduction to Neural Networks, Perceptron, Backpropagation Basics of Deep Learning: Convolutional Neural Networks (CNNs), applications in image recognition Introduction to Recurrent Neural Networks (RNNs), applications in speech and sequence modelling Hands-on with Tensor Flow or PyTorch basics

Unit V : ML Applications in Electronics and Communication [07Hours]

Signal Processing: ML for denoising, filtering, modulation classification, **Image Processing**: ML in object detection, segmentation **Wireless Communication**: Cognitive radio, spectrum sensing using ML **IoT and Embedded ML**: Introduction to edge ML, TinyML platforms

TEXT BOOKS

1. "Introduction to Machine Learning" by Ethem Alpaydin
2. "Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow" by Aurélien Géron
3. "Pattern Recognition and Machine Learning" by Christopher M. Bishop
4. "Machine Learning" by Tom M. Mitchell
5. "Machine Learning" by Saikat Dutt, Subramanian Chandramouli, Amit Kumar Das

Third Year (Semester –VI)

Advanced Java

BTECA604D	Advanced Java	OEC-2	3L- 1T -0P	4 Credits

Teaching Scheme	**Examination Scheme**
Lecture: 3 hrs./week Tutorial :1 hr/week	Continuous Assessment: 20 Marks Mid Semester Exam:20 Marks End Semester Exam: 60 Marks (Duration 03 hrs.)

Course Objectives:

1	To enhance understanding of object-oriented programming concepts through advanced Java features.
2	To understand development of interactive desktop applications using graphical user interfaces.
3	To introduce the concepts of multithreading for concurrent program execution.
4	To understand Java's collection framework and file handling mechanisms for effective data management.
5	To provide foundational knowledge of database connectivity and basic networking in Java using open-source tools.

Course Outcomes: At the end of the course, students will demonstrate the ability to:

CO1	Understand and use basic object-oriented concepts like inheritance and interfaces in Java programs
CO2	Create simple user interfaces for desktop applications using Java Swing.
CO3	Write basic Java programs that run multiple tasks at the same time using threads.
CO4	Use Java collections and file handling to store and manage data.
CO5	Connect Java programs to a database and perform simple networking tasks.

COURSE CONTENTS:

UNIT I: Advanced Object-Oriented Programming Concepts [09Hours]

Review of Classes and Objects. Inheritance and Code Reusability. Interfaces and Polymorphism. Java Packages and Code Organization. Custom Exception Creation and Handling. Introduction to Using External Libraries (JAR files).

UNIT II: Graphical User Interface (GUI) Development [09Hours]

Introduction to Event-Driven Programming. Fundamentals of Java Swing: Components and Containers. Layout Managers for Interface Structuring. Event Handling Mechanisms: ActionListeners and Event Classes. Development of Simple GUI-based Applications.

UNIT III: Multithreading and Concurrency [09Hours]

Introduction to Multithreading and Concurrency. Creating Threads using *Thread* class and *Runnable* interface. Thread Lifecycle and Thread Control Methods. Synchronization Techniques for Thread Safety. Practical Applications of Multithreading in Java

UNIT IV:Collections Framework and File Handling [09Hours]

Overview of Java Collections: List, Set, Map. Common Implementations: ArrayList, LinkedList, HashSet, HashMap. Iterating over Collections using Iterators and Enhanced For-Loop. File Input and Output using FileReader, FileWriter, BufferedReader. Working with CSV Files for Structured Data Storage.

UNIT V Database Connectivity and Networking Fundamentals [09Hours]

Introduction to Relational Databases and SQL. Connecting Java Applications with SQLite using JDBC. Executing SQL Queries and Handling Result Sets. Introduction to Networking Concepts: IP, Port, Client-Server Model. Implementing Simple Network Applications using Sockets.

TEXT BOOKS

1. E. Balagurusamy, Programming with Java: A Primer, 6th Edition, McGraw Hill Education, 2019.
2. R. Nageswara Rao, Core Java: An Integrated Approach, 2nd Edition, Dreamtech Press, 2017.

REFERENCE BOOKS:

1. Herbert Schildt, Java: The Complete Reference, 11th Edition, McGraw Hill Education, 2018.
2. Kathy Sierra and Bert Bates, Head First Java, 2nd Edition, O'Reilly Media, 2005.
3. Cay S. Horstmann, Core Java Volume I – Fundamentals, 11th Edition, Pearson Education, 2018.
4. Cay S. Horstmann, Core Java Volume II – Advanced Features, 11th Edition, Pearson Education, 2019.

Third Year (Semester –VI)

Development Engineering

BTECA605A	Development Engineering	HSSMEC-5	3L- 0T - 0P	3 Credits

Teaching Scheme	**Examination Scheme**
Lecture: 3 hrs./week	Continuous Assessment : 20 Marks Mid Semester Exam:20 Marks End Semester Exam: 60 Marks (Duration 03 hrs.)

Course Objectives:

1	To understand development engineering defination
2	To learn poverty in India and its development
3	To learn development strategies
4	To learn community development

Course Outcomes: On completion of the course, students will be able to:

CO1	Understand engineering for sustainable community development
CO2	Get the knowledge of world poverty and development
CO3	Aware about social justice
CO4	Apply development strategies
CO5	Understand engineering for sustainable community development

COURSE CONTENTS:

Unit I: Introduction [07Hours]

Introduction, Various Definitions of Development Engineering.

Unit II: World Poverty and Development [08 Hours]

World Poverty and Development, Poverty in the India, Sustainable Development, Culture and Global Competence, The Engineer‘s Role.

Unit III: Social Justice [07Hours]

Social Justice, Social Justice and Engineering, Religious Perspectives, Secular Perspectives.

Unit IV: Development Strategies [07Hours]

Development Strategies: Society, Technological Change, and Development, Development Economists, Perspectives, Global Health Perspective, International Education Perspective, Social Business Perspectives.

Unit V: Engineering for Sustainable Community Development [07Hours]

The Engineer as a Helper Participatory Community Development, Teamwork and Project Management, Community Assessment: Learning About a Community, Project Selection, Humanitarian Technology,

Participatory Technology Development, Humanitarian STEM Education. ICT for Development, AI for Humanitarian purposes, Blockchain and Social Development.

Text Books

1. Kevin M. Passino, Humanitarian Engineering: Advancing Technology for Sustainable Development

Third Year (Semester –VI)

Employability and Skill Development

BTECA605B	Employability and Skill Development	HSSME C-5	3L- 0T - 0P	3 Credits

Teaching Scheme	**Examination Scheme**
Lecture: 3 hrs./week	Continuous Assessment : 20 Marks Mid Semester Exam:20 Marks End Semester Exam: 60 Marks (Duration 03 hrs.)

Course Objectives

1	To learn soft skills and communication.
2	To understand reasoning and quantitative ability

Course Outcomes: On completion of the course, students will be able to:

CO1	Improve the soft skills and communication.
CO2	Empower Arithmetic and Mathematical Reasoning and Analytical Reasoning and Quantitative Ability
CO3	Use of grammar.
CO4	Development in interview skills
CO5	Develop problem solving techniques.

COURSE CONTENTS:

Unit I: Soft Skills & Communication basics: [07 Hours]

Soft skills Vs hard skills, Skills to master, Interdisciplinary relevance, Global and national perspectives on soft skills, Resume, Curriculum vitae, How to develop an impressive resume, Different formats of resume Chronological, Functional, Hybrid, Job application or cover letter, Professional presentation- planning, preparing and delivering presentation, Technical writing.

Unit II: Arithmetic and Mathematical Reasoning and Analytical Reasoning and Quantitative Ability [08Hours]

Aspects of intelligence, Bloom taxonomy, multiple intelligence theory, Number sequence test, mental arithmetic (square and square root, LCM and HCF, speed calculation, reminder theorem). Matching, Selection, Arrangement, Verifications (Exercises on each of these types). Verbal aptitude (Synonym, Antonym, Analogy).

Unit III: Grammar and Comprehension [07Hours]

English sentences and phrases, Analysis of complex sentences, Transfo0rmation of sentences, Paragraph writing, Story writing, Reproduction of a story, Letter writing, précise writing, Paraphrasing and e-mail writing.

Unit IV: Skills for Interviews [07Hours]

Interviews- types of interviews, preparatory steps for job interviews, interview skill tips, Group discussion- importance of group discussion, types of group discussion, difference between group discussion, panel discussion and debate, personality traits evaluated in group discussions, tips for successful participation in group discussion, Listening skills- virtues of listening, fundamentals of good listening, Non-verbal communication-body movement, physical appearance, verbal sounds, closeness, time.

Unit V: Problem Solving Techniques [07Hours]

Problem solving model: 1. Define the problem, 2. Gather information, 3. Identify various solution, 4. Evaluate alternatives, 5. Take actions, 6. Evaluate the actions.
Problem solving skills: 1. Communicate. 2. Brain storming, 3. Learn from mistakes.

TEXT BOOKS

1. R. Gajendra Singh Chauhan, Sangeeta Sharma, ―Soft Skills- An integrated approach to maximize personality‖, ISBN: 987-81-265-5639-7, First Edition 2016

REFERENCE BOOKS

1. Wiley Wren and Martin, "English grammar and Composition", S. Chand publications.
2. R. S. Aggarwal, "A modern approach to verbal reasoning", S. Chand publications.
3. Philip Carter, "The Complete Book of Intelligence Test", John Willey & Sons Ltd.
4. Philip Carter, Ken Russell, "Succeed at IQ test", Kogan Page.
5. Eugene Ehrlich, Daniel Murphy, "Schaum;s Outline of English Grammar", McGraw Hills.
6. David F. Beer, David A. McMurrey, ―A Guide to Writing as an Engineer‖, ISBN: 978- 1-118- 30027-5 4th Edition, 2014, Wiley.

Third Year (Semester –VI)

Consumer Behavior

BTECA605C	Consumer Behavior	HSSMEC-5	3L- 0T - 0P	3 Credits

Teaching Scheme	**Examination Scheme**
Lecture: 3 hrs./week	Continuous Assessment : 20 Marks Mid Semester Exam:20 Marks End Semester Exam: 60 Marks (Duration 03 hrs.)

Course Objectives:

1	To learn consumer behavior
2	To develop model and analyze consumer decision making

Course Outcomes: On completion of the course, students will be able to:

CO1	Study of Consumer Behavior
CO2	Get Market Segmentation and Positioning
CO3	Develop Models of Consumer Behavior
CO4	Analyze Psychological Influences on Consumer Decision Making
CO5	Study Diffusion of innovation Diffusion Process

COURSE CONTENTS:

Unit I: Introduction to the Study of Consumer Behavior: [07 Hours]

Defining Consumer Behavior, Scope and Application of Consumer Behavior, Why Study Consumer Behavior, Evolution of Consumer Behavior as a Field Of Study and its relationship with Marketing: Behavioral Dimension, The Interdisciplinary Nature of Consumer Behavior. Market Research and Consumer Behavior, Relevance of Market Research with Consumer Behavior, Approaches to Consumer Behavior Research, Quantitative Research, Qualitative Research.

Unit II: Market Segmentation and Positioning [8 Hours]

Market Segmentation, Basis for Segmentation, Alternatives available for Segmentation, Positioning. The Consumer Decision Making Process: Buying Motives, Buying Roles, Consumer Decision Making Process, Levels of Consumer Decision Making, Perspectives to Consumer Decision Making, Consumer Decision Making Process.

Unit III: Models of Consumer Behavior [07 Hours]

The Economic model, Learning model, Psychoanalytic model, the sociological model. The Howard Sheth model of Buying Behaviour, The Nicosia model, The Engel - Kollat - Blackwell Model, Engel, Blackwell and Miniard (EBM) model.

Unit IV: Psychological Influences on Consumer Decision Making [07 Hours]

Consumers Needs & Motivation, Emotions and Mood, Consumer Involvement, Consumer Learning, Personality, Self-concept and Self-image, Consumer Perception, Risk and Imagery. Consumer Attitude: Belief, Affect, Attitude and Intention, Attitude Formation and Attitude Change, Consumer Communication. Sociological Influences on Consumer Decision Making: Consumer groups, Consumer reference groups, Family and Life cycle, Social class and mobility, lifestyle analysis, Culture;.

Unit V: Diffusion of innovation Diffusion Process [07 Hours]

Adoption Process, Consumer Innovators, Multiplicative innovation adoption (MIA) model. Organizational Buying: Differences between Industrial Markets and Consumer Markets, Differences between Organizational and Consumer Buying, Buying Decisions in Organizational Buying Process, Types of Decision Making, Organization Buyer's Decision Making Process, and Factors influencing Organizational Buying Behavior, Decision Makers in Organizational Buying, Webster and Wind model of Organizational buying behavior, The Sheth model of Industrial buying, The Sheth model of Industrial buying Consumer Behavior.

TEXT BOOKS

1. Consumer Behavior, Schiffman, L.G. and Kanuk L.L., Prentice Hall, India.

REFERENCE BOOKS

1. Consumer Behavior, Concepts and Applications, Loudon, D.L. and Bitta, A.J.D, Tata cGrawHill.

2. Consumer Behavior and Marketing Startegy, Peter, J.P. and Olson, J.C., Schiffman, L.G. and Kanuk L.L., Prentice Hall, India.

Third Year (Semester –VI)

Digital Signal Processing Lab

BTECA606	Digital Signal Processing Lab	LC10	0L-0T-02P	1 Credits

Teaching Scheme	**Examination Scheme**
Lab : 2 hrs./week	Continuous Assessment: 30 Marks End Semester Exam: 20 Marks

(Minimum 08 to 10 experiments are to be performed based on contents in syllabus)

List of Practicals:

1. Zero – pole analysis using transfer function, zero – pole – gain
2. Linear convolution.
3. Circular Convolution.
4. Partial fraction expansion and second order sections and study residue of the system
5. FET based time frequency analysis Spectral analysis
6. Spectral analysis
7. Design IIR filters
8. FIR Filters
9. Generation of standard test signals and basic signals
10. To find the residues, poles and constants of the system
11. Compute the N-point DFT
12. To study spectral analysis of sine wave

Third Year (Semester –VI)

Microwave Engineering Lab

BTECA607	Microwave Engineering Lab	LC11	0L-0T-02P	1 Credits

Teaching Scheme	**Examination Scheme**
Lab : 2 hrs./week	Continuous Assessment: 30 Marks End Semester Exam: 20 Marks

(Minimum 08 to 10 experiments are to be performed based on contents in syllabus)

List of Practicals:

1. To study the characteristics of the Reflex Klystron tube and to determine its Electronic tuning range.
2. Study of V-I characteristics of Gunn diode.
3. To study the ATTENUATOR (fixed and variable type).
4. To study the function of multi hole directional coupler by measuring the following parameters.
   1. Coupling factor 2. Insertion loss 3. Directivity
5. To determine the Standing-Wave Ratio and Reflection Coefficient.
6. To measure unknown impedance using the Smith chart.
7. To determine the frequency and wave length in a Rectangular Waveguide working in TE10 mode.
8. To study the X-band Microwave circulator.
9. To study the X-band Microwave isolator.
10. To study the Magic TEE.

Third Year (Semester –VI)

Internet of Things Lab

BTECA608A	Internet of Things Lab	LC12	0L-0T-02P	1 Credits

Teaching Scheme	**Examination Scheme**
Lab : 2 hrs./week	Continuous Assessment: 30 Marks End Semester Exam: 20 Marks

(Minimum 08 to 10 experiments are to be performed based on contents in syllabus)

List of Practicals:

1. Interfacing of Digital and Analog sensor to NodeMcu
2. Interfacing of Digital sensor to 8266 Wi-Fi module
3. Interfacing of analog and digital sensor to raspberry Pi
4. Interfacing of Servo motor to Raspbery Pi
5. Data transfer to cloud using 8266 Wi-Fi module
6. Home automation using Raspberry Pi
7. Security Surveillance using Raspbery Pi
8. To study Interfacing between 8266 Wi-Fi module and Raspberry Pi
9. To study Interfacing of Raspbey pi to what’s app and twitter.

Third Year (Semester –VI)

Software Engineering & Testing Lab

BTECA608B	Software Engineering & Testing Lab	LC12	0L-0T-02P	1 Credits

Teaching Scheme	**Examination Scheme**
Lab : 2 hrs./week	Continuous Assessment: 30 Marks End Semester Exam: 20 Marks

(Minimum 08 to 10 experiments are to be performed based on contents in syllabus)

List of Practicals:

1. To perform the system analysis: Requirement analysis, SRS. (Both Functional and Nonfunctional requirements. For a set of 10 sample problems, from a book on Software Engineering by Rajib Mall.)
2. To perform the function oriented diagram: DFD and Structured chart.
3. To perform the user‘s view analysis: Use case diagram.
4. To draw the structural view diagram: Class diagram, object diagram.
5. To draw the behavioral view diagram: Sequence diagram, Collaboration diagram.
6. To draw the behavioral view diagram: State-chart diagram, Activity diagram.
7. To draw the implementation view diagram: Component diagram.
8. To draw the environmental view diagram: Deployment diagram.
9. To perform various testing using the testing tool unit testing, integration testing

Third Year (Semester –VI)

Machine Learning Lab

BTECA608C	Machine learning Lab	LC12	0L-0T-02P	1 Credits

Teaching Scheme	**Examination Scheme**
Lab : 2 hrs./week	Continuous Assessment: 30 Marks End Semester Exam: 20 Marks

(Minimum 08 to 10 experiments are to be performed based on contents in syllabus)

List of Practicals:

1. Python Programming and Data Handling for ML
2. Data Preprocessing and Feature Engineering
3. Linear and Ridge Regression for Prediction Tasks
4. Classification using k-NN, Naive Bayes & Decision Trees
5. Support Vector Machines (SVM) and Model Evaluation
6. Clustering with K-Means and DBSCAN
7. Dimensionality Reduction using PCA & LDA
8. Build a Basic Neural Network from Scratch
9. Image Classification using CNNs in TensorFlow or PyTorch
10. ML for Signal or Spectrum Analysis in IoT/Communication Systems

Third Year (Semester –VI)

Advanced Java Lab

BTECA608D	Advanced Java Lab	LC12	0L-0T-2P	2 Credits

Teaching Scheme	**Examination Scheme**
Practical: 02 hrs./week	Continuous Assessment: 30 Marks End Semester Exam: 20 Marks

(Minimum 08 to 10 experiments are to be performed based on contents in syllabus)

List of Practicals:

1. Write a program to demonstrate inheritance.
2. Write a program to group related classes into a user-defined package.
3. Write a program to handle an exception.
4. Write a program to create a simple calculator using buttons and text fields.
5. Write a program to design a login form with username and password fields.
6. Write a program to collect and display student details using a form.
7. Write a program to create and run a simple thread using the Thread class.
8. Write a program to simulate a countdown using multithreading.
9. Write a program to demonstrate how two threads can share and update a value.
10. Write a program to store and print names using an ArrayList.
11. Write a program to store and display key-value pairs using a HashMap.
12. Write a program to read data from a CSV file and display it in the console.
13. Write a program to insert and display data in a database table.
14. Write a program to update and delete data from a database.

Third Year (Semester –VI)

Mini Project –II

BTECA609	Mini Project-II	PROJ	0L- 0T - 4P	2 Credits

Teaching Scheme	**Examination Scheme**
Practical: 04 hrs./week	Continuous Assessment : 60 Marks End Semester Exam: 40 Marks Total : 100 Marks

Guidelines for Mini Project

The students shall study in group of two members (or individual) on some special topic beyond the scope of the syllabus under the subjects of Electronics & Computer Engineering, Artificial Intelligence, Data Science, Electronics Engineering and Computer Science Engineering or inter discipline branch from current literature, by referring the current technical journal or reference books, under the guidance of the teacher.
In this subject head, it is expected that the student should complete the following tasks.

1. Identify problem statement / idea which is solving one problem preferably local problem may be in their University / College / nearby vicinity.

2. Do the literature survey,

3. Design the solutions

4. Implement solution using latest technology

5. Write 20-25 pages report (use of latex is more suitable).

6. Present / demonstrate the solution in front of faculty member
The students shall prepare his report and execution of project for other students of his class in the presence of his guide and examiner. The student is permitted to use audio-visual aids or any other such teaching aids.

Continues Assessment:
The Continues Assessment for this head will consists of the report written in a technical reporting manner and execution of project will be assessed by the internal examiner appointed by the HOD of concern department of the institution.

Third Year (Semester –VI)

Internship – III/MOOC

BTECA610	Internship – III/MOOC	Internship	Audit

Guidelines for Internships

Guidelines for Field Training / Internship / Industrial Training Industrial Training:

1. To apply for a suitable Industrial Training, submit an application form to respective Organization concerned one semester before the Industrial Training Programmed commences.
2. Student can also apply through online platforms such as Internshala for industrial training.
3. Submit one copy of the offer letter for the Industrial Training to the Head of the department or Faculty coordinator (Industrial Training).
4. To complete the Industrial Training process within the specified time based on the Industrial Training Programme schedule.
5. Assessment within the Industrial Training context aims to evaluate the student's work quality and appropriateness to the field of study with reference to the learning outcomes of the Industrial Training Program.
6. Evaluation of the students' performance should be done in the next upcoming semester.

Those students who fails, they can also complete online certification courses which are available at free of cost on various MOOC platforms.